MASTER OF SOCIAL WORK

MSW

SYLLABUS

CREDIT BASED, CHOICE BASED CONTINUOUS ASSESSMENT PATTERNED EDUCATION SYSTEM

(Regulations, Scheme of Examination and Course Content)

To be effective from the Academic Year 2020-21 onwards

DEPARTMENT OF STUDIES IN SOCIAL WORK
JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE, OOTY ROAD, MYSORE

PRINCIPAL
JSS College of Arts, Commerce & Science
(Autonomous)
Ooty Road, MYSURU-25

JSS College of Arts, Commerce and Science

(Autonomous)

Ooty Road, Mysore

Master of Social Work Programme

DISTRIBUTION OF COURSE CONTENT AND CREDITS

MSW- I Semester

Compulsory additional papers for non BSW students

Sl. No.	Code No.	Paper Title	L	T	P	Credits
1	NSW-1	Social Science Perspectives for Social Work Practice	-	-	-	-
2	NSW-2	Term Project	-	-	-	-

1. A bridge course will be conducted for a period of 5 days covering the required course input. There are no credits allotted to this course and no written examination too. However, attendance of 75% is compulsory.

2. Paper code: NSW2 : **Term project**:

The term project is a team-exercise consisting 3 to 5 students. The team is expected to select a theme relevant to current social issues in consultation with the supervisor and make an exhaustive survey of literature on the chosen theme including empirical studies made on the same.

PRINCIPAL
JSS College of Arts, Commerce & Science
(Autonomous)
Ooty Road, MYSURU-25

Further, the group shall also collect the experiences or opinions of people on the issues and make a detailed presentation. Flexibility is accorded in planning and executing the term project. Creative and analytical approaches are to be carried out under the direct supervision of a faculty supervisor.

The report of the term project has to be submitted before the end of theory examination of the first semester. The term project is offered only for the non-BSW students. However, students with BSW background are also encouraged to opt for the term project, as an innovative approach in social work, if they desire so.

DISTRIBUTION OF CREDITS

Sl. No.	Course Type	Credits
1	HARD CORE (HC)	52
2	SOFT CORE (SC)	20
3	OPEN ELECTIVE (OE)	04
	TOTAL	76

Semester- wise Distribution of Course Content and Credits

I Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1.	SWA HC-1	Social Work - History and Ideologies	2:1:0	3
2.	SWA HC-2	Work with Individuals and Families	2:1:0	3
3.	SWA HC-3	Work with Groups	2:1:0	3
4.	SWA HC-4	Work with Communities	2:1:0	3
5.	SWA HC-5	Human Growth and Development	2:1:0	3
6.	SWA HC-6	Social Work Practicum – I	0:1:2	3
		Total		**18**

II Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1.	SWB HC-7	Management of Developmental and Welfare Services	2:1:0	3
2.	SWB HC-8	Social Work Research and Statistics	2:1:0	3
3.	SWB HC-9	Social Work Practicum – II (Social Work Camp and Summer Placement)	0:0:3	3
4.	SWB HC-10	Social Work Practicum - III	0:1:2	3
5.	SWB SC-1	Communication and Counselling / Gandhian Approach to Welfare and Development	3:1:0	4
6.	SWB SC-2	Personal and Professional Growth/ Population and Environment	2:1:0	3
			Total	**19**

III Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1.	SWC HC-11	Human Resource Management	2:1:0	3
2.	SWC HC-12	Social Work Practicum – IV	0:1:2	3
3.	SWC SC-3	Social Work with Tribal and Rural communities/Organizational Behavior and Organizational Development	2:1:0	3
4.	SWC SC-4	Preventive and Social Medicine and Medical Social Work /Rehabilitation and After Care Services	2:1:0	3
5.	SWC SC-5	Social Policy, Planning and Development/ Legal System in India	2:1:0	3
6.	SWC OE	Gerentological Social Work / Social Work Practice with Children	4:0:0	4
			Total	**19**

IV Semester

Sl. No.	Course Code	Course Title	L:T:P	Credits
1	SWD HC-13	Employee Relations and Legislation	2:1:0	3
2	SWD HC-14	Mental Health and Psychiatric Social Work	2:1:0	3
3	SWD HC-15	Major Project	0:2:4	6
4	SWD HC-16	Social Work Practicum – V	0:1:2	3
5	SWD HC-17	Social Work Practicum – VI (Block Placement)	0:0:2	2
6	SWD SC-6	Human Resource Development and Employee Wellness/Case Studies	3:1:0	4
			Total	**21**

Note: In a Semester for only one Soft Core Course, there can be two choices.

Objectives of the Course (Master of Social Work):

1. To provide education and training in social work to those desirous of making a career in social work practice.
2. To provide opportunities through intensive field practicum to work with variety of people in their development and provide service to those who are in need of it.
3. To provide inter-disciplinary collaboration for better understanding of human problems, services and issues related to human development.
4. To link theory with practice in every sphere of human service.
5. To develop requisite knowledge, skills and values in working with people.
6. To promote among learners a sense of responsibility and commitment to work with different sections of people and especially of the vulnerable sections of the society
7. To promote opportunities and to create awareness for personal growth
8. To acquire knowledge and skills in undertaking practice-based research and to administer human service organizations

Name of the Course:

The course shall be called **' Master of Social Work' (MSW)**.

Duration of the Course:

The Course of study **for MSW Degree** shall extend over a period of four semesters spreading over two academic years.

Regulations:

ELIGIBILITY FOR ADMISSION TO MSW COURSE
Candidates who have passed BSW/ BA/ B.Sc. / B.Com. / BBM/ B.C.A / LLB of the University of Mysore or any other university recognized as equivalent there to are eligible for admission to MSW course. Candidates will be selected for admission as per the general guidelines issued from the University of Mysore from time to time. The Department/University shall conduct entrance examination for admission to the course. The examination is of two hour duration and the question paper comprises of 100 objective type questions - 20% questions from general knowledge and current social issues, 60% from science & social sciences, and another 20% questions will be from reasoning and numerical ability. Merit will be assessed on the basis of performance in the entrance examination and performance in the undergraduate examination on equal weightage.

PATTERN OF QUESTION PAPER

Pattern 3

(The Question paper comprising of 3 parts: A,B and C as follows)

PART – A

There are 8 questions and a candidate has to answer any 5 questions. Each question carries 2 marks. This part covers all units of the syllabus.

PART – B

There are 8 questions and a candidate has to answer any 5 questions. Each question carries 5 marks. This part covers all units of the syllabus.

PART –C

There is a single question such as case study (may contain sub questions) covering entire syllabus carrying 15 marks. No choice.

ASSESSMENT OF SOCIAL WORK PRACTICUM

A viva-voce examination shall be conducted for each candidate in all semesters. The performance of the candidate shall be assessed by a committee consisting of three members as follows.

1. Chairperson of the Department
2. One Senior Member of the Faculty
3. One External Examiner

SOCIAL WORK PRACTICUM

The practicum with different learning opportunities is designed to provide scope to develop and enhance professional practice skills. Learning is aided through observation, analysis of social realities and experience of participation in designing and providing social work intervention.

The tasks are organized to help the learner acquire beginning skills, practice those already acquired, and master them from simple to complex. The learner is gradually encouraged to become an independent worker during the course of study.

Objectives

The objectives are met by providing a variety of experiences to learners to:

1. i. Develop the ability to observe and analyze social realities. Understand the
   ii. characteristics of social systems and their dynamics. Appreciate society's
   iii. response to people's needs, problems and social issues.
   iv. Develop critical understanding of the application of legislation, legal process, and social policy.

2. i. Develop the ability to examine the process of programme management and participate in the effort at various levels.
   ii. Develop the ability to recognize the need for newer programs, initiate and Participate in them.
   iii. Use Human Rights tools, understanding of gender justice, and need for equity in all intervention.
   iv. Develop an understanding of organizational structure, resource management, and day-to-day administration for human service programmes - developmental and welfare programmes
   v. Develop the capacity to integrate knowledge and practice-theory by participating in intervention.

3. i. Clarify and imbibe values which sustain positive attitude and professional ethics.
   ii. Develop the capacity for self-direction, growth and change through self awareness.

4. i. Enhance writing skills to document practice appropriately. Recordings to be viewed as an expression of interest, motivation and involvement in practice and as evidence of enrichment in the process of professional growth.

To meet these outcomes, several opportunities with specific objectives are designed. The different sets of opportunities with details of content and related tasks are listed separately.

Odd semester (I Semester)

Paper code: NSW -1

Paper Title: SOCIAL SCIENCE PERSPECTIVES FOR SOCIAL WORK PRACTICE

INTRODUCTION

This course provides the learners basic understanding of relevant concepts from social sciences to help the learners to study and understand social phenomenon. Further, it helps the learner develop skills for social analysis and understand developmental processes.

OBJECTIVES

a. Understand the concepts to examine social phenomenon. b. Develop skills to analyse Indian society and change.
c. Understand change and conflict.
d. Understand the system for economic order.
e. Develop skills for social analysis.
f. Understand the development and its impact.

Course Content

UINIT I

Sociology and its relationship to other disciplines: Meaning, scope and significance - Its relationship with other social sciences such as History, Economics, Politics, Psychology, Anthropology and Social work.

Society and Culture: Society as a system of relationship - Social Structure: Meaning, status and roles - Culture: Meaning and contents-Tradition, customs, values, norms, folklore and mores.

Indian Society: Composition of Indian Society: the concept of unity amidst diversity - Social classification in India: Tribal, rural and urban divisions - Social stratification in India: Meaning, caste, class divisions.
Socialization: Meaning, process of socialisation - The development of self - Agencies of socialisation.

UINIT II

Social Groups, Social Institutions and Social Control - Meaning and types: Primary and Secondary groups, in-groups and out-groups, reference groups - Types of social institutions: Marriage, Family, Religion, State and Law.
Meaning and Functions: Social Control exercised through the social institutions
Social Change: Meaning, characteristics and factors inducing change with reference to India.

Social Movements in India: Meaning, factors essential for a Movement - Dominant social movements in India - Social reform movement and contributions of social reforms - Peasant movement - Trade Union movement - Social movements and social change in India.

UINIT III

Development - A Human Right Perspective: Social Ideals of Indian Constitution - Fundamental Rights - Human Rights.

Socio-economic order and comparative economic system: Capitalism, Socialism and Mixed economy, their features, merits and demerits - Marxian political economy.

Social Analysis: Significance of social analysis: A brief analysis of socioeconomic, political and cultural systems - Inter-linkages in the Indian context.

UINIT IV

Under-development and its causes and Contemporary Development Dynamics: A historical overview with reference to developing countries of Asia, Africa and Latin America - North-south relations, world trades, Multinational corporations and their influences on Third World economics - Trends and counter trends (Paradoxes) in the global, political, economic, military, ecological and socio-cultural spheres.

Theories of Economic Development, Globalisation and its impact on Developing Countries: Stages of growth theory - Structural internationalist theory
Privatization, liberalization and structural adjustment programmes - Role of international financial institutions.

REFERENCES

1. Acuff, F. Gene; Allen, Donald E. and Taylor Lloyd, A. 1973 — From Man to Society, Hinsdale, Illinois, The Dryden Press.

2. Agrawal, A. N. and Lal Kundan 1989 — Economics and Development and Planning, Delhi, New Vikas Publishing House Private Limited

3. Augushine, John S. (Ed.) 1989 — Strategies for Third World Development, New Delhi: Sage Publications.

4. Basu, Durga Das. 1983 — Introduction to the Constitution of India, New Delhi, Prentice-Hall of India Private Ltd.

5. Bert N. Adams. 1975 — A Sociological Interpretation, Chicago: Rang McNally College.

6. Bharadwaj, A. N. 1979 — Problems of SC/ ST in India, New Delhi: Light and Life Publication.

7. Bhushan, Vidya and Sachdev, D.R. 1999 — An Introduction to Sociology, Allhabad, Kitab Mahal

8. Broom, Leonard, Charles M. Bonjean, Dorothy, H. Broom. 1990 — Sociology, Wadsworth Publication Co. Belmount.

9. Chakraborthy, Bimal 1996 — The United Nations and Third World, New Delhi: Tata McGraw Hill Publishing Company Limited.

10. Descrochers, John. 1 77 — Methods of Social Analysis, Bangalore: Centre for Social Action.

11. Deshpande, Srinivasan Narain. 1978 — Society Economy of Polity in India, Mumbai: University of Mumbai.

12. Elsenhans, Hartmut. 1991 — Development and Under Development: The History, Economics and Politics of North South Relations, New Delhi: Sage Publications.

13. Ely Chinoy. 1967 — Society - An Introduction to Sociology, New York: Random House.

14. Haralambos, Michael. 1980 — Sociology, Delhi: Oxford University Press.

15. Jain, P. C. 1991 — Social Movements among Tribals, New Delhi, Rawat Publication.

16. Kapadia, K. M. 1966 — Marriage and Family in India, London: Oxford University Press.

17. Kingsley, David. 1969 — Human Society, New York.

18. Kolenda, Pauline. 1987 — Regional differences in Family Structure in India, Jaipur: Rawat Publication.

19. Maudelbaum, David M. 1970 — Society in India, Vol. I and II, University of California Press.

20. Nagardra, S. P. 1994 — Development and Change, New Delhi: Concert Publishing Company.

21. Nana Poku Lloyd Pettiford (Ed.) 1998 — Rebuilds up the Third World, London: Macmillan Press Limited.

22. Narang, B. S., and Dhawan , R. C. 1983 — Introduction to Social Sciences, Delhi: C.B.S. Publication.

23. Panday Rajendra. 1986 — The Caste System in India-Myth and Reality, New Delhi: Criterion Publication.

24. Pandey, A. K. 1997 — Tribal Society in India, New Delhi: Manak Publishing Ltd.

25. Rao, D. Bhaskar, 1998 — World Summit for Social Development, New Delhi: Discovery Publications.

26. Rao, V. Lakshmana 1994 Ashish — Essays on Indian Economy, New Delhi: Publishing House.

27. Reddy, D. V. 1994 — Development and New International Economic Order, New Delhi: Deep and Deep Publications.

28. Ross, Aileen D. 1961 — The Hindu Family in its Urban Setting, Delhi: Oxford University Press.

29. Rugman, Alan 2000 — The End of Globalization, London: Random House.

30. Sharma, S. L. (Ed.) 1986 — Development: Socio-Cultural Dimensions, Jaipur: Rawat Publications.

31. Sharma, K. L. (Ed.) 1999 — Caste and Race in India, Mumbai: Popular Prakashan.

32. Sharma, R. K. 1997 — Indian Society - Institution and Change, New Delhi: Atlantic Publishers.

33. Singh, K. S. 1985 — Tribal Society in India, New Delhi: Manohar Publishing House.

34. Srinivas, M. N. 1996 — Village, Caste, Gender and Method (Essay in Indian Social Anthropology), Delhi: Oxford University Press.

35. Steveus Smart M., Laura S. Smart. 1976 — Families Developing Relationships, New York: Macmillan Publishing Co.

36. Tandon, B. B., and Tandon, K. K. 1997. — Indian Economy, New Delhi: Tata McGraw-Hill Publishing Company Limited

37. Verghese, K 1992 General Sociology, Delhi: Macmillan Co,

Journals/ Magazines

Sociological Bulletin (Journal of the Indian Sociological Society).

Contribution to Indian Sociology.

Social Change, Issues and Perspectives (Journal of the Council for Social Development).

Economic and Political Weekly, EPW Research Foundations, Mumbai.

Paper code: NSW 2

TERM PROJECT

The term project is a team-exercise consisting 3 to 5 students. The team is expected to select a theme relevant to current social issues in consultation with the supervisor and make an exhaustive survey of literature on the chosen theme including empirical studies made on the same.

Further, the group shall also collect the experiences or opinions of people on the issues and make a detailed presentation.

Flexibility is accorded in planning and executing the term project. Creative and analytical approaches are to be carried out under the direct supervision of a faculty supervisor.

The report of the term project has to be submitted before the end of theory examination of that semester to the Department of Social Work, University of Mysore, Mysore through the supervisor and Chairman/Principal of the college.

The term project is offered only for the non-BSW students. However, students with BSW background are also encouraged to opt for the term project, as an innovative approach in social work, is they desire so.

Evaluation of the term project will be done along with the viva-voce examination by the viva-voce committee, constituted for the assessment of social work practicum or similar committee may be constituted, if required.

Odd semester
Paper code: SWAHC- 1
Paper Title: SOCIAL WORK - HISTORY AND IDEOLOGIES

INTRODUCTION

This course aims at introducing the learners to a critical inquiry into the history and ideologies of social change and professional social work.

OBJECTIVES

a. Understand the history of evolution of social work profession, both in India and the West.
b. Develop insights into the origin and development of ideologies, approaches to social change.
c. Understand rationale, goals, ideals and ethics for social change.
d. Understand the perceptions of people and social problems, the status of benefactors and their motives.
e. Develop skills to understand contemporary reality in its historical context.
f. Understand self as a part of own environment and explore own assumptions, ideals, values to develop sensitivity to marginalization of vulnerable groups.

Course Content:

UNIT I

Indian History of Social Work Profession: Introduction - Beginning of social work education - Welfare versus developmental orientation in social work - Professionalization of social work values, education, knowledge and professional associations - Goals, values, functions/roles and process of social work - Interface between professional and voluntary social work, social work ethics.

UNIT II

Indian History of Ideologies for Social Change -Ancient period: Vedic, Vedantic and non-Vedic Ideologies, Spirituality - Medieval period: Zoroastrianism and Islam in India - Mysticism of Bhakti and Sufi movements and Sikhism.

Modern period: Christianity in India - Hindu reform movements - Dalit movements - Gandhian ideology and Sarvodaya movement – Nationalism - Ideology of the Indian Constitution - Ideology of voluntary organisations and voluntary action.

UNIT III

Contemporary Ideologies for Social Change: Neoliberalism and Globalisation - Post modernism - Multiculturalism - Ideology of action groups and social movements - Ideology of non-governmental organisations.
Role of state in providing social welfare services.

UNIT IV

Western History of Ideologies for Social Change: Organized and scientific charity - Beginning of social work education - Clinical social work - Ecological social work - Attributes of a profession.

Western History of Social Work Profession - Medieval period: Judeo-Christian-ideologies - Secular humanism and Protestantism - Modem period: Rationalism and Welfarism - Liberalism and democracy - Utilitarianism and Social Darwinism - Socialism and human rights - Emerging ideologies of professional social work.

REFERENCES

1. Agarwal, M. M. 1998	Ethics and Spirituality, Shimla: Indian Institute of Advanced Study
2. Alastair, Christie (Ed.) 2001	Men and Social Work: Theories and Practices, New York, Palgrave.
3. Banerjee, G. R.	Papers on Social Work: An Indian Perspective, Bombay, Tata Institute of Social Sciences.
4. Banks, S. 1995	Ethics and Values in Social Work: Practical Social Work Series, London: Macmillan Press Ltd.
5. Borgatta, E. F. (Ed.) 1992	Encyclopedia of Sociology, New York: Macmillan.
6. Brieland, Donald; Costin Lela B.; Atherton, Charles R. and Contributors 1975	Contemporary Social Work - An Introduction to Social Work and Social Welfare, New York, McGraw-Hill Book Company.
7. Butrym, Zofia T. 1976	The Nature of Social Work, London, Macmi1lan Press Ltd.
8. Chatterjee, P. 1996	Approaches to the Welfare State, Washington, D.C.: National Association of Social Workers.
9. Congress, E. P. 1998	**Social Work Values and Ethics, Chicago:** Nelson- Hall Publishers.
10. Desai, Armaity S. 1994	A Study of Social Work Education in India, Bombay, Tata Institute of Social Sciences, Vol. I and II
11. Desai, M. 2000	Curriculum Development on History of Ideologies for Social Change and Social Work, Mumbai: Social Work Education and Practice Cell.
12. Diwakar, V. D. (Ed.) 1991	Social Reform Movements in India: A Historical Perspective, Bombay: Popular Prakashan.

13. Encyclopedia of Social... 1987 — Encyclopedia of Social Work, Silver Spring, Maryland: National Association of Social Workers.

14. Encyclopedia of Social... 1987 — Encyclopedia of Social Work in India, New Delhi: Ministry of Welfare.

15. Feibleman,J. K. 1986 — Understanding Philosophy: A Popular History of Ideas, New York: Souvenir Press.

16. Fink, A. E. 1945 — The Field of Social Work, New York, Henry Holt and Co.

17. Friedlander, Walter A and. Apte, Robert Z. 1982 — Introduction to Social Welfare, New Delhi, Prentice–Hall

18. Ganguli, B. N. 1973 — Gandhi's Social Philosophy, Delhi: Vikas Publishing House.

19. Gore, M. S. 1993 — The Social Context of Ideology: Ambedkar's Social and Political Thought, New Delhi: Sage.

20. Gore, M. S. 1965 — Social Work and Social Work Education, Bombay, Asia Publishing House.

21. Jacob, K. K. (Ed.) 1994 — Social Work Education in India -- Retrospect and Prospect Udaipur, Himansu Publications.

22. Joseph, Sherry (Ed.) 2000 — Social Work: In the Third Millennium (Some Concerns and Challenges), Sriniketan, Department of Social Work, Visva-Bharati.

23. Kappen,S.1994 — Tradition Modernity Counterculture: An Asian Perspective, Bangalore: Visthar

24. Kothari, S. and Sethi, H. (Eds) 1991 — Rethinking Human Rights, New Delhi: Lokayan.

25. Moorthy, M. V. 1974 — Social Work - Philosophy, Methods and Fields, Dharwar, Karnatak University.

26. Noel and Timms, Rita 1977 — Perspectives in Social Work, London, Routledge and Kegan Paul.

27. Nigel Parton and Patrick, O'Byrne 2000 — Constructive Social Work - Towards a New Practie, New York, Palgrave

28. Panikkar, K. N. 1995 — Culture, Ideology Hegemony: Intellectual and Social Consciousness in Colonial India, New Delhi: Tulika.

29. Skidmore, Rex A. and Thackeray, Milton G. 1982 — Introduction to Social Work, New Jersey, Prentice-Hall, Englewood Cliffs

30. Stroup, H. H. 1960 — Social Work - An Introduction to the Field, New Delhi, Eurasia Publishing House.

31. Tata Institute of Social Sciences Social Work Educators Forum (TISSSWEF) 1997 — Declaration of Ethics for Professional Social Workers, The Indian Journal of Social Work, 58(2), 335-341

32. The Cultural Heritage... — The Cultural Heritage of India (Vols. 1-6), Calcutta: The Ramakrishna Mission.

33. United Nations 1992: — HumanRights: Teaching and Learning About Human Rights. UN: New York.

34. University Grants Commission1980, 1990 — Review of Social Work Education in India: Retrospect and Prospect, New Delhi: UGC. Curriculum Development Centre's Report: New Delhi, University Grants Commission.

35. Wadia, A.R. 1968 — History and Philosophy of Social Work in India, Bombay, Allied Publishers.

36. Woodrofe, K. 1962 — From Charity to Social Work, London: Routledge, and Kega Paul.

37. Yelaja, S. A. 1982 — Ethical Issues in Social Work, Springfield, Charles, C. Thomas.

38. Young, Pat 1985 — Mastering Social Welfare, Macmillan Master Series, London, Macmillan Education Ltd.

39. Younghusband, E. 1967 — Social Work and Social Values, Vol. III, London, George Allen and Unwin.

Journals/ Magazines

Economic and Political Weekly, The Indian Journal of Social Work, Lokayan Bulletin and Vikalp.

Odd semester
Paper code: SWAHC- 2
Paper Title: WORK WITH INDIVIDUALS AND FAMILIES

INTRODUCTION

This course aims to develop simple to complex skills of working with individuals and families in various situations like crisis, preventive, facilitative and developmental.

OBJECTIVES

a. Understand casework as a method of social work, and appreciate its place in social work practice.
b. Understand the values and principles of working with individuals and families.
c. Develop the ability to critically analyse problems of individuals and families and factors affecting them.
d. Enhance understanding of the basic concepts, tools and techniques in working with individuals and families, in problem-solving and in developmental work.
e. Develop appropriate skills and attitudes to work with individuals and families.

Course Content

UNIT I

Social case work: Definitions, scope, historical development - Influence of psychoanalysis on casework - Introduction of casework as a method of social work - Concepts of adjustment and maladjustment - Philosophical assumptions and casework values.

Principles of casework: Individualization, acceptance, non-judgmental attitude, participation, relationship, effective communication of feeling, client self-determination, and confidentiality.

Components of social casework: The person, the problem, the place and the process.
Process in casework: Study, assessment, intervention, evaluation, follow-up, and termination.

UNIT II

Types of problems faced by Individuals and families; individual differences and needs - Family assessment in casework practice.

Theories and approaches: Psycho-social approach, Functional approach, Problem-solving approach, Crisis Theory, Family intervention, Behavioural modification, Transactional analysis and Holistic approach.

UNIT III

Tools for Help: Case work tools: Interview, home visit, observation, listening, communication skills, rapport building.
Records: Nature, purpose and principles of recording.

Techniques of casework: Supportive, resource enhancement and counseling.
Self as a professional: Professional self - Conflicts and dilemmas in working with individuals and families.

UNIT IV

Application of Method: Primary and secondary settings - Application of methods in family, women, and child welfare settings, marriage counselling centres, schools settings, medical and psychiatric settings, correctional institutions, and industry.

REFERENCES

1. Banerjee, G. R. 1967 — "Concept of Being and Becoming in the Practice of Social Work", Indian Journal of Social Work, Mumbai: Tata Institute of Social Sciences.
2. Banerjee, G. R. 1971 — "Some Thoughts on Professional Self in Social Work", Indian Journal of Social Work, Mumbai:Tata Institute of Social Sciences.
3. Banerjee, G. R. — Papers on Social Work - An Indian Perspective, Bombay, Tata Institute of Social Sciences.
4. Barba, J. G. 1991 — Beyond Casework; London: Macmillan.
5. Bergh, M. V. 1995 — Feminist Practice in the 21st Century, Washington: National Association of Social Workers.
6. Biestek, F. P. 1957 — The Case Work Relationship, London, George Allen and Unwin.
7. Hamilton, G. 1946 — Principles of Social Case Recording, New York, Columbia University Press.
8. Hamilton, G. 1950 — Theory and Practice in Social Case Work, New York, Columbia University Press
9. Hartman, A. and Laird, J. 1983 — Family Centered Social Work Practice, New York: The Free Press.
10. Hollis, Florence. 1964 — Case Work - A Psychological Therapy, New York: Random House.
11. Joel Fisher. 1978 — Effective Case Work Practice - An Eclectic Approach, New York: McGraw Hill.

12. Mathew, Grace 1992 — An Introduction to Social Case Work, Bombay, Tata Institute of Social Sciences.

13. Nursten, Jean. 1974 — Process of Case Work, G.B: Pitman Publications.

14. Perlman, H. H. 1957 — Social Case Work: A Problem Solving Process, Chicago. The University of Chicago Press.

15. Pippins, J. A. 1980 — Developing Case Work Skills, California: Sage Publications.

16. Richmond, M. E. 1922 — What is Social Case Work? An Introductory Description, New York: Sage Foundation.

17. Richmond, M. E. 1917 — Social Diagnosis, New York, Free Press.

18. Sainsbury,Eric, 1970 — Social Diagnosis in Case Work, London: Routledge and Kegan Paul.

19. Sena F. Fine and Paul H. Glass. 1996 — The First Helping Interview Engaging the Client and building Trust, Sage Publication. '

20. Timms, N. 1964 — Social Case Work: Principles and Practice, London: Routledge and Kegan Paul.

Odd semester
Paper code: SWAHC -3
Paper Title: WORK WITH GROUPS

INTRODUCTION

This course aims at developing the understanding of Group Work as a method, developing skills for intervention, and gaining knowledge of the scope of this method in various settings.

OBJECTIVES

a. Develop awareness about the specific characteristics of Group Work and its contributions as a method of social work intervention,
b. Gain knowledge about group formation and the use of a variety of group approaches.
c. Develop understanding of concepts, dynamics and small group theory in relation to all types of groups, e.g. family, staff, committee, long-term client groups.
d. Identify the various situations and settings where the method could be used in the context of social realities of the country.

Course Content

UNIT I

Introduction and history of Group Work: Understanding of groups - Characteristics and significance of group - Definition of Social Group Work - Characteristics of Social Group Work - Purpose of Social Group Work; Historical evolution of group work with special emphasis on the Indian Context.

Type of Groups: Types and approaches based on objectives and purpose - Type of

membership - Time duration - Social group work in different settings and analysis of group processes.

Values and Principles in group work and Characteristics of Group formation: Values in social group work- Principles in group work - Assumptions underlying social group work - Factors of group formation - Formulation of goals - Identification of problems for work.

Pre-group and Initial Phase: Planning model - Characteristics of pre group phase - Group structures - Facilitation skills and role of worker in pre-group and initial phase.

UNIT II

Group Processes and Group Dynamics: Importance of group processes - Typical patterns - Processes in different type of groups - Worker's skills in identifying and understanding processes - Bond, sub-groups, role.
Leadership - Isolation - Decision making - Conflict – Communication - Relationships.

UNIT III

Middle Phase and Use of Program: Characteristics of middle phase - Group structures - Group dynamics - Facilitation skills - Role of group workers - - Comparison across phases - Concept and principles - Program planning - Skills in program planning

Facilitation: Knowledge of skills and techniques for effective work with groups/problem solving.
Recordings in Group work: Importance of recording in social group work - Principles of recording - Recording structure - Types of recording.

UNIT IV

Evaluation in Groups and Termination Phase : Importance of evaluation - Types of evaluation - Methods of evaluation - Need for termination - Types of termination - Characteristics of termination phase - Worker's skills.

Application of Group Work: Application in health settings, school settings, family welfare settings, industrial settings, women and child welfare settings.

REFERENCES

1. Alissi, A. S. 1980	Perspectives on Social Group Work Practice: A Book of Readings, New York: The Free Press.
2. Balgopal, P. R. and Vassil, T. V. 1983	Groups in Social Work - An Ecological Perspective, New York: Macmillan Publishing Co. Inc.
3. Brandler S. and Roman, C. P. 1999	Group Work: Skills and Strategies for Effective Interventions, New York: The Haworth Press.
4. Davies, Bernard 1975	The Use of Groups in Social Work Practice, London, Routledge and Kegan Paul.
5. Garland, J. A. (Ed.) 1992	Group Work Reaching Out: People, Places and Power, New York: The Haworth Press.
6. Garwin, C. 1987	Contemporary Group Work, New York: Prentice-Hall Inc.
7. Kemp, C. G. 1970	Perspectives on the Group Process, Boston: Houghton Miffiin C.

8. Klein, A. F. 1970 — Social Work through Group Process: School of Social Welfare, Albany: State University of New York.

9. Konopka, G. 1963 — Social Group Work : A Helping Process, Englewood Cliff. N J: Prentice- Hall Inc.

10. Milson, Fred 1973 — An Introduction to Group Work Skills, London, Routledge and Kegan Paul.

11. Northen, H. 1969 — Social Work with Groups. New York: Columbia University Press.

12. Pepell, C.P. and Rothman, B. — Social Work with Groups, New York: The Haworth Press.

13. Sundel, M., Glasser, Sarri, R., and Vinter, R. 1985 — Individual Change through Small Groups, New York: The Free Press.

14. Tom, Douglas 1978 — Basic Group Work, London, Tavistock Publications Ltd.

15. Toselane, R. W. and Rivas, R. F. 1984 — An Introduction to Group Work Practice, New York: Macmillan Publishing Co.

16. Trecker, Harleigh B. 1970 — Social Group Work: Principles and Practice, New Work:Association Press.

17. Wilson, G. and Ryland, G. 1949 — Social Group Work Practice, Boston: Houghton Mifflin, Co,

Odd semester
Paper code:SWAHC-4
Paper Title: WORK WITH COMMUNITIES

INTRODUCTION

Community organization / development, as a method of social work practice, is seen as a means to facilitate communities towards self-directed change. It takes as its basis the inequalities in society manifested through processes of marginalization, discrimination or disempowerment of groups, which have resulted in the loss of control over resources, be they tangible or intangible. The strategies of Community Organisation practice being addressed as part of the course cover a range spanning different ideologies, from those being people-initiated, and those that are initiated by the elite. Community organization is seen as a means as well as an end, where collective processes are to sustain the community's capacity to bring about change.

OBJECTIVES

a. Understand the critical elements of community organisation practice.
b. Enhance critical understanding of the models and strategies for community organisation practice.
c. Make the micro-macro connections between the range of complex issues in practice.
d. Develop attitudes conducive to participatory activities for civil society.

Course Content

UNIT I

Community: Concept, characteristics, types and functions.
Understanding of community organisation practice: Definition of community organisation, values and principles of Community Organisations, ethics of community organisation practice.

Community Organisation Practice: Community work within social work, Understanding Human Rights in community organisation practice.
Historical development of community organisation practice.

Power: Concept of power - The range of perspectives - Dimensions of power relevant to community organization.

Empowerment: Concept of Empowerment - Barriers to, process and cycle of empowerment.

Gender and Empowerment: Gender sensitive community organization practice

UNIT II

Models and Strategies of Community Organization - Locality Development Model - Social Planning Model - Social Action Model - Select methods of public interest mobilization, litigation, protests and demonstrations, Dealing with authorities, Public Relations, Planning, Monitoring and Evaluation - Roles in different models attributes and attitude.

UNIT III

Community Organization as a Method: Relevance of community organisation as a method across different spheres of social work intervention and relook at own attitudes.

Skills of Community Organization Practitioner: Problem analysis, resource mobilization, conflict resolution, organizing meetings, writing and documentation, networking, training.

UNIT IV

Strategy and Roles: Unionization as a strategy - Advocacy in community organization.

Current debates in Community Organisation Practice: Emerging issues - Impact of macro policies.

REFERENCES

1. Arora R. K. (Ed.) 1979 — People's Participation in Development Process: Essays in Honour of B. Mehta, Jaipur: the HCM State Institute of Public Administration.

2. Battern, T. R. 1962 — The Non-Directive Approach in Group and Community Work, London: Oxford University Press.

3. Brager, G. and Specht, H. 1969 — Community Organisation, New York: Columbia University Press.

4. Battern, T. R. 1965 — The Human Factor in Community Work, London: Oxford University Press.

5. Dandavate, M. 1977 — Marx and Gandhi, Bombay: Popular Prakashan Pvt. Ltd.

6. Dayal, R. 1960 — Community Development Programme in India, Allahabad: Kitab Mahal Publishers.

7. Dunham, Arthur E. 1970 — The Community Welfare Organisation, New York, Thomas Y. Crowell.

8. Gandhi, M. K. — Sarvodaya (I'he Welfare of All), Ahmedabad: Navjivan Publishing House.

9. Gangrade, K. D. 1971 — Community Organisation in India, Bombay, Popular Prakashan.

10. Henderson, Paul; Jones, David and Thomas, David N. 1980 — The Boundaries of Change in Community Work, Boston, George Allen and Unwin.

11. Lal, A. K. 1977 — Politics of Poverty: A Study of Bonded Labour. New Delhi: Chethana Publications.

12. Marulasiddaiah, H. M. 1987 — Community: Area and Regional Development in India, Bangalore, Bangalore University.

13. Mayo H., Jones D. 1974 — Community Work, London: Routledge and Kegan Paul.

14. McMiller, W. 1945 — Community Organisation for Social Welfare, Chicago: University of Chicago Press.

15. Murphy, C. G. 1954 — Community Organisation Practice, Boston: Houghton Mifflin Co.

16. Patnaik, U. and Dingwaney, M. 1985 — Chains of Servitude, Bondage and Slavery in India. Madras: Sangam Books Pvt. Ltd.

17. Polson and Sanderson. 1979 — Rural Community Organisation, New York: John Wiley and Sons.

18. Ramchandra Raj, G. 1974 — Functions and Dysfucntions of Social Conflict, Bombay: Popular Prakashan.

19. Ross Murray G. 1967 — Community Organisation: Theory, Principles and Practice, New York: Harper and Row.

20. Siddiqui, H. Y. 1997 — Working with Communities: An Introduction to Community Work, New Delhi: Hira Publications.

21. Shivappa R. 2009 — STREAMS IN THE RIVER- A Journey Into Inclusive Concerns, Dhatri Pustaka, Bangalore

22. Sussman, M. B. 1959 — Community Structure and Analysis, New York: Thomas Y. Crowell Co.

23. Volken, H. et. al. 1982 — Learning from the Rural Poor: Shared Experiences of the Mobile Orientation and Training Team, New Delhi: Indian Social Institute.

24. Warren, R. L. 1965 Studying Your Community, New York: Free Press.

25. Zaltman, G. and Duncan, R. 1977 Strategies for Planned Change, New York: Association Press.

Journals

Community Development Journal: An International Forum, UK, Oxford University Press.

Development and Change, Hague Blackwell Publisher.

Paper code: SWAHC-5
Paper Title: HUMAN GROWTH AND DEVELOPMENT

INTRODUCTION

The course aims to introduce the learners to the development of the individual across the life span, in a system and an ecological perspective. It also provides an understanding of human development and behaviour, in contextual influences, including individuals in disadvantaged or special contexts. The theoretical inputs are to enhance the understanding of people's growth, health, and development at various stages as bio-psycho-socio-spiritual being over the life span.

OBJECTIVES

a. Develop an overall understanding of the principles of growth; their relevance and application to behaviour at various phases in the life span.
b. Understand the twin roles of individual's heritage and environmental influences in growth and development.
c. Understand interactional nature of growth and behaviour at various stages in the life span: infancy, childhood, adolescence, youth, adulthood and old age, and impact of cultural aspects.
d. Develop sensitivity towards needs, developmental tasks and health status along with need for developmental programmes for the same.
e. Apply the information of growth, development and health in social work practice in general and individuals, groups and communities in particular.

Course Content

UNIT I

Life Span: Beginning of life - Human reproductive system; Fertilization and Foetal development - Delivery and pre-natal and post-natal care and their importance in development.
Principles of growth and development - Methods of studying human behaviour, - Role of heredity and environment - Social customs traditions, values in parenting and child rearing practices, deprivation and development during stages of life span. Understanding of the Indian concept of life span stages.

UNIT II

Developmental periods: Infancy, babyhood, childhood, puberty, adolescence -. Growth, hazards, lifestyle effects
Adulthood - Growth, personal and social adjustment, health, sexuality, vocational and marital adjustment.
Aging - Characteristics, hobbies, adjustment, physical and mental health, death, dying and bereavement.
Special focus is on psychosocial development, moral development, and personality development vis-a-vis the influence of the contexts of development., (The contexts here refers to gender, family, significant others, neighbourhood: peers, school, community, work place and other larger contexts like the society and culture. Emphasis is placed on the Indian context of development, variations from the

normal patterns of development and views on the stages)

UNIT III

Theories of Human Development: A critical look at the theories of human development - Freud's psychosexual theory, Erikson's psychosocial theory, learning theories.

UNIT IV

Basic human needs: Physical, psychological and intellectual needs, stress - Coping and social support.
Motivation, frustration and conflicts - Emotions and emotional behaviour.
Personality: Definition, nature, types and assessment of personality.
Intelligence: Concept, levels of intelligence, influence of heredity and environment, assessment of intelligence.
Relevance of Psychology to social work practice across the stages of development, period specific needs, tasks and challenges.

REFERENCES

1. Anastasi, Anne 1988	Psychological Testing, New York, Macmillan Publishing Company.
2. Baltes, P. B. (Ed.) (1978)	Life span Development and Behaviour. New York: Academic Press, Inc.
3. Bronfenbrenner, U. 1979	The Ecology of Human Development, Cambridge: Harvard University Press.
4. Chowdary, D. P. 1992	Aging and the Aged, New Delhi: Inter-India Publications.
5. Feldman Robert S 1997	Understanding Psychology, 4th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi
6. Gore, M. S. 1978	Changes in the Family and the Process of Socialisation In India, In Anthony, E. J. & Colette, C. (Eds.). The Child in his Family, Wiley, 365-374.
7. Gore, M. S. 1992	Aging and the Future of the Human Being, The Indian Journal of Social Work, 53 (2), 210-219.
8. Hurlock, Elizabeth B. 1978	Child Growth and Development, New Delhi, Tata McGraw-Hill Publishing Company Ltd.

9. Hurlock, Elizabeth B. 1975 — Developmental Psychology, New Delhi, Tata McGraw-Hill Publishing Company Ltd.

10. Kail, R. V. and Cavanangh, J. C. 1996 — Human Development, Pacific Grove, CA: Brooks/ Core Publishing Company.

11. Kakar, S. 1979 — Indian Childhood, Cultural Ideals and Social Reality, Delhi: Oxford University Press.

12. Kakar, S. 1982 — Identity and Adulthood, Delhi: Oxford University Press.

13. Kakar, S. 1970 — Conflict and Choice - Indian Youth in a Changing Society, Bombay: Somaiya Publications.

14. Kakar, S. 1978 — Images of the Life Cycle and Adulthood in India, In Anthony, E. J. and Colette, C. (Eds.) The Child in his Family, Wiley. 319-332.

15. Kaplan, P. S. 1988 — The Human Odyssey: Life-Span Development, St.Paul, West Publishing Company.

16. Le francois, G. R. 1990 — The Life Span, Third Edition, University of Alberta.

17. Magmesson, D. and Allen, V. C 1983 — Human Development: An International Perspectives, New York: ,Academic Press. Chapters 1,5,6,11,14,16,19,21.

18. Maier, H. W. 1965 — Three Theories of Child Development, N.Y.: Harper and Row Publishers.

19. Misra, G. (Ed.) 1990 — Social Psychology in India, New Delhi: Sage Publications.

20. Rapoport, Rhona and Rapoport, Robert 1980 — Growing through Life, Lifecycle Book, New York: Harper & Row Publishers.

21. Sharma, N. 1999 — Adolescent Girl Child in India, News Bulletin of the Indian Council of Child Welfare.

22. Sheehy, G. 1976 — Passages: Predictable Crisis of Adult Life, New York: Bantam Books.

23. Sige1man, C. K. and Shaffer, D. R. 1995 — Life-Span Human Development, 2nd Edition, Pacific Grove, CA: Brooks Cole Pub1ishing Company.

24. Smolack, L. 1993 — Adult Development, New Jersey: Prentice-Hall.

25. Sternberg, R. J. and Wagner, R. K. 1986 — Practical Intelligence: Nature and Origin of Competence in Everyday World, London: Cambridge University Press.

26. Veedon, R. 1993 — Death in OId Age and Bereavement Counselling, Indian Journal of Social Work, 54 (1),85-92.

27. Weiner, E. A. and Stewart, B. J. 1984 — Assessing Individuals: Psychological and Educational Tests and Measurements, Boston, Little, Brown and Co.

Odd semester
Code: SWAHC-6

Title: SOCIAL WORK PRACTICUM - I

Orientation provides information regarding.

i. the importance and place of the practicum in the educational programme.
ii. the purpose, functions and ethics in professional practice.

In the first four weeks, the learners may make a local directory to include emergency numbers of Hospitals/ PHCs/ Police/ Panchayath Office and Network Agencies along with references to other developmental and welfare services in the location.

Visits - provide an exposure to and understanding of the services provided in responses to people's needs. (Agencies in health setting, education, community, institutional services, criminal justice system, civic administration, rehabi1itation etc.)

Structured experience laboratory - is a classroom activity, which provides opportunities through the games/activities, to form the involvement of self in various practice skills. These laboratory experiences are designed in small groups to encourage participation, sharing of the experience and aid in examining learning and applications of skil1s. These sessions have a specific objective of experiencing self, and applying /using self in practice. (Relationship skills, Communication skills etc., will be focused)

Concurrent practice learning of two-days a week - on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning social work practice for two, or two and a half days or its equivalent, each week of the semester.

The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies, skills and techniques to practice social work.

Even semester (II Semester)

Code: SWBHC -7

Paper Title: MANAGEMENT OF DEVELOPMENTAL AND WELFARE SERVICES

INTRODUCTION

The course aims to develop management competencies to function in organizations, participate as a team member and understand the role of a social work programmes manager.

OBJECTIVES

a. Understand the overall environment and its impact on the nature, structure and development of organizations in corporate, public and voluntary sectors in the context of social work profession.
b. Understand policies and procedures involved in establishing and maintaining human service organizations.
c. Acquire skills to network and participate in the management of resources - human, material and environmental.
d. Develop skills to participate in management of programmes, as a part of the inter-disciplinary team and initiate as well as develop new programmes.
e. Develop ability to analyse the practices applied in specific settings.

Course Content

UNIT I

Social Services: Need for welfare and developmental organisations, Factors determining social welfare programmes, Development and Welfare organizations' response to societal needs; role of state, voluntary and corporate sector.

Management services: Types of settings, organizational characteristics like origin, nature, size, structure, and design, organizational climate and impact of socio-political environment - Management process: Vision, Planning, Organizing, Directing, Staffing, Coordination, Reporting, Budgeting.

Establishment: Registration, different types of legislations, legal status, constitution, rules and procedure, goals - Financial resources: Organizational Budget, Sources of finance, Fund Raising, Records, Audit.

UNIT II

Physical: All activities related to acquiring, hiring and maintaining importable structure and infrastructure, maintenance of premises and daily upkeep.

Enhancing the involvement and the potential of people in organization's executive boards, committees; professionals and other staff-relationship, communication, team work, and facilitating team building, supervision, and participation in training.

UNIT III

Programme Development: Programme management: long term, short term, and Documentation.

Project proposals based on felt-needs, nature of resources, eligibility criteria, records, evaluation and research.

Impact analysis - Qualitative and quantitative.

UNIT IV

Public Relations: Public relations need and its promotion by all in the organisation. Representing the organization, networking, public, corporate and voluntary sector, resource building, accountability, transparency, use of media for publicity.

Change and its Management: Understand and manage change, innovation in a rapidly changing social environment: for policy programmes and structure.

Organizational understanding: Conflict, conflict resolution, creating positive climate.

REFERENCES

1. Choudhari, D. Paul. 1983 Social Welfare Administration, Delhi: Atma Ram and Sons.

2. Garain, S. 1998 Organizational Effectiveness of NGOs, Jaipur: University Book House.

3. Garain, S. Towards a Measure of Perceived Organizational Effectiveness in Non-government Organization, Mumbai: Indian Journal of Social Work, 54 (2), 251 -270.

4. Goel, S. L. and Jain, R. K. 1988 Social Welfare Administration: Theory and: Practice, Vol. I and II, New Delhi: Deep and Deep Publications.

5. Government of India Evaluation of Social Welfare Programmes, Encyclopedia of Social Work. Vol. 1, 297 - 310.

6. Haimann, A. 1982 Professional Management and Practice, Delhi: Eurasia Publications.

7. Hasenfeld, Y and English, R. (Eds.) 1978 — Human Service Organizations. Ann Arbor: University of Michigan Press.

8. Hauman, A. 1962 — Professional Management and Practice, Delhi: Eurasia Publications.

9. Jackson, J. 1989 — Evaluation for Voluntary Organizations. Delhi: Information and News Network.

10. Kapoor, K. K. 1986 — Directory of Funding Organizations, Delhi: Information and News Network.

11. Lauffer, A. 1977 — Getting the Resources You Need, New Delhi: Sage Publications.

12. Lauffer, A. 1977 — Understanding Your Social Agency, London: Sage Publications.

13. Luthans, Fred. 1990 — Organizational Behaviour, Boston, Irwin McGraw Hill.

14. PRIA. 1990 — A Manual on Financial Management - An Accounts Keeping for Voluntary Organizations, New Delhi: Society for Participatory Research in Asia.

15. PRIA b — Training of Trainers: A Manual for Participatory Training Methodology in Development, New Delhi: Society for Participatory Research in Asia.

16. Sachdeva, D. R. 1998 — Social Welfare Administration in India, Allahabad, Kitab Mahal.

17. Siddiqui, H. Y. 1984 — Social Work and Social Action, New Delhi: Hamam Publications.

18. Skidmore, R. A. 1983 — Social Work Administration, New Jersey, Prentice-Hall.

19. Slavin, S. (Ed.) 1978 — Managing Finance, Personnel and Information in Human Services, New York: Howorth Press.

20. Slavin, S. (Ed.) 1978 — Social Administration, New York: The Haworth Press.

21. Weiner, M. 1982 — Human Service Management, Illinois: The Dorsey Press.

22. Young, Pat 1985 — Mastering Social Welfare, London, Macmillan Master Series, Macmil1an Education Ltd.

Paper Code: SWBHC-8
Paper Title: SOCIAL WORK RESEARCH AND STATISTICS

INTRODUCTION

This course is to equip learners to utilize, and conduct research as service managers to improve services, evaluate, and develop new services and intervention methods: strategies and techniques and also, be an effective consumer of other researches.

OBJECTIVES

a. Develop an understanding of scientific approach to human inquiry in comparison to the native or common sense approach in various aspects, and its process.
b. Understand major research strategies, meaning, scope and importance of social work research.
c. Develop an ability to see the linkages between practice, research, theory and their role in enriching one another.
d. Develop ability to conceptualize, formulate and conduct simple research projects/exercises (This would include a broad range of basic research skills such as conceptualization of a research strategy and problem; writing a research proposal; developing tools for col1ecting data; use of sampling, strategies; data collection, processing, presentation, analysis and interpretation; and writing research report etc).
e. Make informed assessment and judicious use of research studies and findings.
f. Develop skills for use of library and documentation services for research.

Course Content

UNIT I

Science - Meaning and assumptions, scientific approach in comparison to the native or common sense approach.

Scientific attitude; Scientific method; application of scientific method for the study of social phenomena.

Research: Definition and objectives, Social Work Research: Meaning, objectives, functions and limitations; Scope of social work research in India; Agencies sponsoring and conducting social work research, ethics in research.

Problem identification: Criteria for the selection of research problem; Problem formulation.
Concepts, constructs, variables, conceptual and operational definitions. Hypothesis: Meaning, importance, uses and requirements.

UNIT II

Design of research: Definition and importance; types of research design; exploratory,

descriptive, experimental, evaluative design, participatory research and action research.

Source and Types of Data: Primary and secondary, objective and subjective, qualitative and quantitative.

Sampling: Sample and population: Rationale and Characteristics of sampling; methods of sampling, general considerations in the determination of sample size.

Methods of collection of primary data:
Observation: Structured and unstructured; participant and non-participant. Questionnaire, interview schedule and interview guide. Pilot study and Pre-testing.

Scales: Need for scales, some prominent scaling procedures.
Case study: Meaning, uses, steps.

Secondary data: Official data, personal documents, problem in the use of secondary data

UNIT III

Processing of data: Content, editing, coding data classification, manual and mechanical tabulation of data; frequency distribution, diagrammatic and graphic presentation - use of computers.

Issues related to Social Work Research: Interpretation of data, research reporting: contents of research report: foot-note, references, bibliography, preparation of abstract; the art of making book review.

UNIT IV

Statistics: Definition, functions and importance
Measures of Central Tendency; Measures of Dispersion.
Chi-square, Correlation Coefficient, 't' distribution; Analysis of Variance and 'F' distribution.

SPSS package.

REFERENCES

1. Ackoff, R. L. 1962 — Scientific Method: Optimizing Applied Research Designs, New York: John Wiley and Sons.

2. Anderson, J. et al. 1970 — Thesis and Assignment Writing, New Delhi: Wiley Eastern Limited.

3. Bailey, Kenneth, D. 1987 — Methods of Social Research, New York: The Free Press

4. Blaikie, Norman. 1993 — Approaches in Social Enquiry, Cambridge: Polity Press.

5. Blalock, H. M. 1972 — Social Statistics, New York: McGraw Hill.

6. Blalock, H. M. and Blalock, A. M. (Eds.) 1968 — Methodology in Social Research; New York: McGraw-Hill.

7. Coolidge, Frederick L. 2000 — Statistics: A Gentle Introduction, New Delhi: Sage Publications.

8. Crabtres, B. F. and Miller, W. L. (Eds.) 2000 — Doing Qualitative Research, New Delhi: Sage Publications.

9. Cranstein, A. and Phillips, W.R.1978 — Understanding Social Research: An Introduction, Boston: Allwyn and Bacon.

10. Denzin, Norman, K. & Lincoln, Y. S. (Eds.) 2000 — Handbook of Qualitative Research (II ed.), New Delhi: Sage Publications.

11. Field, Andy. 2000 — Discovering Statistics Using SPSS for Windows: Advanced Techniques for Beginning, New Delhi: Sage Publications.

12. Foster, J. J. 1998 — Data Analysis Using SPSS for Windows: A Beginner's Guide, New Delhi: Sage Publications.

13. Gahan, Celis and Hannibal, Mike. 1998 — Doing Qualitative Research Using QSR, NUD, IST, New Delhi: Sage Publications.

14. Geltung, J. 1961 — Theory and Methods of Social Research, London: George Allen & Unwin

15. Goode, W. J. and Hatt, P. K. 1962 — Methods in Social Research, New York, McGraw-Hill.

16. Gupta, S. P. 1984 — Statistical Methods, New Delhi, Sultanchand and Sons.

17. Jefferies, J. and Diamons, I. 2000 — Beginning Statistics: An Introduction for Social Scientists, New Delhi: Sage Publications.

18. Krishnaswamy, O. R. 1993 — Methodology of Research in Social Sciences, Bombay, Himalaya Publishing House.

19. La1das, D. K. 2000 — Practice of Social Research, Jaipur, Rawat Publications.

20. Manheim, Henry, L. 1977 — Sociological Research: Philosophy and Methods, Illinois:The Dorsey Press.

21. Marshal1, Gatherine and Rosaman, G. B. 1999 — Designing Qualitative Research, III Edition, New Delhi: Sage Publications.

22. May, Tim. 1997 — Social Research: Issues, Methods & Process, Buckingham: Open University Press.

23. Moser, C. A. and Kalton, G, 1977 — Survey Methods in Social Investigation, London: Heinemann Educational Books

24. Mukherji, Partha N. (Ed.) 2000 — Methodology in Social Research: Dilemma, and Perspectives, New Delhi: Sage Publications.

25. Nagel, Ernest. 1984 — The Structure of Science: Problems in the Logic of Scientific Explanation.

26. Padgett, Deborah, K. 1988 — Qualitative Methods in Social Work Research, New Delhi: Sage Publications.

27. Polansky, N. A. (Ed.) 1960 — Social Work Research, Chicago, University of Chicago.

28. Ramchandran, P. 1990 — Issues in Social Work Research in India, Bombay: Institute for Community Organisation Research.

29. Ramachandran, P. 1990 — Issues in Social Work Research in India, Bombay, Tata Institute of Social Sciences.

30. Reid, William J. and Smith, Andrey D. 1981 — Research in Social Work, New York: Columbia University Press.

31. Rosenberg, M. 1968 — The Logic of Survey Analysis, New York: Basic Books.

32. Rubin, A. and Babbie, K. 1993 — Research Methods for Social Work, California: Brooks Cole Publishing Co.

33. Sellits, Glaire et al. 1976 — Research Methods in Social Relations, New York:Holt, Rinebart and Winston.

34. Shah, F. V. 1977 — Reporting Research, Ahmedabad: Rachna Prakashan.

35. Shaw, Ian and Lishman, Joyce. (Ed.) 1999 — Evaluation and Social Work Practice, New Delhi: Sage Publications.

36. Silverman, David (Ed.) — Qualitative Research,. New Delhi: Sage Publications.1997

37. Society for Participatory Research in Asia, 1995 — Participatory Research: An Introduction, Participatory Research, Network Series, No.3, New Delhi: PRIA.

38. Stewart, Alex. 1998 — The Ethnographer's Method, New Delhi: Sage Publications.

39. Yanow, Dvora. 1999 — Conducting Interpretive Policy Analysis, New Delhi: Sage Publications.

40. Yin, Robert, K. 1.994 — Case Study Research: Design and Methods, New Delhi: Sage Publications

41. Young, Pauline V. 1982 — Scientific Social Survey and Research, New Delhi, Prentice-Hall of India Pvt. Ltd.

Code : SWBHC-9

Title: SOCIAL WORK PRACTICUM - II:

SOCIAL WORK CAMP:

Rural/ Tribal camps with a duration of 7 - 10 days - provide opportunities to experience rural life, analyze rural dynamics, and observe the functioning of local self government and voluntary organisations. This experience aids peer participation in planning for activities for own group and those for local people. It also helps develop skills to carry out, evaluate, and report the experience.

SUMMER PLACEMENT:

Summer Placement - provides an opportunity to experience day-to-day work in a setting. The learner gets involved with direct practice with the client system and with the ongoing management operations of the setting. The time frame recommended for this experience is about three weeks, after the first year of the post-graduate programme. The learner may use the same setting for data collection of research project, if such an arrangement is part of the plan.

Code: SWBHC -10
Title : SOCIAL WORK PRACTICUM - III

Concurrent practice learning of two-days a week - on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning social work practice for two, or two and a half days or its equivalent, each week of the semester. The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies, skills and techniques to practice social work.

Even semester
Paper Code: SWBSC-1
Paper title: COMMUNICATION AND COUNSELING

INTRODUCTION

This paper relates the relevance of components of communication and counseling in social work practice.

OBJECTIVES

a. Understand the meaning and importance of communication in day-to-day life.
b. Focus on interpersonal communication of interviewing and allied aspects.
c. Develop holistic understanding of counseling as a tool for help.
d. Acquire knowledge of various approaches: their theoretical under-pinnings for goals, values, processes and techniques,
e. Develop skills of application to real life situations.

Course Content

UNIT I

Communication: Meaning and importance of communication.
Process of communication: Key elements in the communication process - Communication, message, audience; channel of communication. Verbal and non-verbal communication.

Basics of Communication.
Education and communication for national development.

Interpersonal communication: Interviewing - Objectives, principles of interviewing; listening, qualities of effective communicator.
Seminars, conferences, lectures, group discussion, panel discussion, symposium, workshop, role playing, simulation exercises, written communication, report writing, letter writing, article/essay writing, games, brain storming, street play, field work exposure.

UNIT II

Visual aids in communication: Poster making, use of notice boards, flip charts, charts, flash cards, photographs, pamphlets, slide shows.

Mass Communication: Television, exhibition, newspapers and magazines, advertisements, radio, film, VCD/ DVD, e-mail, internet.

Impact of mass communication on society, family, marriage and child development.

Communication Analysis and Planning: Planning and executing a communication campaign on an issue using various methods of communication.

UNIT III

Counseling: Definition, nature and goals, areas of counseling; Historical background and origins of counseling, ethical nature of counseling, qualities of an effective counselor.

Counseling Situations: Developmental, preventive, facilitative, and crisis.

Counseling and Psychotherapy - Skills in counseling - Establishing the relationship.

Process of Counseling.

Approaches to Counseling: Approaches; Theoretical base, thrust, goals, key concepts, techniques - Approaches like person-centered, rational-emotive, behavioural approaches, gestalt, existential approaches, Egans three stage model, eclectic model.

Indigenous Approach: Indigenous approaches of help and self-help like yoga, reflection. Act of Prayashchit.

UNIT IV

Couple and Family Counseling: Issues in such counseling, its process and stages.

Crisis Counseling

Group Counseling: Counseling for groups - Process, advantages and disadvantages of group counseling.

Practice of counseling in family counseling centres, family courts, counseling bureau - Premarital and marital counseling, vocational counseling centres, mental health centres, child guidance clinics, correctional institutions, deaddiction and rehabilitation centres, educational institutions.

REFERENCES

1. Brown, Leland 1970 — Communicating Facts and Ideas in Business, New Jersey: Prentice-Hall Inc., Englewood Cliffs.

2. Chandrashekar, C. R. (Ed.) 1999 — A Manual on Counseling for Lay- Counselors, Bangalore, Prasanna Counseling Centre.

3. Dave, Indu 1983 — The Basic Essentials of Counseling, New Delhi: Sterling Publishers Pvt., Ltd.

4. Desai, M. M.(Ed.) 1979 — Creative Literature and Social Work Education, Bombay: Somaiya Publications Pvt. Ltd.

5. Desai, Murli (Ed.) 1994 — Family and Interventions - A Course Compendium, Bombay, Tata Institute of Social Sciences.

6. D'souza, Y. K. 1999 — Communication Today and Tomorrow, New Delhi: Discovery Publishing House.

7. Fisher, Dalmar 1999 — Communication in Organisations, Second Edition, Mumbai: Jaico Publishing House.

8. Fullmer, D. W. and Bernard, H. W. 1972 — Counseling: Content and Process, New Delhi: Thomson Press India.

9. Fuster, J. M. 2000 — Personal Counseling, Eighth Updated Edition, Mumbai, Better Yourself Books.

10. Kennedy, E. 1977 — On Becoming a Counselor - A Basic Guide for Non-professional Counsellors, Delhi: Gill and Macmillan.

11. Lakshmipathi Raju, M (Ed.) 1999 — Family Counseling: Perspectives and Practices, Tirupati, Sri Padmavati Mahila Visvavidyalayam.

12. Lewis,E. Patterson and Elizabeth, Reynolds Welfel 2000 — The Counseling Process, Stamford, Brooks / Cole Thomson Learning,

13. Melkote, Srinivas R. 1991 — Communication for Development in the Third World – Theory and Practice, New Delhi: Sage Publications.

14. Mohan, Krishna and Banerji, Meera. 1990 — Developing Communication Skills, Delhi: Macmillan India Ltd..

15. Murphy, Robert D. 1977 — Mass Communication. and Human Interaction, Boston:Houghton Miffiin Company.

16. Narang, Vaishna 1996 — Communicative Language Teaching, New Delhi: Creative Books.

17. Narayana, Rao S. 1981 — Counseling Psychology, New Delhi: Tata Mc Graw Hill Publishing Company Ltd.

18. Pollock, Thomas C1ark; Sheridan, Marion C; Ledbetter, Frances and Doll, Ronald C. 1955 — The Art of Communicating, New York: The Macmillan Company.

19. Robert, G. Madden 1998 — Legal Issues in Social Work Counseling and Mental Health, Sage Publications India Pvt., Ltd.

20. Small, Jacquelyn 1990 — Becoming Naturally Therapeutic: A Return to the True Essence of Helping, New York, Bantam Books.

21. Venkatramani, S. H. 1998 — Corporate Communications - The Age of Image, New Delhi: Sterling Publishers Private Ltd.

Paper code: SWBSC -1

Paper Title: GANDHIAN APPROACH TO WELFARE AND DEVELOPMENT

INTRODUCTION

The course aims at sensitizing the learner to the Gandhian approach and to utilize some of the skills in practice.

OBJECTIVES

a. Develop an understanding of Gandhi's concept of society and his approach to social transformation.
b. Develop knowledge of the specific programmes formulated by Gandhi for rural reconstruction and the development of the weaker sections of society, with the focus on strategies and skills.
c. Develop the ability to identify similarities and differences between the Gandhian and professional social work approaches to social change, welfare and development.

Course Content

Unit I

Gandhian thought: Salient features of Gandhian thought; Gandhian values; Concepts and methods; Concept of a healthy society; Sarvodaya.

Unit II

Gandhian Approach: Economic and its organization: Ownership of property; Concept of trusteeship, distribution and economic equality; System of production, problems of mechanization, decentralization of production, rural- urban relationship

Unit III

Social Organisation: Marriage and family, position of women, social stratification, caste and untouchability, education and its role; Basic education.

Unit IV

Constructive programmes: Contents training of constructive workers, skills involved, nature of programmes; Boodan, Gramdan.
Gandhian and Vinbobha's movements with special reference to Bhoodan and Gramdan

Gandhian and Professional Social Work Approach: Similarities and differences between Gandhian and professional approach to social development and welfare

REFERENCES

1. Dasgupta, S (Ed.) 1967 — Towards Philosophy of Social Work in India, New Delhi: Popular Book Service

2. Bandopadhyaya, J 1969 — Social and Political Thought to Gandhi, Bombay: Allied Publishers

3. Gandhi, M.K — Social Service, Work and Reform; 3 Volumes, Ahmedabad: Navijivan Press

4. Ganguli, B.N 1972 — Gandhi's Vission of Ideal Society, Hyderabad: Andhra Mahila Sabha

5. Iyer, R 1986 — Moral and Political Writings of Gandhi, Vol 3, Delhi: Oxford University Press

6. Kumarappa, J.C 1951 — Gandhian Economic Thought, Bombay: Vora and Co.

7. Mishra, R.M 1972 — Bhoodan Movement in India, Delhi : S Chand.

8. Nanda, B.R 1985 — Gandhi and His Critics, Delhi: Oxford University Press

9. Narayan, J 1965 — From Socialism to Sarvodaya, Varanasi: Sarva Seva Sangh

10. Palkhiwala, N 1986 Relevance to Gandhi, New Delhi: Gandhi Peace Foundation.

11. Unitahna, T.K.N 1979 Gandhi and Social Change, Jaipur: Rawat Publications

Even semester
Paper Code: SWSC-2
Paper title: PERSONAL AND PROFESSIONAL GROWTH.

INTRODUCTION

The course aims at enhancing personal and professional effectiveness by developing a continuous awareness and deeper insight into one's being. It encourages value clarification, upholding of professional ethics, and ability to make effective choices for integration. It provides opportunities to understand stress, stressors and methods to handle stress experienced.

OBJECTIVES

a. Understand self as a being, as one in the process of becoming and experience self-awareness.
b. Examine own values and attitudes and explore choices made to express self in own environment.
c. Develop positive life skills and practice self-help methods for integration and for stress reduction.
d. Understand and uphold professional values and ethics.

Course Content:

UNIT I

Self and Self Awareness: Understand self through a cognitive construct/paradigm (two/three models from among those available may be offered as workshops). Suggested approaches are: Rational Emotive Therapy, Gestalt Approach, Transactional Analysis, Reality Therapy, Yoga for Therapy, Meditation Techniques.

Explore self as being, and understand the process of becoming. (through observation)
Practice consciously measures to sustain and experience continuous awareness.
Observation and Reflection: Theory and techniques.
Communication Choices: Communication mode and patterns and effectiveness, Interpersonal communication, nature of choices made.

UNIT II

Emotions and their Expression: Emotions, nature of expression.
Understand own pattern of communication, choices made to express emotions, modes used, examine need for change.

Communication: Informal and knowledge and skills of rapid reading, writing, creative writing, report writing and public speaking.

UNIT III

Creativity and Self: Understand brain functions: Creativity, need and development
Life Style: Conscious life style - enhanced life skills: Communication, decision making, empathy, critical thinking, use of time and money, building and sustaining bonds-relational, colleagial and personal.
Self defeating behaviour - nature and impact. Choices for change.

UNIT IV

Values, Attitude and Professional Ethics: Values and attitudes - their role in life, Value conflict - its impact, value clarification.

Integration: Through Eastern and Western approaches experience the processes of integration. Approaches recommended are: Yoga as a science, meditation (tool for meditation - own choice).

Stress / Burn out - Self help Methods: Stress, Stressors, nature and impact of stress, its expression, and burnout.

Spirituality and Growth.

REFERENCES:

1. Becavar, D. (Ed.) 1997 — The Family, Spirituality and Social Work, Journal of Family Social Work, Vol.2, No.4,

2. Bhattacharya, K. 1971 — The Indian Concept of Self, Bulletin Ramakrishna Mission Institute of Culture, 22(8), August 1971. 304 - 13.

3. Burke, R, 1. 1982 — Personality, Self-Image and Situational Characteristics of Effective Helpers in Work Settings, The Journal of Psychology, Vol. 112,213.

4. Byrne, D. 1966 — Self-Concept, Ch. 12, 434. An Introduction to Personality: A Research Approach. New Jersey: Prentice Hall Inc.

5. Crum,J. K. 1976 — The Art of Inner-listening. Theosophist, 97 (8), May 1976, 64-65.

6. Feldman Robert S 1997	Understanding Psychology, 4th Edition, Tata McGraw Hill Publishing Company Limited, New Delhi.
7. Grossbard, H 1954	'Methodology for Developing Self-Awareness, Journal of Social Casework, Vol. 35, No.9, 380-386.
8. Hamilton, G. 1954	Self-Awareness in Professional Education', Journal of Social Casework, Vol. 35, No.9, 371-379.
9. Haskar, S. L. 1976	Know Thyself, Triveni 45(2), 88.
10. Paul, Brunton. 1975	The Hidden Teaching Beyond Yoga, Triveni, 44 (3), 91.
11. Ramakumar,. O. 1970	Intelligence and Self-concept, Education and Psychology Review, 10 (3), 154 -57.
12. Ritajanada. (Translated by John Phillip) 1996	The Practice of Meditation, Mylapore, Chennai: Ramakrishna Math Printing Press.
13. Singh, N. P. 1970	The Concept of Self in Modern Psychology, Indian Education Review, 5 (1), 84 -99.

Paper code: SWBSC-2

Paper Title: POPULATION AND ENVIRONMENT

INTRODUCTION

The content has two aspects to it. Population dynamics and its relatedness to the environment, natural resources, utilization and their preservation.

OBJECTIVES:

a. Understand characteristics, determinants of population growth.
b. Examine population policy, plan and initiatives.
c. Understand inter-relatedness of human life, living organisms and environment.
d. Examine utilization and management of resources.
e. Develop skills to participate in activities related to the two areas.

Course Content

UNIT I

Characteristics of population: Population, determinants of growth. global concerns - Characteristics of Indian Population – Distribution by age, sex, literacy and occupation – Fertility trends - Birth and death ratio.

Population Policy, World Action Plan, Population Policy of India- Implementation; Initiatives – Government and NGO.

UNIT II

Family Planning: Objectives, scope, methods, implementation, mechanisms and progress.

Concept and Scope of Population education, family life education, sex education, and family planning education.

Population and Environment: Interrelatedness of human life, living organisms; Environment and natural resource – Environment, lifestyle, degradation. Environment management, maintaining, improving, enhancing – Current issues of Environment.

UNIT III

Natural Resources and Diversity: Utilisation and management – Forest, land, water, air, energy sources - Pollution - Sources, treatment, prevention - Soil, water, air, noise - Waste matter - disposal, recycling, renewal, problems, issues - Programmes for forest, land and water management.

UNIT IV

Environment Protection Laws and Role of Social Worker: Acts related to environmental protection – Forest conservation- Water pollution – Standards and tolerance levels – Unplanned urbanization- Environmental movements in India - Role of NGOs in Environmental issues – Government agencies in environmental protection – Social work initiatives at different levels.

REFERENCES

1. Cassen, R.H 1978 India Population, Economy and Society, London: Macmillan.

2. Family planning Association of India — Family planning Counseling Guide, Population Reports Service Series J.N 35 and 36

3. Fisher, W.F 1997 — Towards Sustainable Development (Struggling over India's Narmada River), New Delhi: Rawat Publications.

4. Gadgil, and Guha. 1997 — This Fissured Land – An Ecological History of India: Delhi: Oxford University Press.

5. Klieinman.R (Ed.) 1998 — Family Planning Handbook for Doctors, Hertford: IPPF

6. Krishna. M. 1995 — Air Pollution and Control, Kakinada: Kaushal and Co.

7. Miller, Jr. Tyler, G and Armstrong. 1982 — Living in the Environment, California: Wordsworth International Group.

8. Mohan, R. 1985 — "Urbanization in India's Future", Population and Development Review, Vol. 11(4)

9. Oxford, 1987 — Our Common Future, Delhi: Oxford University Press.

10. Prasad, R.K — Population Planning, Policy and Programmes, New Delhi: Deep and Deep Publications.

11. Reddy, Laxmi, M.V.1994 — Population Education, New Delhi: Asish Publication.

12. Ryding, S.O. 1992 — Environmental Management Handbook, Ahmedabad: IOS Press.

13. Sapru, R.K (Ed.) 1987 — Environment Management in India, Vol. II, New Delhi: Ashish Publishing House

14. Satapathy, N. 1998 — Sustainable Development (An Alternative Paradigm), Ahmedabad: Karnavati Publications.

15. Seshadri and Pandey, J (Eds.) 1991 — Population Education, A Natural Source Book, New Delhi: NCERT.

16. Sharma, P.D. 1995 — Ecology and Environment, New Delhi: Rastogi Publishers.

odd semester (III Semester)

Odd Semester

Paper code: SWCHC-11

Paper Title: **HUMAN RESOURCE MANAGEMENT**

INTRODUCTION

The main objective of this course is to prepare young graduates for management and administrative positions in various industrial, business, governmental/non-governmental organisations and service sector organisations.

OBJECTIVES

a. Develop managerial skills in different functional areas of management with practical focus on HRM.
b. Develop the competence to evolve the problem-solving approaches by applying conceptual and behavioural skills.
c. Develop interpersonal skills/ competence and leadership qualities to work in a group with team building approach.
d. Develop sound theoretical base in various concepts and theories to enable the student to develop a broad perspective of the management field.
e. Distinguish the strategic approach to Human Resources from the traditional functional approach.
f. Understand the relationship of HR strategy with overall corporate strategy.

Course Content

UNIT I

Human Resource Management: Concept, scope, philosophy and objectives; Evolution; Approaches, Structure and Functions; Line and staff relations of HRM; HRM Model. Hierarchy, formal and informal structure, Organization chart/reporting structure.

Human Resource Planning: Concept and objectives; Human resource inventory; Human resource planning process; job analysis; job description; job specification; job design; career planning and career paths; job rotation.

UNIT II

Talent Acquisition: Goals; polices, sources and methods. Selection: Concept, process. Talent Acquisition Tests, Theories and issues in psychological testing, Intelligence testing – theoretical background, Aptitude Testing, Personality Assessment, MBTI. Placement, Induction and socializing the new employee. Talent retention: Concept, importance and methods.

UNIT III

Compensation Management: Factors influencing compensation plans and policies; Job evaluation - Fixation of salary, components of salary. Pay for performance – Incentive Schemes, principles and types, Employee Stock Option Plan, compensation survey / review

UNIT IV

Strategic Human Resource Management (SHRM): Business strategy and organizational capability, SHRM: aligning HR with Corporate strategy, Strategic HR planning and Development, Change Management and restructuring and SHRM, Corporate Ethics, Values and SHRM, Competencies of HR professional in a SHRM scenario.

REFERENCES

1. Agarwal, R. D. (Ed.) 1973	Dynamics of Personnel Management in India, New Delhi: Tata McGraw-Hill Publishing Company.
2. Bhargava, P. P. 1990	Issues in Personnel Management, Jaipur: Printwell Publishers.
3. Chalofsky, Neal E and Reinhart, Carlene. 1988	Effective Human ResourceManagement, London: Jossey Bass.
4. ChatteIjee, Bhaskar 1999	The Executive Guide to Human Resource Management,New Delhi, Excel Books.
5. Desai, K. G. 1969	Human Problems in Indian Industries, Bombay, Sindhu,
6. Famularo, Joseph 1987	Handbook of Human Resource Administration, McGraw-Hill.
7. Fisher, Cynthia; Schoenfeldt Lyle F. and Shaw, James, G. 1997	Human Resource Management, Third Edition., Boston, Houghton Mifflin Company.
8. Gary Desslar 1997	Human Resource Management, 7th Edition, New Delhi: Prentice Hall of India Pvt. Ltd.
9. Mamoria,C.B. 1989	Personnel Management, Bombay: Himalaya Publishing House.

10. McKenna, Eugene and Beech, Nic 1997 — The Essence of Human Resource Mangaement, New Delhi, Prentice – Hall of India Pvt. Ltd.

11. Moorthy,.M. V. 1992 — Human Resource Management: Psycho-Sociological Social Work Approach, Bangalore, R & M Associates.

12. Pareek, Udai and Rao, T. V. 1982 — Designing and Managing Human Resources, New Delhi, Oxford & IBH.

13. Rudrabasavaraj, M. N. 1984 — Human Factors in Administration, Bombay: Himalaya Publishing House.

14. Rudrabasavaraj, M. N. 1986 — Cases in Human Resource Management, Bombay: Himalaya Publishing House.

15. Subba Rao, P. 1996 — Essentials of Human Resource Management and Industrial Relations, Himalaya Publishing House.

Odd semester
Code: SWCHC-12
Title: SOCIAL WORK PRACTICUM - IV

Workshops: Skills Development - help learners acquire specific skills for situations encountered during practice and acquire skills for intervention. These may be for problems/ concerns, issues or situations like work with alcoholics, HIV/AIDS affected persons, adolescents for life ski11s development, youth for leadership development and couples for marital relationship and enrichment work with elderly. These workshops are to enhance skills/ develop new skills for practice in specific situation, specific problems and issues.

Concurrent practice learning of two-days a week -on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning social work practice for two, or two and a half days or its equivalent, each week of the semester. The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of

the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies, skills and techniques to practice social work

Odd semester
Paper code : SWCSC-3
Paper Title : SOCIAL WORK WITH TRIBAL AND RURAL COMMUNITIES.

INTRODUCTION

This course aims at introducing the learner the programmes of tribal and rural development, and the importance of social work practice with tribal and rural communities.

OBJECTIVES

a. Develop an understanding of tribal and rural communities.
b. Understand the characteristics and problems of tribal and rural communities.
c. Acquire knowledge about the contribution of Governmental and Non-governmental Organisations to tribal and rural development.
d. Develop an understanding of the functions of Panchayath Raj Institutions with particular reference to Karnataka.
e. Gain knowledge about the application of social work in tribal and rural development programmes.

Course Content

UNIT I

Tribe in relation to caste and nation - Nature and Characteristics of Primitive Cultures- Tribes in India and their ecological distribution.
Emerging Trends in Tribal Social Institutions - Family and Kinship Systems, Jati Structure, Economic Structure, Political organisations.

Characteristics of Tribal Society - Economic, Social, Political and Cultural Problems of Tribal Life.

UNIT II

Government Programmes since Independence and their Impact on Tribal Societies - Programmes of Voluntary Agencies and their Impact on Tribal Societies.

Analysis and Assessment of Tribal Community Problems - Special Problems of the Tribals in a particular area.

Social Work Practice in Tribal Development: Community organisation as a method of intervention, Participatory Rural Appraisal (PRA), Logical Framework Approach/Analysis (LFA), techniques of intervention and its scope in tribal community development.

UNIT III

Rural Society and Poverty - Historical perspective - Dynamics in the village society – Caste/class relationships - Control and Power, Conflict and Integration. Poverty in the rural context - Its nature and manifestations. Analysis of Basic Problems - Issues faced by the rural poor such as indebtedness, Bonded labour, Low wages, Unemployment, Underemployment, and other forms of exploitations.

UNIT IV

Current Rural Development Programmes in India: Council for the Advancement of People's Action and Rural Technology (CAPART) and other Rural Development Statutory Bodies.

Panchayath Raj System in Karnataka and its role in rural and tribal development.

Role of social worker in tribal and rural development progrmmes. **REFERENCES:**

1. Barnabas, A. P. 1987 — Rural Community Development in India, In Encyclopedia of Social Work in India, Vol. II, New Delhi: Ministry of Welfare, Government of India,

2. Bhalla, Alok and Bumke, Peter J. (Eds) 1992 — Images of Rural India in the 2nd Century, New Delhi; Sterling Publishers Pvt. Ltd.

3. Bharadwaj, A. N. 1979 — Problems of Scheduled Castes and Scheduled Tribes in India, New Delhi: Light and Life Publishers.

4. Bose, Nirmal Kumar 1971 — Tribal Life in India, National Book Trust India, New Delhi.

5. Brahmananda, P. R., Narayan, B. K. and Kalappa, A. (Eds.) 1987 — Dimensions of Rural Development in India, Bombay: Himalaya Publishing House.

6. Desai, A. R. (Ed.) 1978 — Rural Sociology in India, Bombay: Popular Prakashan,

7. Desai, A. R (Ed.) 1981 — Peasant Struggles in India, New Delhi: Oxford University Press.

8. Debey, S. N. and Murdia, R. 1977 — Land Alienation. and Restoration in Tribal Communities, Bombay: Himalaya Publications,

9. Dube, S. C. 1987 — Welfare of the Scheduled Tribes, In. Encyclopaedia of Social Work in India, VoL, III, New Delhi: Ministry of Welfare, Government of India.

10. Epstein Scarlet J 1973 — South India: Yesterday, Today and Tomorrow; Mysore Villages Revisited, London and Basingstoke: Macmillan Press

11. Kuturnba Rao, M. and Perraju Sharma,P, (Eds.) 1989 — Human Resource Development for Rural Development, Bombay: Himalaya Publishing House.

12. Mahajan, V. S, (Ed.) 1993 — Employment through Rural Development - Towards Sustainability, New Delhi: Deep & Deep Publications.

13. Mahanti, Neeti 1994 — Tribal Issues - A Non-conventional Approach, New Delhi, Inter-India Publications.

14. Nair, T. K. and Anbarasan, R. S. (Eds.) 1981 — Training Social Workers for Rural Development, ASSWI.

15. Panwalkar, V. G. 1987 — Social Work in Rural Settings, In. Encyclopedia of Social Work in India, Vol. Ill, New Delhi: Ministry of Welfare, Government of India.

16. Patel, M. L. 1994 — Tribal Development without Tears, New Delhi, Inter-India Publications.

17. Ramaiah, P. 1988 — Issues in Tribal Development, Allahabad, Chugh Publications.

18. Singh, K. 1986 — Rural Development: Principles, Policies and Management, New Delhi: Sage Publications.

19. Sinha, B. B. 1982 — Society in Tribal India, Delhi, B,R Publishing Corporation.

20. Sodhi, J. S. 1990 — Poverty Alleviation of Rural Development, New Delhi: Criterion Publications.

21. Swaminathan, M. S. 1982 — Science and Integrated Rural. Development, New Delhi: Concept Publishing company.

Paper code SWCSC-3

Paper Title: ORGANIZATIONAL BEHAVIOUR AND ORGANIZATIONAL DEVELPOMENT

INTRODUCTION

The course aims to provide an understanding of human behavior at work so that the learner may acquire the skills required to analyze problems and develop a problem-solving approach.

OBJECTIVES:

a. To impart knowledge about individual, group and organizational dynamics and their consequences,
b. To make clear the concepts and approaches that help in developing models or systems that support human ingenuity.
c. To acquaint the students with the knowledge of theories and practices that govern human behavior at work,
d. To help the learner understand the value and worth of human resources in an organization.
e. To enable the students to become aware of their communication skills and sensitize them to their potential to become successful managers.
f. To gain self-confidence and healthy self-respect while retaining respect for other's rights.
g. To understand the application of Transactional Analysis in several areas of employee management.

Course content

UNIT I

Conceptual Framework: Organization Behavior: Definition, concept, approaches and scope, historical background of Organization Behavior.

Introduction to Enneagram, personality types according to Enneagram. Emotional Intelligence; Attitude, Values, Personality; Job satisfaction, Employee Morale : Meaning, influences and outcomes - Measuring job satisfaction.
Assertiveness Training: Benefits of assertiveness – components of assertive behavior, measuring assertiveness, handling fear, handling anger, handling depression, developing assertive behavior skills, assertiveness on the job, assertiveness in interpersonal relations.

UNIT II

Transactional Analysis (TA), TA and self awareness, Winners and Losers, Structural analysis, Life positions, transactions, games and strokes, Life scripts, TA applications in motivation, Leadership and Teamwork, TA in counseling.

Motivation: Concept and theories, techniques of motivation, role of reinforcement and punishment, motivation and organization reward system, awards, employee empowerment and engagement.

UNIT III

Leadership: Meaning, roles, skills, and styles, leadership theories, types of leadership, powerful persuasion strategies.

Group dynamics: Concept, types of groups, dynamics of group formation, decision making in groups.

Organization Development: Concept, emerging approaches and techniques, Foundations of OD, Organizational Diagnosis, OD interventions – An overview, individual and interpersonal interventions, team/group interventions, comprehensive interventions, organizational transformation, success and failure of OD, Planned Organizational change, feedback and OD.

UNIT IV

Organizational Conflict: Concepts, causes and types, conflict-resolution strategies.

Organizational change: Concept, forces of change and resistance to change, managing organizational change and diversity, facilitating creative and divergent thinking, planned organizational change.

Stress and Burn Out: Concepts, causes, consequences and coping strategies.
Managerial Ethics: Individual ethics, ethical dilemmas in management, Ethical practices of Indian Managers, Corporate ethics.

REFERENCES

1. Andrew, Dubrin J, 2006 — Leadersip – Research Findings, Practice, and Skills, New Delhi, Biztantra Publication.

2. Aswathappa K, 2008 — Organisational Behaviour- Text, Cases and Games, Mumbai, Himalaya Publication House.

3. Donald, Hislop, 2007 — Knowledge Management in Organisation- A Critical Introduction, Oxford University Press.

4. Khanka, S S,2008 — Organisational Behaviour, New Delhi, S Chand and Co., Ltd.

5. Hellriegul Don and Slocum John W., Jr,2004 — Organisational Behaviour, New Delhi, Thomson South-Western.

6. ICFAI, 2004 — Organisational Behaviour, Hyderabad, Centre for Management Research.

7. Kumar Arun and Meenakshi N, 2009 — Organisational Behaviour- A Modern Approach, NIILM Center for Management Studies, New Delhi.

8. Luthans Fred, 2005 — Organisational Behviour, New York, McGraw Hill International Edition.

9. Moorhead Gregory and Griffin Ricky W, 2005 — Organisational Behaviour- Managing People and Organisations, New Delhi, Biztantra Publications.

10. Nelson, Debra L and Quick, James Compbell, 2007 — Organisaional Behaviour- Foundations, Realities and Challenges, New Delhi, Thomson South-Western,.

11. Northouse Peter G, 2003 — Leadership- Theory and Practice, New Delhi, Response Books: A Division of Sage Publications.

12. Robibins, Stephen P, 2007 — Organisational Behaviour, New Delhi, Pearson Education.

13. Ryan, Rosemary K C, 2008 — Leadership Development- A Guide for HR and Training Professionals, New Delhi, Elsevier Publications.

14. Sadler, Philip, 2004 — Lerdership- Styles, Role Models, Qualities, Behaviours, Concepts, New Delhi, Kogan Page India Pvt., Ltd.

15. Subba Rao, P, 2004 — Organisational Behaviour, Mumbai, Himalaya Publications House.

Odd semester

Paper code: SWCSC-4

Paper Title: PREVENTIVE AND SOCIAL MEDICINE AND MEDICAL SOCIAL WORK

INTRODUCTION

This course introduces the basic health issues and the application of social work in health setting both in hospital and community.

OBJECTIVES

a. Understand the concept and dimensions of health.
b. Understand the issues related to the prevention, clinical features and treatment of major communicable and non-communicable diseases.
c. Trace the historical development of medical social work in India and abroad.
d. Understand the nature of medical social work services.
e. Understand the tenets of National Health Policy of India and modernization of community based health care services. .
f. Understand the health care services at different levels.

COURSE CONTENT

UNIT I

Concept of health : Physical, social, mental and spiritual dimensions of health - Positive health - Determinants of health - Health and development - Indicators of health. Concept of Prevention: Levels of prevention - Hygiene, public health, preventive medicine, community health, social medicine, community medicine.
Health Care of the Community; Concept of health care - Levels and principles of health care.

UNIT II

Communicable and Non-communicable Diseases: Leprosy, Tuberculosis, Sexually Transmitted Diseases (STDs), HIV/AIDS. Cancer, Hypertension, Accidents, Diabetes, Blindness, Neurological problems, Mental illnesses.
Maternal and Child Health Services - Immunization – Integrated Child Development Services (ICDS) Scheme - School health programmes.

UNIT III

Medical Social Work: Meaning, Definition and Scope - Historical background and nature: Medical Social Work in India and Abroad - Team work and Multidisciplinary approach in health care; Organization and administration of medical social work departments in hospitals.
Patient as a person and Role of Social Worker: Understanding the patient as a person; Illness behaviour and treatment behaviour of the patient - Impact of illness on the patient and family.
Role of social worker with patients and their families - Rehabilitation.

UNIT IV

National Health Policy of India, Directorate General of Health Services, Indian Council of Medical Research (ICMR), Health as a concurrent subject.

Health System in India - at the Centre, at the State level, at the district level, and village level. Health Education and Communication.
Voluntary Health Agencies in India - International health - World Health Organisation (WHO), UNICEF, UNDP, FAO, ILO, World Bank.

Non - governmental and other Agencies - Ford Foundation, CARE, International Red Cross, Indian Red Cross.

REFERENCES:

1. Bajpai, P. K. (Ed.) 1998 — Social Work Perspectives on Health, Jaipur, Rawat Publications.

2. Brody, Elaine M. and Contributors. 1974 — A Social Work Guide for Long-Term Care Facilities, U. S. Dept. of Health, Education and Welfare, Public Health Service, Maryland: National Institute of Mental Health.

3. Butrym, Zofia and Horder, John. 1983 — Health, Doctors and Social Workers, London: Routledge and Kegan Paul.

4. Clark, D. W. and — Preventive and Community Medicine,

MacMahon, B. (Ed.) 1981 — Boston. Little, Brown and Company,

5. Friedlander, W. A. 1967 — Introduction to Social Welfare (Chapter 12: Social Work in Medical and Psychiatric Settings), New Delhi: Prentice-Hall of India.

6. Hilleboe, H. E. and Larimore, G.W.1966 — Preventive Medicine, Philadelphia, W. B. Saunders Company.

7. Humble, Stephen and Unell Judith (Ed.) 1989 — Self Help in Health and Social Welfare, London: Routledge.

8. Jordan, William. 1972 — The Social Worker in Family Situations, London: Routledge and Kegan Paul.

9. Lathem, W. and Newbery, A. 1970 — Community Medicine - Teaching, Research and Health Care, London, Butterworths.

10. Mathur,J. S. 1971 — Introduction to Social and Preventive Medicine, New Delhi, Oxford and LB.H. Publishing Company,

11. Mechanic, David 1968 — Medical Sociology- A Selective View, New York, Free Press.

12. Mishne, Judith (Ed.) 1980 — Psychotherapy and Training in Clinical Social Work, New York: Gardner Press.

13. Nichols, P. J. R. (Ed.) 1980 — Rehabilitation Medicine, London: Butterworths.

14. Park, K. 2002 — Park's Textbook of Preventive and Social Medicine, Jabalpur, Banarsidas Bhanot.

15. Pathak, S. H. 1968 — Medical Social Work, Chapter.25, In Wadia, A R (Ed.) : History and Philosophy of Social Work in India, Bombay: Allied Publishers.

16. Ramachandrudu, G. 1997 — Health Planning in India,' New Delhi, A. P. H. Publishing Corporation.

17. Rusk, Howard A. 1977 — Rehabilitation Medicine, Saint Louis: Mosby Company.

18. UNICEF — Health and Basic Services, New Delhi, UNICEF South Central Asia Regional Office.

Paper code: SWCSC-4
Paper Title: **REHABILITATION AND AFTER CARE SERVICES**

INTRODUCTION

Rehabilitation of differently abled people is a noble and worthy endeavor, requiring the combined knowledge of the psycho-social theory and practical skills and techniques of social work. The current paper facilitates social work students to work with the specific group of clientele suffering from various types of disabilities and impart application of specific professional social work methods to cater to the needs of this population.

OBJECTIVES:

a. To understand the concept of handicap, rehabilitation and the scope for practice.
b. To identify the specific client categories requiring the rehabilitation services, problem specificity and rehabilitation service interventions.
c. To acquaint oneself with different rehabilitation settings, different therapeutic approaches to rehabilitation process.
d. To acquire the social work skills adapted to facilitate the process of rehabilitation,the rights and legal provisions provided for differently abled people and assimilate the knowledge of social work practice to disability specific client service.

Course Content

UNIT I

Rehabilitation: Definition and scope for social work interventions; definition of Impairment, Disability, Handicap; causes of Handicap - heredity, acquired, Major illnesses - physical, neurological and psychiatric Stress, vulnerability, coping and competence to deal with handicaps; Need for comprehensive rehabilitation – psycho-social rehabilitation

UNIT II

History, philosophy and principles of psycho-social rehabilitation; specific problem areas – physical handicap - vision, hearing, orthopedic, speech and language difficulties, mental retardation and others; neurological, psychiatric problems, disasters, alcohol and drug usage, terminal illnesses and any other.
Intervention in rehabilitation: Assessment, planning, intervention, evaluation, tools for assessment, follow-up services.

UNTI III

Rehabilitation Settings: Hospital based, day-care, night-care, quarter-way home, half- way-home, group home, hostels, long-stay homes, vocational guidance centre,

sheltered workshop, occupational therapy centre, community based rehabilitation centre, home care, inclusive education and others
Approaches: Therapeutic community, behavior modifications, transactional analysis and eclectic approach

UNIT IV

Practice of Social work methods in the process of rehabilitation: Case work, group work, community organisation, research, administration and social action.
Legal provisions for differently abled people – The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act 1995, Rehabilitation Council of India: Formation, scope and functions, governmental policies and programmes, initiatives from the non- governmental sectors.

International trends and national initiatives in the rehabilitation scenario.

REFERENCES

1. Anthony, William. A. 1980.	The Principles of Psychiatric Rehabilitation. Baltimore University Part Press
2. Chowdhary, Paul. D. 1995.	Introduction to Social Work: history, concept, methods and fields. Delhi, Atma Ram & Sons.
3. Corey, Gerald. (6th ed.)2004.	Theory and Practice of Group Counseling. Thomas Brooks/ Cole Belmont
4. Dorothy Stock Whitaker. 1985.	Using Groups to help people. London & New York, Tavistock/ Routledge,.
5. Danda, Amita. 2000.	Legal order and Mental Disorder, Sage Publications.
6. Delhi Law House. 1998.	The Mental Health Act-1987, Law Publishers.
7. Thakur Hari Prasad Institute of Research and Rehabilitation of the Mentally Handicapped Publication, Hyderabad.	Enabling the Disabled.1999
8. Feldman, Robert. S (1997)	Understanding Psychology. New Delhi, Tata McGraw Hill.
9. Hume, Clephane and Pullen Ian. 1986	Rehabilitation in Psychiatry. Edinburgh Churchill Livingstone
10. International Labour persons,ffice. 1985.	Vocational Rehabilitation of Disabled ILO.

11. International Labour Office. 1982.	Vocational rehabilitation of the Mentally Retarded (second impression) ILO.
12. Kalyanasundaram S. and Verghese,Mathew,(Eds).2000	Innovations in Psychiatric Rehabilitation Richmond Fellowship Society, Bangalore, India.
13. Kapur, Malavika and Others. (Ed). 1979.	Psychotherapeutic process. NIMHANS Publication. Bangalore
14. Lakshman Prasad. 1994.	Rehabilitation of the Physically handicapped. Konark Publishers Pvt. Ltd.
15. Liberman, Robert. P. (ed). 1988.	Psychiatric Rehabilitation of Chronic Mental Patients. Washington D.C., American Psychiatric Association.
16. Madan, G.R. 2000	Indian Social Problems Vol.2 Social Work (3rd ed). New Delhi, Allied Publishers.
17.Manning, Nick. 1989	Therapeutic Community Movement. London, Routledge Publications.
18. Pandu Naik. G. 1992	A Review of Social Legislation in India. Lambani Publishers.
19. Schizophrenia Research Foundation. 1998	Community Mental Health and Community Based Rehabilitation. Chennai, SCARF Publication.
20. Sen, Anima. 1988	Psycho-social integration of the Handicapped, New Delhi, Mittal Publishers.
21. Sharma, S and Chadda, R.K 1997	Essential Psychiatry, New Delhi, Interprint Publishers.
22. Wolberg, L.R. 1977	The Technique of Psychotherapy Part I & II, 3rd edition. New York, Grune and Stratton,.

Paper code: SWCSC-5
Paper Title: SOCIAL POLICY, PLANNING AND DEVELOPMENT

INTRODUCTION

The course introduces the learner as to how policy is a link between Constitutional Principles, Development Plans, Legislative and Executive Actions. The analysis of these processes is to enable utilization of the knowledge to improve social work practice.

Further, it provides a critical and analytical framework to understand key concepts, development processes and current issues, pertaining to different parts of the world, with specific reference to India. This course is expected to provide the social work students with a context for micro-level interventions.

OBJECTIVES

a. Gain knowledge of policy analysis and the policy formulation process.
b. Acquire skills in critical analysis of social policies and development plans.
c. Develop an understanding of social policy in the perspective of national goals as stated in the Constitution, particularly with reference to Fundamental Rights and the Directive Principles of State Policy.
d. Critically understand the concept, content and process of social development.
e. Develop the capacity to identify linkages among social needs, problems, development issues and policies.
f. Locate strategies and skills necessary for social development and reinforce
values of social justice, gender justice and equality.

Course Content

UNIT I

Social Policy and Constitution: Concept of social policy, sectoral policies and social services - Relationship between social policy and social development--Values underlying social policy and planning based on the Constitutional provisions (i.e. the Directive Principles of State Policy and Fundamental Rights) and the Human Rights - Different models of social policy and their applicability to the Indian situation.

UNIT II

Sectoral Social Policies in India: Evolution of social policy in India in a historical perspective-Different sectoral policies and their implementation, e.g. Policies concerning education, health, social welfare, women, children, welfare of backward classes, social security, housing, youth, population and family welfare, environment and ecology, urban and rural development, tribal development and poverty alleviation.

UNIT III

Social Planning: Concept of social planning - Scope of social planning - the popular restricted view as planning for social services and the wider view as inclusive of all sectoral planning to achieve the goals of social development - Indian planning in a historical perspective - The Constitutional position of planning in India. Niti Ayog - Coordination between Centre and State, need for decentralization - Panchayath Raj - people participation.

UNIT IV

Social Development: Concept of social development - Current debates of development - Approaches to development - Development indicators.

Social Development in India: The historical and social context of development in India - Demographic transitions - Rural development: Agrarian and land reforms; Green Revolution - Industrialization and urban development - Labour relations-Gender issues - Environmental issues (land, water, forest) - Education - Health.

REFERENCES

1. Bagchi, A. K. 1982 — Political Economy of Underdevelopment, Cambridge: Cambridge University Press.

2. Bhanti, R. 1993 — Social Policy and Development in Rajasthan, Udaipur: Himanshu Publications.

3. Bulmer, M. et. aI., 1989 — The Goals of Social Policy. London: Unwin Hyman.

4. Chakraborty,S. 1987 — Development Planning - Indian Experience, Oxford: Claredon Press.

5. Dandekar, V. M. 1994 — "Role of Economic Planning in India in the 1990s & Beyond", Economic and Political Weekly, Vol. 29, No. 24, 1457-1464.

6. Desai, V. 1988 — Rural Development (Vol. 1) Mumbai: Himalaya Publishing House.

7. Dimitto, D. M. 1991 — Social Welfare: Politics and Public Policy, New Jersey: Prentice-Hall.

8. Fidelma, A. et. al. 1999 — Contemporary Social and Political Theory: An Introduction, Buckingham: Open University Press.

9. Ganapathy, R. S. and Others 1985 — Public Policy and Policy Analysis in India, Delhi: Sage Publications.

10. Ghosh, A. 1992 — Planning in India: The Challenge for the Nineties, New Delhi: Sage Publications.

11. Government of India — Five Year Plan Documents (latest), New Delhi.

12. Hebsur, R. K. (Ed.) — Social Intervention for Justice, Bombay: TISS.

13. Huttman, E. D. 1981 — Introduction to Social Policy, New York: McGraw- Hill.

14. International Labour Office. 1973 — Multinational Enterprises and Social Policy, Geneva, ILO.

15. Jones, K. et. al., 1983 — Issues in social Policy, London: Routledge & Kegan Paul.

16. Kahn, A. E. 1973 — Social Policy and Social Services, New York: Random House.

17. Kulkarni, P. D. 1979 — Social Policy and Social Development in India, Madras: Association of Schools of Social Work in India.

18. Kulkarni, P. D. 1952 — Social Policy in India, New York: McGraw-Hill Book Company.

19. Kulkarni, P. D. 1975 — Social Policy in India, Bombay, Tata Institute of Social Sciences.

20. Leonard, P. 1997 — Postmodern Welfare: Reconstructuring Emancipatory Project, London: Sage

21. Lindblom, C. E. 1980 — The Policy-making Process, New Jersey: Prentice-Hall.

22. Livingstane, A. 1969 — Social Policy in Developing Countries, London: Routledge & Kegan Paul.

23. Madison, B. Q .1980 — The Meaning of Social Policy, London: Croom Helm.

24. Macpherson, S. 1980 — Social Policy in the Third World, London: Wheatspeat Brooks.

25. Macpherson, S. 1982 — Social Policy in the Third World, New York: John Wiley and Sons.

26. Mathur, K. Bjorkman — Top Policy Makers in India, New Delhi: Concept Publishing Co.

27. Meadows, D. H. 1972 — The Limits to Growth, New York: University Books.

28. Mishra, R. 1977 — Society and Social Policy, London: Macmillan Ltd.

29. Mukherjee, N. 1993 — Participatory Rural Appraisal: Methodology and Applications, New Delhi: Concept Publishers.

30. Mundle, S. 1993 — 'Policies, Paradigms and Development Debate at the Close of Twentieth Century', Economic and Political Weekly, Vol. 28, No. 26, September 4, 1993.

31. Mullard, M. and Spieker. 1998 — Social Policy in a Changing Society, London: Routledge.

32. Phillips,D. R. and Verhasselt Yola (Eds.) 1994 — Health and Development, London: Routledge and Kegan Paul

33. Rao, V. 1994. — "Social Policy: The Means and Ends Question" Indian Journal of Public Administration, Vol. 50, No.1, Jan.-March, 1994.

34. Rastogi, P. N. 1992 — Policy Analysis and Problem-solving for Social Systems, New Delhi: Sage Publications

35. Roychaudhury, T. 1982 — The Cambridge Economic History of India, Vol. I & II, New Delhi: Cambridge University.

36. Singh, R. R. (Ed.) 1995 — Whither Social Development? New Delhi: ASSWI.

37. Singh, Y. 1972 — Modernization of Indian Tradition, Delhi: Thomas Press.

38. Spicker, Paul. 1998 — Principles of Social Welfare: An Introduction to Thinking About the Welfare State, London: Routledge.

39. The Probe Team. 1999 Association with Centre for Development Economics. — Public Report on Basic Education in India, New Delhi: Oxford University Press.

40. Upadhyay, S. B. 1992 — Urban Planning, Jaipur: Printwell

41. UNDP — Human Development Reports, Oxford University Press.

42. Weimer. D. L. and Vining, A. R. 1994 — Policy Analysis: Concepts and Practice, New Jersey: Prentice-Hall.

43. World Bank — World Development Reports (Annual), Oxford University Press.

44. Yadav, C. S. (Ed.) 1986 — Urban Planning and Policies - Part A, New Delhi: Concept Publishing Co.

Recommended Journals / Periodicals

Alternatives; Development and Change; Economic and Political Weekly.

Paper code : SWCSC-5
Paper Title : LEGAL SYSTEM IN INDIA

INTRODUCTION

The course is to help learners understand the legal system and procedures in India. It supports understanding the processes in public interest litigation and develops skills for the same.

OBJECTIVES

a. Acquire information on the legal rights of people.
b. Develop an understanding of the legal system and get acquainted with the process of the legal system with emphasis on functioning in India.
c. Understand the role of the police, prosecution, judiciary and correction. d. Gain insight into the problems faced by the people belonging to different strata of society, in interacting with this system.
e. Develop an understanding of the processes and problems of public interest litigation and legal aid to marginalized.

Course Content

UNIT I

Social Justice: Meaning and Concept; Social legislation: Meaning, definitions and concept. Social justice as an essential basis of social legislations; Social legislations in a welfare state with special reference to India.

Rights: Concept and definitions of Rights; types of Rights; Rights of women and children; Rights of Scheduled Castes and Scheduled Tribes; Rights of accused and offender under Constitution of India, Indian Penal Code and Criminal Procedure Code.

UNIT II

Division of Law: Substantive Law and Procedural Law.

Legislations pertaining to Social Institutions: Marriage, divorce, maintenance of spouse, adoption.

Legislations for prevention of Crime and Deviance: Indian Penal Code (relevant chapters like of Offences against Public Tranquility, of Offences affecting the Public Health, Safety, Convenience, of Decency and Morals, of Offences relating to Religion, of Offences affecting the Human Body, of Offences relating to Marriage, of Cruelty by Husband or Relatives of Husband)

Legislations pertaining to women.

UNIT III

Criminal Justice System in India:

Police: Structure, powers and functions and their role in maintaining peace and order in the society.

Prosecution: Meaning, structure, its role in criminal justice, trial participation.

Judiciary: Supreme Court, High Court - Constitution of Supreme Court and High Court: Powers and functions.
Sub-ordinate Courts - District Sessions Court, Magistrate Courts, and other subordinate courts.

UNIT IV

Correction and Correctional Laws: Corrective measures as per Criminal Procedure Code, Probation of Offenders Act, Juvenile Justice (Care and Protection of Children) Act.

Legal Aid: Concept of legal-aid, history of legal-aid, persons needing legal-aid, legal-aid schemes.

Public Interest Litigation: Meaning, Concept, Process and Problems.

Right to Information Act- Provisions and implementation.

Role of Social Worker: Social Work intervention, need, methods.

REFERENCES

1. Aranha, T.	Social Advocacy - Perspective of Social Work, Bombay: College of Social Work.
2. Buxi, U. 1982	Alternatives in Development: Law the Crisis of the Indian Legal System, New Delhi: ,Vikas Publishing House.
3. Curry, J. C. 1977	The Indian Police, New Delhi: Manu Publications.
4. Desai, A. E. (Ed.) 1986	Violation of Democratic Rights in India, Vol. 1.
5. Fleming, M. 1978	Of Crimes and Rights, New York: W.W. Norton and Company.

6. Gandhi B.M. 2006.	Indian Penal Code, Lucknow, Eastern Book Company.
7. Iyer, V. R. K 1980.	Some Half Hidden Aspects of Indian Social Justice, Lucknow: Eastern Book Company.
8. Iyer, V. R. K 1984.	Justice in Words and Justice in Deed for Depressed Classes, New Delhi: Indian Social Institute.
9. Iyer, V. R. K 1981.	Law Versus Justice: Problems and Solutions, New Delhi: Deep and Deep.
10. Iyer, V. R. K 1980.	Justice and Beyond, New Delhi: Deep and Deep.
11. Kelkar R. V. 2006.	Lectures on Criminal Procedure, Lucknow, Eastern Book Company.
12. Khanna, H. R. 1980	The Judicial System, New Delhi: II P A.
13. Mathew, P. D.	II P.A Legal Aid Series, Delhi: Indian Social Institute
14. McDonald. W. F. (Ed.) 1979	The Presentator, California: Berkeley: Hill
15. Newman, G. 1999	Global Report on Crime and Justice, New York: Oxford University Press.
16. Nirmal Anjali. 1992	Role and Functioning of Central Police Organisations, New Delhi: Uppal.
17. Peak, K. J. 1998	Justice Administration - Police, Courts and Correction, New Jersey: Prentice-Hall.
18. Ratanlal and Dhirajlal, 2006	Indian Penal Code, Lexis and Lexis, Nagpur.
19. Singh. L. M. (Ed.) 1973	Law and Poverty: Cases and Materials, Bombay: Tripathi.
20. Western, P. B. 1976	The Criminal Justice System: An Introduction and Guidelines, California: Good Year Publishers.
21. Government of India, 1973	Report of the Legal Aid Committee.

Open Elective
Paper Code: SWOE
Paper Title: GERONTOLOGICAL SOCIAL WORK

INTRODUCTION

Changing demographic profile in India has led to rise in the number of elderly as never before. Along with the enhanced longevity, a number of issues related to care and management of elderly have come into focus. Social work as a profession concerned with providing professional service to the needy, has recognized the need to address the concerns of the senior citizens. The paper envisages training the learners in professional social work practice with the elderly.

The paper focuses on senior citizens as target client group for social work intervention; the paper deals with the issues, concerns, problems and social work methods in facilitating healthy adaptation of the client group in the current Indian context.

OBJECTIVES:

a. To get an overview of the perspectives on aging and scope for practice.
b. To understand the various challenges related to aging, healthy aging and problems of the elderly in difficult situations.
c. To identify agencies working with elderly, the different care settings and issues in working with elderly in different settings. To gain an insight into process of working with elderly.
d. To train the learners in applying specific social work intervention measures in working with senior citizens, care givers and to have an understanding of
e. National Policy on Older Persons, and the role of International and NGOs in improving the quality of life of the elderly.

Course Content

UNIT I

Gerontology – Definition and scope. Understanding the elderly – demographic, developmental, psychological, socio cultural, economic, and health perspectives. The issues pertaining to elderly- health, occupation, income, retirement planning, family support, gender issues, property Rights and any other

UNIT II

Developmental tasks in elderly: Issues in health care, changes in family structure, coping with aging process, challenges due to changing physiological, economic, safety, status in the family and other issues, Healthy aging, quality of life, coping with demise of the life partner, bereavement, resolving one's own death, and any other.

UNIT III

Care settings for elderly: General hospitals, geriatric wards/ hospitals, home-based care, homes for the aged, nursing homes, day-care-centers, hobby centers, and facilities for homeless elderly, elder helpline, and senior citizen forum.
Tools for assessment of the problems of elderly, intervention and follow up services and evaluation.

UNIT IV

Social work intervention measures for senior citizens through methods of social work: Case work, group work, community organisation, welfare administration, social work research, social action
Care giver issues - Needs, burden, coping and training; training for caregivers of institutions for the elderly

National Policy on Older Persons, Legal and governmental welfare benefits for senior citizens, Role of HelpAge India and other prominent Organisations working for elderly.
International scenario

REFERENCES

1. Bali . P. Arun, 2001 — Care of the Elderly in India. Shimla, Indian Institute of Advanced Studies.

2. Chatterjee, S.C., Patna, and K.P., Charian, V. 2008., . — Discourses on aging and Dying. New Delhi, Sage Publications

3. Dandekar, Kumudini. 1996 — The Elderly In India, New Delhi, Sage Publications.

4. Desai, Murli and Raju, Siva (Ed.) 2000. — Gerontological Social Work in India - Some issues and Perspectives. Delhi, BR Publishing House,.

5. Dey, A. B (Ed.) 2003 — Ageing in India: Situation Analysis and Planning for the Future. New Delhi / WHO and AIIMS.

6. Emmatty, Leena. M. 2008 — An insight into Dementia Care in India. New Delhi, Sage Publications,.

7. Hurlock, Elizabeth. 1981 — Developmental Psychology. 5th Edition. New Delhi, Tata McGraw Hill Publications.

8. Khan M.Z. 1989 — Voluntary Welfare Services for the Aged, Dept. of Social Work, New Delhi, Jamia Milia Islamia.

9. Kumar, Vinod (Ed.) 1996 — Aging - Indian Perspective and Global Scenario, New Delhi, AIIMS.

10. Rajan, Irudaya.S., Mishra,U. S., and Sharma, S.P. 1999. — India's Elderly, New Delhi, Sage Publications.

11. Ramamurti P,V and Jamuna D (Ed) 2004. — Handbook of Indian Gerontology. New Delhi, Serial Publishers.

12. Vineeta B Pai 2000 — Coping with Retirement, UNESCO CLUB, Naganur, Belgaum

JOURNALS.

1. Indian Journal of Gerontology, C-207, Manu Marg, Tilak Nagar, Jaipur 302 004

2. R & D Journal of Helpage India . C-14, Qutab Institutional Area, New Delhi, 110016.

Open Elective
Paper code SWOE
Paper Title: SOCIAL WORK PRACTICE WITH CHILDREN

INTRODUCTION

Children are the future of human society. Profession of social work has to work with children in difficult circumstances while rendering services in varied settings. There is a need for social workers specially trained in working with the children and adolescents. Such trained social workers can render valuable services to children in need of professional help.

The current paper focuses on children as a special group for focused social work intervention through facilitating acquisition of knowledge about children from different perspectives, types of settings where the children can be helped and application of social work methods to render social work intervention to children.

OBJECTIVES

a. To understand children facing difficult circumstances and the impact of difficult circumstances on children's development.
b. To gain an overview of agencies where children form the major client group, and appropriate evaluation of children's problems.
c. To impart to the trainee, specific social work intervention methods in dealing with children as a client group; to understand the Rights of children in the legal, national and international context.

Course Content

UNIT I

Human reproductive system - beginning of life till beginning of adulthood. Understanding the children and adolescents from different perspectives - developmental, demographic, economic, psychological, sociological, environmental, familial, educational dimensions of child development. Issues in adolescence - self image, peer group, career choice, sexuality, education, vocation and other issues
Healthy child development, importance of supportive environment in upbringing of the children.

UNIT II

Children in difficult circumstances - developmental delay, physical and intellectual handicaps; chronic illnesses, nutritional deficiencies, accidents, poverty, child labour, abandoned and orphaned children, adoption issues, children in institutions, psychological problems in children, self harm and suicides in children, addiction related problems in children, children brought up by single parent due to death, divorce and other related issues, problems in formal schooling, children living in difficult situations - children in streets, slums, war zones, migration, children in conflict with law, truancy, drug abuse, running away from homes, neglected children, child abuse, child trafficking, child marriage and any other. Special focus on adolescent issues as applicable.

UNIT III

Children in difficulties – Helping agencies, Settings and issues - paediatric hospitals, nursing homes, child care centres, child guidance clinics, residential care services for children - residential schools, orphanages, homes for children in conflict with law, agencies dealing with differently abled children, any other.
Assessment, intervention, follow up and evaluation of children and adolescents facing difficulties.

UNIT IV

Social Work Intervention Programmes - Case work, group work, community organisation methods in helping children, school mental health programmes, home visits, school visits, life skills training, family life education for adolescents, creative use of play therapy, art, dance, drama and other mediums for helping children, child

help lines, child care centres, adoption services, special rehabilitation services for rescued children and any other.

Legislations pertaining to children, legal protection, International, National and non-governmental organisations working with children, Rights of the children.

REFERENCES

1. Bhargava. Vinita. 2005 — Adoption in India, New Delh, Sage Publications,

2. Beck, Laura — Developmental Psychology. New Delhi, Pearson Education Inc..

3. Government of India, Dept. of Women and Child Development 1992. — Plan of Action – A Commitment to the Child.

4. Hegarty S and Arul, M. 2002 — Children with Special Needs - From segregation to Inclusion, New Delhi, Sage Publications.

5. Hurlock, Elizabeth. 1981 — Developmental Psychology. 5th Edition. New Delhi, Tata McGraw Hill Publications,.

6. Hurlock, Elizabeth. 1996 — Personality Development. New Delhi, Tata McGraw Hill Publications.

7. Kantha Amod and Varma, R.M, 1993 — Neglected Child – Changing Perspective, New Delhi, Prayas Juvenile Aid Centre,.

8. NIPCCD,1989. — Perspective Plan on Child Development (1980-2060), New Delhi

9. NIPCCD.1992. — National Evaluation of Integrated Child Development Services, New Delhi.

10. Rani, Asha 1986. — Children in Different situation in India – A Review, Bombay, Tata Institute of Social Sciences.

11. Reddy, Suma Narayan,1989. — Institutionalized Children, Allahabad, Chug Publication,

12. UNICEF Publication — The State of The World's Children. Annual Report. http://WWW. unicef.org

13. Ved Kumar and Brooks, Susan. L. 2004 — Creative Child Advocacy, New Delhi, Sage Publications,

14. Venkatesan. S. 2004 — Children with Developmental Disabilities, New Delhi, Sage Publications,.

Even semester (IV Semester)

Paper code SWDHC-13

Paper Title: EMPLOYEE RELATIONS AND LEGISLATION

INTRODUCTION

The purpose is to provide an in-depth knowledge about the relationship between employer, employee and the state, to bring out the importance of cordial employee relations for organizational productivity and gain an understanding of the mechanism of inter-personal relations, collective bargaining and productivity improvement functions in the organisation through involvement of all groups.

OBJECTIVES

a. Develop the skills of interpersonal relationship as per organisational requirement.
b. Understand the trends and dynamics between the partners in the organisation.
c. Enhance the knowledge on organisational performance, role and responsibility.
d. Develop the knowledge on various statutory / legal aspects influencing the organizations.
e. To stimulate thinking on rationale behind the Laws and their enforcement.

Course Content

UNIT I

Employee relations, History of industria1ization in India - Issues related to employees in organized and unorganized sector.

Concept, Definition, Philosophy and Principles of employee relations. Employee relations with special reference to Occupation - Safety - Health and Environment (OSHE) Education.

Analysis of the terms 'industry' and 'industrial dispute', industrial discipline – misconduct, disciplinary proceedings.

Domestic Enquiry: Contents and Process, Principles of Natural Justice, Tribunal; Discharge/Dismissal.

UNIT II

Trade Unions: Trade Unionism in India, emergence, history and growth, Trade Union as an organization – Various Trade Unions in India, Trade Union policies, Role of Trade Unions in India, Employers'' Associations – Objectives, structure and activities. Contemporary issues in employee relations.

UNIT III

Employee Legislations: - The Payment of Bonus Act, 1965, Employees Provident Fund (and Misc. Previsions) Act 1952, Workmen's Compensation Act 1923, Employees State Insurance Act 1948, Payment of Gratuity Act, 1972,Child Labour (Prohibition and Regulation) Act, 1986.
Fundamentals of Labour laws, The Constitution of India: Preamble, Fundamental Rights including writs, Directive Principles of State Policy, The Factories Act 1948, The Contract Labour (Regulation and Abolition) Act 1970,The Minimum Wages Act 1948 and The Payment of Wages Act 1936; The Apprentices Act, 1961,The Maternity Benefit Act 1961.

UNIT IV

The Trade Union Act 1926, The Industrial Employment (Standing Orders) Act 1946, The Industrial Dispute Act 1947, The Employment Exchanges (Compulsory Notification of Vacancies) Act 1958. Introduction to Right to Information Act, Intellectual Property Rights, Patent Law, Copyrights, Trademark Law.

Collective Bargaining: Definitions, characteristics, critical issues in collective bargaining, theories of collective bargaining, Hick's Analysis of Wages setting under collective bargaining, conflict-choice model of negotiation, Behavioral Theory of Labor Negotiation, Collective Bargaining in India, Collective bargaining in practice, levels of bargaining, coverage and duration of agreements, administration of agreements, negotiating a contract, the negotiation process, effective negotiation, negotiation and collective bargaining, post negotiation – Administration of the agreement.

Employee relations in knowledge based industry - Concepts of self-managed teams (SMT) - Changing employee/ employer and trade union relationship. Current rules of Taxation of Salaries.

Labor Welfare Officer - Duties and functions; Social Work in Industry.

REFERENCES

1. Achar, M. R. 1976 — Labour Rules in Karnataka, Bangalore, Shree Vidya Printers.
2. Arora, M, 2005 — Industrial Relations, New Delhi, Excell Books.
3. Dasgupta, S. K. — Industrial Law, Sterling Publishers Pvt. Ltd.
4. Devar, R. S. 1967 — Personnel Management and Industrial Relations, New Delhi, Vikas Publishing House.
5. Joseph, T.M. 2009 — Industrial Law, Mumbai, Himalaya Publications Pvt., Ltd.
6. Lal Das, D. K. 1991 — Personnel Management, Industrial Relations and Labour Welfare, Agra, Y. K. Publishers.
7. Madhusudhana Rao, M. 1986 — Labour Management Relations and Trade Union Leadership, New Delhi, Deep and Deep Publications.
8. Malik P. L. 1986 — Handbook of Labour and Industrial Law, Lucknow, Eastern Book Company.
9. Mamoria, C. B. and Mamoria S. 2006 — Dynamics of Industrial Relations, Mumbai, Himalaya Publishing House.
10. Mamoria, C. B; Mamoria Satish, Gankar, S. V. 2000 — Dynamics of Industrial Relations in India, Mumbai, Himalaya Publishing House.
11. Mishra M, 2006 — Case Laws on Industrial Relations, New Delhi, Excell Books.

12. Moorthy, M. V. 1968 — Principles of, Labour Welfare, Vishakapatnam, Gupta Brothers.

13. Nagaraju, S. 1981 — Industrial Relations System in India, Allahabad, Chugh Publications.

14. Pyle M and George, Simon A, 2009 — Industrial Relations and Personnel Management, New Delhi,Vikas Publishing House Pvt Ltd.

15. Rudrabasavaraj, M. N. 1984 — Human Factors in Administration, Bombay, Himalaya Publishing House.

16. Sanajaoba, Naorem 1985 — Industrial Tribunal - Working, Procedure and Judicial Trends, New Delhi, Deep and Deep Publications.

17. Sharma, A. M. 1989 — Industrial Relations - Conceptual and Legal Frame Work, Bombay, Himalaya Publishing House.

18. Saiyed I A, 2009 — Labour Law, Mumbai, Himalaya Publishing House Pvt., Ltd.

19. Singh BD, 2005 — Industrial Relations: Emerging Paradigms, New Delhi, Excell Books.

20. Sinha, G. P. and Sinha, P. R. 1977 — Industrial Relations and Labour Legislation in India, New Delhi, Oxford IBH Publishing Co.

21. Somani, Anjan and Mishra, Shivani, 2009-10 — Employment Laws, Jaipur, Ramesh Book Depot

22. Srivastava S C, 2009 — Industrial Relations and Labour Law. New Delhi, Vikas Publishing House Pvt Ltd.

23. Subramanian, H. N. 1967 — Labour Management Relations in India, Bombay, Asia Publishing House.

24. Tripati, P. C. 1989 — Personnel Management and Industrial Relations, New Delhi, S. Chand and Sons,.

25. Tyagi, B. P. 1976 — Labour Economics and Social Welfare, Meerut, Jai Prakash Nath & Co.

26. Vaid, K. N. 1970 — Labour Welfare in India, New Delhi, Sri Ram Centre for Industrial Relations.

27. Yoder, D. 1972 — Personnel Management an Industrial Relations, New York, Prentice-Hall India.

Paper code: SWDHC-14
Paper Title: **MENTAL HEALTH AND PSYCHIATRIC SOCIAL WORK**

INTRODUCTION

This course is to provide awareness about mental health and mental health problems and also application of social work in mental health settings.

OBJECTIVES

a. Understand the concepts 'mental health' and 'mental illness'.
b. Understand the signs and symptoms, etiology, diagnosis and treatment of
mental health problems.
c. Understand different services for the care of mentally ill.
d. Understand historical background of psychiatric social work in India and
abroad.Understand the nature of psychiatric social work services and relevance of team work.
e. Understand the nature of collaboration with voluntary organisations for the
welfare of mentally ill.
f. Identify the issues related to psychiatric social work department in hospitals
and community mental health settings.

Course Content

UNIT I

Concept of mental health and mental illness - Mental health as a part of general health - Misconceptions about mental illnesses. General approaches to the mentally ill - International Classification of Mental Disorders.
Signs, symptoms, etiology, diagnosis, prognosis and management of the following:

- Neuroses
- Psychoses
- Psycho physiologic disorders
- Personality disorders
- Psychiatric disturbances in children and adolescents
- Organic psychotic conditions
- Mental retardation.

UNIT II

Introduction to Psychiatric Social Work: Meaning and Scope - Historical background of psychiatric social work in India and abroad - Reasons for its development as a specialty. Application of social work methods and other related techniques used in the field - Multi-disciplinary approach and team work in mental health care - Problems of hospitalization - Impact of mental illness on the patient, family and community.

Practice of Social Work: Importance of home visit and visit to the place of work - Role of family in the treatment of mentally ill - Preparing the family and community for the return of the affected individual, follow-up.

UNIT III

Care of mentally ill: Day-care centre, night-care centre, half-way-home, sheltered workshop, Occupational therapy units - Role of social worker and role of voluntary organisations.
Role of voluntary organisations, governmental-agencies and paraprofessionals in the welfare of mentally ill.

Role of social worker in mental health centers, departments of psychiatry in general hospitals, child guidance clinics, community mental health units, correctional institutions, industries, and family welfare centres.

Role of social worker with head injured, paraplegics and epileptics.

Role of social worker in the management of substance abuse – Educational avenues in psychiatric social work - Research avenue in the field of mental health for social workers.

UNIT IV

Organisation of psychiatric social work department - Functions; and collaboration with other departments.

Community mental health and social work, NMHP, Innovations like Satellite clinics, district mental health programme etc.

Rehabilitation and Acts: Occupational therapy - Principles and practice - Psychosocial rehabilitation.

Mental Health Act, 1987.

The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995.

REFERENCES

1. Ahuja, Niraj 1995 — A Short Textbook of Psychiatry, Third Edition, New Delhi, Jaypee Brothers.

2. Anderson, David. 1982 — Social Work with. Mental Handicap, London, Macmillan Press Ltd.

3. Banerjee, G. R. 1968 In. — Psychiatric Social Work, Chapter 26, Wadia, A. R. (Ed.): History and Philosophy of Social Work in India, Bombay: Allied Publishers.

4. Brody, Elaine M. and care Contributors 1974 — A Social Work Guide for Long-term Facilities, U. S. Department of Health, Education and Welfare, Public Health Service, Maryland: National Institute of Mental Health.

5. Coleman, J. C. 1976 Life, — Abnormal Psychology and Modern Bombay, D. B. Taraporevala and Sons.

6. Dickerson, Martha Ufford. 1981 — Social Work Practice with the Mentally Retarded, New York: Free Press.

7. Freedman, A. M. and Kaplan, H. I. (Eds.) 1967 — Comprehensive Textbook of Psychiatry, Baltimore, Williams and Wilkins Company.

8. French, Lois Meredity. 1940 — Psychiatric Social Work, New York; The Commonwealth Fund.

9. Friedlander, W. A. 1967 — Introduction to Social Welfare, (Chapter 12: Social Work in Medical and Psychiatric Settings), New Delhi: Prentice-Hall of India.

10. Feldman Robert S 1997 — Understanding Psychology, 4th Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi

11. Golan, Naomi. 1978 — Treatment in Crisis Situations, New York: Free Press.

12. Henderson, Sir David and Batchelor, I. R. C. 1962 — Textbook of Psychiatry, New York Oxford University Press.

13. Hudson, Barbara L. 1982 — Social Work with Psychiatric Patients, London: Macmillan.

14. Humble, Stephen and Unell, Judith (Ed.) 1989 — Self Help in Health and Social Welfare, London: Routledge.

15. Jones, Kathleen. 1972 — A History of the Mental Health Services, London: Routledge and Kegan Paul.

16. Jordan, William. 1972 — The Social Worker in Family Situations, London: Routledge and Kegan Paul.

17. Maller, Joshua-o. 1971 — The Therapeutic Community with Chronic Mental Patients, S. Karger.

18. Mishne, Judith (Ed.) 1980 — Psychotherapy and Training in Clinical Social Work, New York: Gardner Press.

19. Page, J. D. 1983 — Abnormal Psychology, New York, McGraw-Hill.

20. Robbins, Arthur J. 1957 — Mental Hospitals in India and Social Work Service, Delhi School of Social Work.

21. Strean, Herbert S. 1979 — Psychoanalytic Theory and Social Work Practice, New York: Free Press.

22. Stroup, H. H. 1960 — Social Work - An Introduction to the Field, (Chapter 9: Psychiatric Social Work), New Delhi: Eurasia Publishing House.

23. Todd,F.Joan.1967 — Social Work with the Mentally Subnormal, New York: Routledge and Kegan Paul.

24. Towle, Charlotte. 1941 — Social Case Records from Psychiatric Clinics with Discuss Notes, Chicago;

Illinois: University of Chicago Press.

25. Yelloly, Margaret. 1980 Social Work Theory and Psychoanalysis, New York: Van Nostrand Reinhold Company.

26. National Mental Health Programme for India

Code SWDHC -15
Title: **MAJOR PROJECT**

Students are given broad guidelines for undertaking empirical evidence-based project in the fourth semester. In case of group project work, the group will be formed by the college or the university department by adopting random method of selection. The project shall comprise of selection of the topic, methodological details, analysis, interpretation and deductions made. The department will prepare a set of guidelines for presenting the report.

Evaluation of the Project will be done along with the viva-voce examination by the viva-voce committee constituted for the assessment of social work practicum.

Even semester

Code: **SW DHC-6**
Title : **SOCIAL WORK PRACTICUM - V**

Concurrent practice learning of two-days a week - on going learning of practice is an opportunity to develop intervention skills in reality situations. This entails learning social work practice for two, or two and a half days or its equivalent, each week of the semester. The learners may be placed in agencies or in communities to initiate and participate in direct service delivery. Practice learning is a vital component of the educational opportunity to be provided to the learner. The teaching-learning process must be designed to help the learner to move on the mastering strategies, skills and techniques to practice social work.

Even semester

Code: **SWDHC-17**

Title: **SOCIAL WORK PRACTICUM – VI**: (BLOCK PLACEMENT)

Block Placement - enables learners to integrate learning and generate newer learning by participating in the intervention process over a period of 6 weeks continuously, in a specific agency. Usually, block field work is provided at the end of the two-year programme. There shall be a professionally qualified worker in the setting willing to plan orientation and provide consultation, when needed.

Paper code: SWDSC-6

Paper Title: **HUMAN RESOURCE DEVELOPMENT AND EMPLOYEE WELLNESS**

INTRODUCTION

The purpose of this course is to provide practical exposure and knowledge in behavioural science to develop skills not only to understand and analyse problems but also to develop a problem-solving approach to issues.

OBJECTIVES

a. To develop multi facets of the personality and to build self confidence.
b. To develop a spirit of continuous learning and innovation.
c. To strengthen the competency base of individuals, teams and organization and also femilar with the organizational culture.
d. Understand and further the organization culture.
e. To appreciate the importance of bottom-line focus to the Human Resource
function and trend toward HR Accountability.
f. To understand the various approaches to and techniques of measuring HR issues.
g. To create awareness of different types of information systems in an organization so as to enable the use of computer resources efficiently, for effective decision- making.

Course Content

UNIT I

Human Resource Development (HRD): Concept, origin and needs for HRD; Overview of HRD as a Total system; Approaches to HRD; human capital approach; social psychology approach and poverty alleviation approach; HRD and its dimensions, Competency Mapping.

UNIT II

HRD Interventions: Performance Measurement Systems – Fundamental issues. Feedback sessions. Organizational goal setting process, Key Result Area (KRA) and Key Performance Indicator (KPI),Coaching, Mentoring, career planning, career development, reward system, quality of work life. HRIS: - Computers and computer based Information Systems. Measuring HR : Changing role of HR, HR as a strategic partner, the need for measuring HR. Approaches to measuring HR: - Competitive Benchmarking, HR Accounting, HR Auditing, HR Effectiveness Index, HR Key Indicators, HR MBO (Management by Objectives).

Instructional Technology: Learning and HRD; Building Learning Organization: measuring learning – the intellectual capital, architecting a learning organization, Organizational Learning, models and curriculum; factors and principles of learning; group and individual learning; HRD trends; behavioural sciences; transactional analysis; Concepts of continuous learning, behavior modeling and self-directed learning; evaluating the HRD effort; data gathering; analysis and feedback; HRD experience in Indian organizations; future of HRD - Organization culture and development.

UNIT III

Talent Development: Concept and importance; Training Need Analysis, process of training, designing and evaluating training and development programs. Use of information technology, Types and Methods of Training: Training within industry (TWI), External; on the job and off the job; Training methods; lecture, incident process, role play, structured and unstructured discussion, in-basket exercise, simulation, vestibule, training, management games, case study, programmed instruction, team development, and sensitivity training; review of training programs.

UNIT IV

Employee Wellness: Concept, philosophy, principles and scope; Importance and relevance of wellness programs, Role of Welfare Officer as per the Factories Act 1948. Relevance - with reference to Accidents, Absenteeism, Alcoholism, Domestic Violence: Preventive and remedial measures.

Employee Counseling. Role of Counselor in Organizations. Corporate Social Responsibility (CSR): CSR as a business strategy.

Environmental management systems ISO 14001, ISO 26000: Social responsibility guidance standard, environmental impact assessment.

REFERENCES

1. Bhattacharyya, Dipak Kumar.1999 Managing People, New Delhi, Excel Books.

2. Business Today Managing People: The Business Today, ExperientialGuide to Managing Workforce 2000, January 7-21, 1996.

3. Cowling, Alan and James Philip The Essence of Personnel Management and Industrial Relations, New Delhi, Pentice-Hall of India Pvt., Ltd.

4. Davis, Keith. 1983 Human Behaviour at Work, New Delhi: Tata McGraw-Hill

5. Fisher, Cynthia; Schoenfeldt, Lyle F. and Shaw, James, B. 1997 Human Resource Management, Third Edition, Boston, Houghton Mifflin Company.

6. Jayagopal, R. 1990 Human Resource Development: Conceptual Analysis and Strategies, New Delhi: Sterling Publishers Pvt. Ltd.

7. Moorthy, M. V. 1982 Priciples of Labour Welfare, New Delhi, Oxford & IBH.

8. Moorthy, M. V. 1992 Human Resource Management Psycho-Sociological Social Work Approach, Bangalore, R & M Associates.

9. Norman, M. 1960 Psychology in Industry, London, Harrap & Company.

10. Prasad, L. M. 1996 Organisational Behaviour, New Delhi, S.Chand & Co.

11. Rao, T. V. 1990 HRD Missionary, New Delhi. Oxford & IBH.

12. Rao, T. V. 1991 Reading in Human Resource

Development, New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd

13. Rudrabasavaraj, M. N. 1984 — Human Factors in Administration, Bombay: Himalaya Publishing House.

14. Sahni, P. and Sharma, K. K. 1988 — Organisational Behaviour, New Delhi: Deep and Deep Publications.

15. Singh M. K. and Bhattacharya (Eds.) 1990 — Personnel Management, New Delhi : Discovery Publishing House.

16. Vroom, V. H. and Grant, L. 1969 — Organisational Behaviour and Human Performance, New York. Wiley.

Code: SWDSC-6
Title: CASE STUDIES

Every Candidate is expected to take up five cases, study them in depth and present the intervention, if any. Case refers to a unit of study – an individual, an institution, a community or an incident. The candidate has to work under the guidance of faculty member and submit the report on or before the date prescribed.

The university or the college concerned can develop guidelines for undertaking case studies. However, the students are encouraged to start his/her work on case studies from the beginning of the course.

Evaluation of the case study will be done along with the viva-voce examination by the viva-voce committee constituted for the assessment of social work practicum or similar committee may be constituted, if required.

JSS Mahavidyapeetha

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

B. N. ROAD, MYSURU – 570 025

POSTGRADUATE DEPARTMENT OF CHEMISTRY

SYLLABUS FOR M.Sc. DEGREE PROGRAMME IN CHEMISTRY

PROGRAMME CODE: CHE

under

Choice Based Credit System (CBCS) and

Continuous Assessment Grading Pattern (CAGP)

(With effect from 2018-19)

GENERAL REQUIREMENTS

Scheme of Instructions:

A. A Masters Degree program is of 4 semesters-two years duration. A candidate can avail a maximum of 8 semesters – 4 years (in one stretch) to complete Masters Degree (including blank semesters, if any). Whenever a candidate opts for blank semesters, he/ she has to study the prevailing courses offered by the department when he/ she continues his/ her studies.

B. A candidate has to earn a minimum of 76 Credits, for successful completion of a Master Degree. The 76 Credits shall be earned by the candidate by studying Hard Core, Soft Core and Open Elective.

C. **Minimum for Pass:** In case a candidate secures less than Thirty percent in C_1 and C_2 put together, the candidate is said to have DROPPED the course, and such a candidate is not allowed to appear for C_3.

D. In case a candidate secures less than Thirty percent in C_3, or secures more than Thirty percent in C_3 but less than Thirty percent in C_1, C_2 and C_3 put together, the candidate is said to have not completed the course and he/ she may either opt to DROP the course or to utilize PENDING option.

E. **Credits (Minimum) Matrix:** A candidate has to study a minimum of 16 Credits in Soft Core (sum total of 4 semesters) and 04 Credits in Open Elective (in III Semester) for the successful completion of the Masters Degree course. A minimum of 15 students should register for every Soft Core or Open Elective course.

F. All other rules and regulations hold good which are governed by the College/ University.

GENERAL SCHEME WITH RESPECT TO THE ASSESSMENT OF CREDITS

Semester	Hard Core (HC)		Total	Soft Core (SC)		Total	Open Elective (OE)
	Theory	Practicals		Theory	Practicals		
I	3+3+3+3=12	(4+4)+(4+4)=08[a]	**20**	2+2+2+2=08[b]	NIL	**08[b]**	NIL
II	3+3+3+3=12	(4+4)+(4+4)=08[a]	**20**	2+2+2+2=08[b]	NIL	**08[b]**	NIL
III	3+0+3+0=06	NIL	**06**	0+(2x2)+0+(2x2)=08	(4+4)+(4+4)=08[a,c]	**16**	04
IV	0+3+0+3=06	NIL	**06**	(2x2)+0+(2x2)+0=08	4[d]+(4+4)+(4+4)=08[a,c]	**18**	NIL
Grand Total	**36**	**16**	**52**	**26**	**16**	**42**	**04**

[a]Fifty percent of the students will attend Analytical/ Inorganic Practicals and remaining Fifty percent students will attend Organic/ Physical Practicals in I or III Semester and *vice-versa* during II or IV Semester.

[b]Courses are common for both I and II Semesters and the candidate can opt any course of his/ her choice in aforesaid semesters and should ascertain that the course/ s already studied in I Semester are not repeated in the II Semester.

[c]Practicals are only for chemistry students which are compulsory courses.

[d]Dissertation/ Project work

SCHEME OF STUDY AND EXAMINATION

FIRST SEMESTER
HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHA 130	Fundamentals of Chemical Analysis	03	03	100	15	15	03	70
CHA 140	Inorganic Chemistry-I	03	03	100	15	15	03	70
CHA 150	Organic Chemistry-I	03	03	100	15	15	03	70
CHA 160	Physical Chemistry-I	03	03	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHA 050	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHA 060	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHA 070	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHA 080	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: Fifty percent of the students will attend Analytical and Inorganic practicals and remaining Fifty percent of the students will attend Organic and Physical practicals in I semester and *vice-versa* during II semester.

SOFT CORE

THEORY

Course Code	Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHA 500	Applied Analysis I	02	02	100	15	15	03	70
CHA 510	Frontiers in Inorganic Chemistry	02	02	100	15	15	03	70
CHA 520	Reaction Mechanisms	02	02	100	15	15	03	70
CHA 530	Solid State Chemistry and Chemistry of Nano Materials	02	02	100	15	15	03	70

SECOND SEMESTER
HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHB 090	Separation Techniques	03	03	100	15	15	03	70
CHB 100	Advanced Coordination Chemistry	03	03	100	15	15	03	70
CHB 170	Organic Chemistry-II	03	03	100	15	15	03	70
CHB 120	Physical Chemistry - II	03	03	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHB 130	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHB 140	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHB 150	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHB 160	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: It is same as that of I Semester. Students who have studied Analytical/ Inorganic or Organic/ Physical Practicals will get interchanged during II Semester.

SOFT CORE

All the courses are common for both I and II Semesters and the candidate can opt any course of his/ her choice in aforesaid semesters and should ascertain that the course/ s already studied in I Semester are not repeated in the II Semester.

THEORY

Course Code	Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHB 500	Applied Analysis I	02	02	100	15	15	03	70
CHB 510	Frontiers in Inorganic Chemistry	02	02	100	15	15	03	70
CHB 520	Reaction Mechanisms	02	02	100	15	15	03	70
CHB 530	Solid State Chemistry and Chemistry of Nano Materials	02	02	100	15	15	03	70

THIRD SEMESTER

HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 030	Instrumental Methods of Analysis	03	03	100	15	15	03	70
CHC 040	Spectroscopy	03	03	100	15	15	03	70

OPEN ELECTIVE (for Non-Chemistry Students only)

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 600	Selected Topics in Chemistry	04	04	100	15	15	03	70

SOFT CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 500	Inorganic Chemistry-II	02	02	100	15	15	03	70
CHC 510	Structural Methods in Inorganic Chemistry	02	02	100	15	15	03	70
CHC 520	Biophysical Chemistry and polymers	02	02	100	15	15	03	70
CHC 530	Applications of Chemical Kinetics and Quantum Chemistry	02	02	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHC 210	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHC 220	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHC 230	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHC 240	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: 1. Fifty percent of the students will attend Analytical and Inorganic practicals and remaining Fifty percent of the students will attend Organic and Physical practicals in III semester and *vice-versa* during IV semester.

2. Practicals papers are only for chemistry students which are compulsory

FOURTH SEMESTER
HARD CORE

THEORY

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 010	Bioinorganic Chemistry	03	03	100	15	15	03	70

CHD 020	Advanced Physical Chemistry	03	03	100	15	15	03	70

SOFT CORE

THEORY

Course Code	Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 500	Applied Analysis II	02	02	100	15	15	03	70
CHD 510	Applied Analysis III	02	02	100	15	15	03	70
CHD 520	Retrosynthesis and Organometallic Chemistry	02	02	100	15	15	03	70
CHD 530	Biomolecules and Natural Products	02	02	100	15	15	03	70

PRACTICALS

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 210	Analytical Chemistry Practicals	08	04	100	15	15	06	70
CHD 220	Inorganic Chemistry Practicals	08	04	100	15	15	06	70
CHD 230	Organic Chemistry Practicals	08	04	100	15	15	06	70
CHD 240	Physical Chemistry Practicals	08	04	100	15	15	06	70

Note: It is same as that of III Semester. Students who have studied Analytical/ Inorganic or Organic/ Physical Practicals will get interchanged during IV Semester.

PROJECT /DISSERTATION WORK

Course Code	Course Title	Contact Hours/ Week	Credits	Max. Marks/ Course	Internal Assessment Marks		Semester End Exams (C_3)	
					C_1	C_2	Duration	Max. Marks
CHD 250	Project /Dissertation Work	08	04	100	15	15	06	70

SCHEME OF EXAMINATION FOR C_1, C_2 AND C_3 COMPONENTS

Preamble: In view of the CBCS syllabus, following is the model distribution of marks for C_1, C_2 and C_3 Components. At a glance, the model includes both theory (HC/ SC/ OE) as well as practicals (HC/ SC) assessment of marks.

The following is the scheme which will be followed for the assessment of marks for both theory (HC/ SC/ OE) as well as practicals (HC/ SC) irrespective of the Credits associated with each Course. Thirty percent of the marks will be assessed for the internals (C_1 and C_2) and remaining seventy percent will be for the semester end examinations (C_3). Each Course carries 100 marks and hence thirty marks for internal assessment and remaining seventy marks will be for Semester End Examinations. Out of thirty marks for internals, fifteen marks will be allotted to each C_1 and C_2 components. The distribution of marks for C_1 and C_2 varies with HC and SC papers.

Each theory Course (HC/ SC/ OE) consists of three components namely C_1, C_2 and C_3. C_1 and C_2 are designated as Internal Assessment (IA) and C_3 as Semester End Examination. Each Course (HC/ SC/ OE) carries **100 Marks** and hence the allotment of marks to C_1, C_2 and C_3 Components will be fifteen, fifteen and seventy marks respectively. i.e.,

C_1 Component	: 15 Marks	Internal Assessment Marks
C_2 Component	: 15 Marks	
C_3 Component	: 70 Marks	Semester End Examination
Total	**: 100 Marks**	

The above will be followed in common for all the theory (HC/ SC/ OE) and practical (HC/ SC) Courses in all the four semesters.

1. THEORY:

1.1. HARD CORE (03 CREDITS COURSES)

1.1.1 Distribution of Marks for C_1 and C_2 Components (I/ II Semesters):

IA consists of fifteen marks for each component it will be divided into three parts viz., ***Internal Test, Home Assignment and Seminar***. Internal tests will be conducted during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. Home Assignment will be

concerned for C_1 Component and Seminar for C_2 Component only. Hence, a teacher may give only one assignment (or in their personal interest one more may be given). Since each Course has three units, the marks shall be divided equally. Allotment of marks for C_1 and C_2 is as follows: Out of fifteen Marks for IA for C_1, Internal test will be conducted for Thirty Marks (reduced to 10 Marks) and Home Assignment will be given for 05 Marks (Each Home Assignment from every unit will be assessed for 05 Marks and finally reduced to 05 Marks). IA for C_2 will be distributed as follows: Internal test will be conducted for Thirty Marks (reduced to 10 Marks) and Seminar will be assigned for 05 Marks for the favor of IA. Please note that actual Seminar will be assessed for 20 Marks and finally 05 Marks will be distributed to each theory HC Course. i.e.,

C_1		**C_2**	
Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**	Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**
Home Assignment	: 15 Marks (05+05+05) **Reduced to 05 Marks**	Seminar	: 20 Marks (05+05+05+05) **Distributed 05 Marks to each HC Course**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.1.1a Distribution of Marks for C_1 and C_2 Components (III/ IV Semesters):

The modalities discussed above in 1.1.1 holds good for this also except for Seminar component. Seminar will be assigned for 05 Marks for the favor of IA. Please note that actual Seminar will be assessed for 10 Marks and finally 05 Marks will be distributed to each theory HC Course. i.e.,

C_1		**C_2**	
Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**	Internal Test	: 30 Marks (10+10+10) **Reduced to 10 Marks**
Home Assignment	: 15 Marks (05+05+05) **Reduced to 05 Marks**	Seminar	: 10 Marks (05+05) **Distributed 05 Marks to each HC Course**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.1.2 Distribution of Marks for C_3 Component (Semester End Examination):

The question paper is of 3 hr duration with Max. Marks 70. The following question paper pattern will be followed for all the theory Courses (HC/ SC/ OE). Question paper will have 2 parts both parts will cover all units of the course with equal proportional of distribution. Part A is of Short Answer Type questions which will have ten questions and each question carries two

Marks. Part B carries fifty Marks and comprises of seven questions where in a student has to answer any five. Each question carries ten marks with sub question i.e.,

Model Question Paper Pattern:

Max. Duration: 3 Hr **Max. Marks: 70**

Note: *Question paper has two parts, answer both the parts*.

PART A

Ten questions will be given and all ten should be answered. Each question carries two marks.

10 x 2 = 20

PART B

Seven questions will be given and any five should be answered. Each question carries Ten marks. An examiner may distribute marks as (3+3+4), (5+5), (7+3) & (4+6). Two marks question shall be avoided to maximum extent. **5 x 10 = 50**

1.2 SOFT CORE (02 CREDITS COURSES):

1.2.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of 15 marks for each components; it will be divided into two parts viz., ***Internal Test and Home Assignment***. Internal tests will be conducted during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. As far as Home Assignment is concerned, the concerned teacher will assign one or two Home Assignments to each student. Since each Course has two units, the marks will be divided equally. Allotment of marks for C_1 and C_2 is as follows: Out of 15 Marks for IA, Internal tests will be conducted for 10 marks and Home Assignment for 05 Marks. i.e.,

C_1		**C_2**	
Internal Test	: 20 Reduced to10	Internal Test	: 20 Marks 10
Home Assignment	: 10 Marks **Reduced to 05**	Home Assignment	: 10 Marks **Reduced to 05**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.2.2 Distribution of Marks for C_3 Component (Semester End Examination):

The above discussed pattern (1.1.2) holds good in this case also.

1.3 OPEN ELECTIVE (04 CREDITS COURSE):

1.3.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of 15 marks for each components; it will be divided into two parts viz., ***Internal Test and Home Assignment***. Internal tests will be conducted during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. As far as Home Assignment is concerned, the concerned teacher will assign one or two Home Assignments to each student. Allotment of marks for C_1 and C_2 is as follows: Out of 15 Marks for IA, Internal tests will be conducted for 20 marks and reduced to 10 Home Assignment for 05 Marks. i.e.,

C_1		**C_2**	
Internal Test	: 20 Marks **Reduced to 10**	Internal Test	: 20 Marks **Reduced to 10**
Home Assignment	: 20 Marks **Reduced to 05**	Home Assignment	: 20 Marks **Reduced to 05**
Total	**: 15 Marks**	**Total**	**: 15 Marks**

1.3.2 Distribution of Marks for C_3 Component (Semester End Examination):

The above discussed pattern (1.1.2) holds good in this case also.

2. PRACTICALS (04 CREDITS COURSES):

The following scheme will be applicable for both HC and SC in all the four semesters (SC courses are for chemistry students only which are compulsory Courses).

Each practical (HC/ SC) consists of three components namely C_1, C_2 and C_3. C_1 and C_2 are designated as Internal Assessment (IA) and C_3 as Semester End Examination. Each practical (HC/ SC) carries **100 Marks** and hence the allotment of marks to C_1, C_2 and C_3 Components will be fifteen, fifteen and seventy marks respectively. i.e.

C_1 Component	: 15 Marks	} Internal Asessment Marks
C_2 Component	: 15 Marks	
C_3 Component	: 70 Marks	Semester End Examination
Total	**: 100 Marks**	

2.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of **15 Marks**; it will be divided into three parts viz., ***Internal Test, Continuous Assessment and Record***. Continuous assessment refers to the daily assessment of

each student based on his/ her attendance, skill, results obtained etc. Thus, three marks are allotted for Continuous Assessment. Internal tests will be conducted for ten marks during the 8th Week of the semester for C_1 and 16th Week of the semester for C_2. Finally, remaining two Marks will be for the record. i.e.,

C_1		**C_2**	
Internal Test	: 10 Marks	Internal Test	: 10 Marks
Continuous Assessment	: 03 Marks	Continuous Assessment	: 03 Marks
Record	: 02 Marks	Record	: 02 Marks
Total	**: 15 Marks**	**Total**	**: 15 Marks**

5.1.2 Distribution of Marks for C_3 Component (Semester End Examination):

The end examination will be conducted for **seventy Marks/ Course** with a maximum duration of six hours. Two experiments will be given to each student which carries thirty Marks each. Each student will be subjected to Viva-Voce Examination for which ten Marks is allotted. i.e.,

Two Experiments	: 60 Marks
Viva-Voce	: 10 Marks
Total	**: 70 Marks**

2.3 Evaluation of Project Work/ Dissertation (Minor):

Each student can take up Project Work/ Dissertation under the guidance of the faculty of the department during the IV Semester as a Soft Core course.

2.3.1 Distribution of Marks for C_1 and C_2 Components:

IA consists of **fifteen Marks** for each components; it will be divided into three parts viz., ***Attendance, Continuous Assessment and Work Progress***. Continuous assessment refers to the daily assessment of each student based on his or her skill, results obtained, literature survey etc. C_1 will be assessed during the 8th Week of the semester and C_2 during the 16th Week of the semester. Hence, the concerned guide will prepare the marks list based on the above said parameters for both C_1 and C_2 Components.

2.3.2 Distribution of Marks for C_3 Component (Semester End Examination):

The semester end examination will be conducted for **seventy Marks**. Every student is suppose to prepare a hard copy of the findings of the work in the form of report and submitted for

evaluation. This part will be assessed for fourth Marks. Each student will be subjected to Viva-Voce Examination for which thirty Marks is allotted. i.e.,

Evaluation of Report	: 40 Marks
Viva-Voce	: 30 Marks
Total	**: 70 Marks**

Programme Outcomes (POs)
At the end of the programme the student able to:

POID	PO
39167	Work in the pure, interdisciplinary and multidisciplinary areas of chemical sciences and its applications.
39159	Learn about the potential uses of analytical, inorganic, organic and physical chemistry.
39165	Acquire knowledge, abilities and insight in well-defined area of research within Chemistry.
39168	Plan and execute research in frontier areas of chemical sciences.
39162	Develop knowledge of scientific theories and methods, gain experience in working independently with scientific questions and clearly express opinion on academic issues.
39163	Acquire the skills of planning and conducting advanced experiments by applying suitable simple and sophisticated analytical techniques.
39169	Learn professionalism, including the ability to work in teams and apply basic ethical principles.
39166	Adopt the skills and knowledge required to the professional life, and to qualify for training as scientific researcher.
39160	Develop scientific communication skills for differently specialized and non-specialized audiences.

POID	PO
39161	Gather attention about the physical aspects of chemistry.
39164	Examine specific phenomena theoretically and/or experimentally, contribute to the generation of new scientific insights or to the innovation of new applications of research in Chemistry.

Programme Specific Outcome (PSOs)

After completion of this programme the candidate able to

PSOID	PSOs
PSO1	Think and teach aspects of chemistry to the different levels of students in a futuristic manner.
PSO2	Reach the positions by employment in chemical, pharmaceutical, food and material industries.
PSO3	Reach a level to think about the scientific situations existing around him/her.
PSO4	Take up Global level research opportunities to pursue Ph.D. programme and will be more resourceful and will have targeted approach to qualify CSIR- NET and other competitive examinations.
PSO5	Analyse data obtained from sophisticated instruments for the structure determination and chemical analysis.
PSO6	Understand the background of organic mechanism and instrumental methods of chemical analysis.
PSO7	Apply modern methods of analysis to chemical systems in a laboratory setting.
PSO8	Find placements in R & D and synthetic division of polymer industries & allied division.
PSO9	Explore new areas of research in both chemistry and allied fields of science and technology.

FIRST SEMESTER

THEORY – HARD CORE

Course Title: FUNDAMENTALS OF CHEMICAL ANALYSIS
Course Code: CHA 130
Course Outcomes
After studying this course the student able to:

COID	CO
47457	Learn in depth Language of analytical chemistry, Errors and treatment of analytical data.
47470	Specify in depth Titrimetric analysis, Acid-base titrations in non-aqueous media, Precipitation titrations.
47494	Learn in depth Complexometric titrations, Redox titrations, Obtaining and preparing samples for analysis.

UNIT – I

Analytical Chemistry–Meaning, role, central location of analytical chemistry. Quantitative and qualitative analysis.Steps in quantitative analysis.

Language of analytical chemistry - Analysis, determination and measurement.Techniques, methods, procedures and protocols.Classifying analytical techniques.

Errors and treatment of analytical data: Limitations of analytical methods – Error: determinate and indeterminate errors, minimization of errors. Accuracy and precision,distribution of random errors, the normal error curve. Statistical treatment of finite samples-measures of central tendency and variability: mean, median, range, standard deviation and variance. Student's t-test,confidence interval of mean.Testing for significance-comparison of two means and two standard deviations.Comparison of an experimental mean and a true mean.Criteria for the rejection of an observation- Q-test. Propagation of errors: determinate errors and indeterminate errors.

Standardization and calibration: Comparison with standards-direct comparison and titrations. External standard calibration-the least squares methods, regression equation, regression coefficient. Internal standard methods and standard-addition methods.

Selecting an analytical method: Accuracy, precision, sensitivity, selectivity, robustness and ruggedness,scale of operation, equipment, time and cost.Making the final choice.Figures of merit of analytical methods–sensitivity, detection and quantitation limit, linear dynamic range.

[16 HOURS]

UNIT – II

Titrimetric analysis: An overview of titrimetry. Principles of titrimetric analysis. Titration curves. Titrations based on acid-base reactions-titration curves for strong acid and strong base, weak acid and strong base and weak base and strong acid titrations. Selecting and evaluating the end point. Finding the end point by visual indicators, monitoring *p*H and temperature. Quantitative applications – selecting and standardizing a titrant, inorganic analysis-alkalinity, acidity and free CO_2 in water and waste waters, nitrogen, sulphur ammonium salts, nitrates and nitrites, carbonates and bicarbonates. Organic analysis-functional groups like carboxylic acid, sulphonic acid, amine, ester, hydroxyl, carbonyl. Air pollutants like SO_2.Quantitative calculations. Characterization applications-equivalent weights and equilibrium constants.

Acid-base titrations in non-aqueous media: Role of solvent in acid-base titrations, solvent systems, differentiating ability of a solvent, some selected solvents, titrants and standards, titration curves, effect of water, determining the equivalence point, typical applications-determination of carboxylic acids, phenols and amines.

Precipitation titrations: Titration curves, feasibility of precipitation titrations, factors affecting shape - titrant and analyte concentration, completeness of the reaction, titrants and standards, indicators for precipitation titrations involving silver nitrate, the Volhard, the Mohr and the Fajan's methods, typical applications.

[16 HOURS]

UNIT – III

Complexometric titrations: Complex formation reactions, stability of complexes, stepwise formation constants, chelating agents, EDTA-acidic properties, complexes with metal ions, equilibrium calculations involving EDTA, conditional formation constants, derivation of EDTA titration curves, effect of other complexing agents, factors affecting the shape of titration curves-completeness of reaction, indicators for EDTA titrations-theory of common indicators, titration methods employing EDTA-direct, back and displacement titrations, indirect determinations, titration of mixtures.

Redox titrations: Balancing redox equations, calculation of the equilibrium constant of redox reactions, calculating titration curves, detection of end point, visual indicators and potentiometric end point detection. Quantitative applications-adjusting the analyte's oxidation state, selecting and standardizing a titrant. Inorganic analysis-chlorine residuals, dissolved oxygen in water, water in non-aqueous solvents. Organic analysis-chemical oxygen demand (COD) in natural and waste waters, titrations of mercaptans and ascorbic acid with $I_3^-$and titration of organic compounds using periodate.

Obtaining and preparing samples for analysis: Importance of sampling, designing a sample plan-random, judgement, systematic-judgement, stratified and convenience sampling. Type of sample to collect - grab and composite samples. *Insitu* sampling. Size of sample and number of samples.Implementing the sampling plan - solutions, gases and solids. Bringing solid samples into solution - digestion and decomposing.

[16 HOURS]

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch, 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001, John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993,Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
7. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.

Course Title: INORGANIC CHEMISTRY-I
Course Code: CHA 140
Course Outcomes

After studying this course the student able to:

COID	CO
48345	Understand the details of Molecular symmetry and group theory and applications, Representation of groups.
48356	Learn in details with examples VSEPR model , Non-aqueous solvents, Electron deficient compounds, Lanthanides & Actinides.
48360	Understand the classification and characteristics of Organometallics of transition metals.
48367	Specify in depth Ferrocene and ruthenocene, Complexes containing alkene, alkyne, arene and allyl ligands.

UNIT – I

Molecular symmetry and group theory: Symmetry elements and symmetry operations. Concept of a group, definition of a point group. Classification of molecules into point groups. Subgroups. Schoenflies and Hermann-Maugin symbols for point groups. Multiplication tables (C_n, C_{2V} and C_{3V}). Matrix notation for the symmetry elements. Classess and similarity transformation.

Representation of groups: The Great Orthogonality theorem and its consequences. Character tables (C_s, C_i, C_2, C_{2v}, C_{2h} and C_{3v}).

Applications of group theory: Group theory and hybrid orbital. Group theory to Crystal field theory and Molecular orbital theory (octahedral and tetrahedral complexes). Determining the symmetry groups of normal modes (both linear and non-linear molecules).

[16 HOURS]

UNIT – II

Structures and energetics of inorganic molecules: Introduction, Energetics of hybridization. VSEPR model for explaining structure of AB, AB_2E, AB_3E, AB_2E_2, ABE_3, AB_2E_3, AB_4E_2, AB_5E and AB_6 molecules. M.O. treatment of homonuclear and heteronuclear diatomic molecules. M.O. treatment involving delocalized π-bonding (CO_3^{2-}, NO_3^-, NO_2^-, CO_2 and N_3^-).

Non-aqueous solvents: Classification of solvents, Properties of solvents (dielectric constant, donor and acceptor properties) protic solvents (anhydrous H_2SO_4, HF and glacial acetic acid) aprotic solvents (liquid SO_2, BrF_3 and N_2O_4). Solutions of metals in liquid ammonia. Super acids.

Electron deficient compounds: Higher boranes, polyhedral boranes (preparations, properties, structure and bonding). Wade's rules, carboranes and metallocarboranes.

Lanthanides & Actinides: Spectral & magnetic properties. Use of lanthanide compounds as shift reagents.

[16 HOURS]

UNIT – III

Fundamental concepts: Introduction, Classification of organometallic compounds by bond type, nomenclature, the effective atomic number rule, complexes that disobey the EAN rule, common reactions used in complex formation.

Organometallics of transition metals: Preparation, bonding and structures of nickel, cobalt, iron and manganese carbonyls. Preparation and structures of metal nitrosyls in organometallics.

Ferrocene and ruthenocene: Preparation, structure and bonding.

Complexes containing alkene, alkyne, arene and allyl ligands: preparation, structure and bonding. The isolobal principles.

[16 HOURS]

References:

1. Symmetry and spectroscopy of molecules, 2nd Ed. Veera Reddy, New Age International Publication (2009).
2. Group Theory and its Chemical Applications, P.K. Bhattacharya, Himalaya Publishing House (1986).
3. Chemical Applications of Group Theory, 3rd Ed., F.A. Cotton,Wiley, New York (1990).
4. Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
5. Inorganic Chemistry, 3rd edition. G.L. Miessler and D.A. Tarr, Pearson Education (2004).
6. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2004).
7. Inorganic Chemistry, 2nd edition. C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd. (2005).
8. Basic Organometallic Chemistry - B.D. Gupta and A.J. Elias, Universities Press (2010).

Course Title: ORGANIC CHEMISTRY-I
Course Code: CHA 150
Course Outcomes

After studying this course the student to:

COID	CO
49763	Learn in details with examples Stereoisomerism, Stereoselectivity, Optical, Geometrical, isomerism and Conformational isomerism.
49791	Understand in details with examples Molecular rearrangements, Carbon to carbon migration, Carbon to nitrogen migration.
49796	Learn in details with examples Miscellaneous rearrangements.
49802	Learn the classification and characteristics of Heterocyclic chemistry.

UNIT – I

Stereoisomerism: Projection formulae [Fly wedge, Fischer, Newman and Saw horse], enantiomers, diasteroisomers, configurational notations of simple molecules, *DL* and *RS* configurational notations.

Stereoselectivity: Stereoselective reactions, diasteroselective reactions, stereospecific reactions, regioselective and regiospecific reactions, enantioselective and enantiospecific reactions.

Optical isomerism: Conditions for optical isomerism, Elements of symmetry – plane of symmetry, centre of symmetry, alternating axis of symmetry (rotation-reflection symmetry);

optical isomerism due to chiral centers and molecular dissymmetry, allenes and biphenyls, criteria for optical purity.

Geometrical isomerism: Due to C=C, C=N and N=N bonds, E, Z conventions, determination of configuration by physical and chemical methods.

Conformational isomerism: Elementary account of conformational equilibria of ethane, butane and cyclohexane. Conformation of cyclic compounds such as cyclopentane, cyclohexane, cyclohexanone derivatives and decalins. Conformational analysis of 1,2, 1,3, and 1,4-disubstituted cyclohexane derivatives and *D*-Glucose, Effect of conformation on the course/ rate of reactions.

[16 HOURS]

UNIT – II

Molecular rearrangements: Introduction

Carbon to carbon migration: Pinacol-pinacolone, Wagner-Meerwein, Benzidine, Demjanov, benzylic acid, Favorskii, Arndt-Eistert synthesis, Fries rearrangement, Steven's rearrangement, dienophine rearrangement.

Carbon to nitrogen migration: Hofmann, Curtius, Lossen, Schmidt and Beckmann rearrangements.

Miscellaneous rearrangements: Sommelet-Hauser, Wittig, Smiles, Neber, Japp-Klingemann rearrangement, Meisenheimer rearrangements, Bayer-Villeger rearrangement, Allylic rearrangements.

[16 HOURS]

UNIT – III

Heterocyclic chemistry: Nomenclature of heterocyclic systems

Structure, reactivity, synthesis and reactions of indole, pyridine, benzofuran, quinoline, isoquinoline, pyrazole, imidazole, pyrone, coumarin, chromones, pyrimidines and purines. Synthesis and synthetic applications of azirines and aziridines, isoxazole, oxazole and azepine.

[16 HOURS]

References:

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mc Graw Hill, New York, 1987.
2. Organic Chemistry by Morrison & Boyd.
3. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II, 1984.
4. E.L. Eliel and S.H. Wilen, Stereochemistry of Organic Compounds, John Wiley and Sons, New York. 1994.

5. Introduction to Stereochemistry by K. Mislow.
6. Basic Principles of Organic Chemistry by Roberts & Caserio
7. N.S. Issacs, Reactive Intermediates in Organic Chemistry, John Wiley and Sons, New York.1974.
8. R.K. Bansal, Organic Reaction Mechanism, Wiley Eastern Limited, New Delhi, 1993.
9. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
10. E.S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 964.
11. A Guide Book to Mechanism in Organic Chemistry by Petersykes
12. Stereochemistry and Mechanism through Solved Problems by P.S. Kalsi.
13. Text book of Organic Chemistry by P.S. Kalsi.
14. F.A. Carey and Sundberg, Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York, 1990.
15. D. Nasipuri, Stereochemistry of Organic Compounds, 2nd edition, Wiley Eastern Limited, New Delhi, 1991.
16. S.K. Ghosh, Advanced General Organic Chemistry, Book and Alleied (P) Ltd, 1998.
17. Heterocyclic Chemistry – Joule & Smith
18. Heterocyclic Chemistry – Achaeson
19. Basic Principles of Heterocyclic Chemistry – L.A. Pacquette
20. Comprehensive Heterocyclic Chemistry – Kartritzky series, Pergamon Press, New York, 1984.

Course Title: PHYSICAL CHEMISTRY-I
Course Code: CHA 160
Course Outcomes
After studying this course the student to:

COID	CO
51245	Learn in depth Concepts of entropy and free energy, Partial molar properties.
51250	Learn the details of Fugacity, Statistical thermodynamics.
51272	Learn the details of Chemical Kinetics, Kinetics of reactions in solution, Linear free energy, Enzyme kinetics.
51303	Learn the characteristics of Electrochemistry, Energetics of cell reactions, Corrosion.

UNIT – I

Concepts of entropy and free energy: Second law of thermodynamics, definition of entropy,entropy of phase transition,entropy change during spontaneous process. Helmholtz and Gibbs free energies,Maxwellrelations,Variation of free energy with temperature and pressure. Third law of thermodynamics,Nernst heat theorem & its applications,numericals based on entropy and free energy changes.

Partial molar properties: Partial molar quantities,Partial molar gibbsfunction,Partial molar volume and its determination by intercept method and density measurements.Chemical potential and its significance. Variation of chemical potential with temperature and pressure.Formulation of the Gibbs Duhem equation.Derivation of Duhem-Margules equation.

Fugacity: Determination of fugacity of gases. Variation of fugacity with temperature and pressure.Activity and activity coefficients.Variation of activity with temperature and pressure.Determination of activity co-efficients by vapour pressure, depression in freezing points and solubility measurements by electrical methods.

Statistical thermodynamics: Different types of ensembles, ensemble averaging, distribution law (Boltzmann statistics),partition function and thermodynamic parameters; relation between molecular and molar partition functions, translational partition function, rotational partition function for linear and non-linear molecules.

[16 HOURS]

UNIT – II

Chemical Kinetics: Basic concepts of chemical kinetics. Complex reactions: measurement of kinetics. Chain, parallel, consecutive and reversible reactions. Arrhenius equation, energy of activation and its experimental determination. Simple collision theory-mechanism of bimolecular reaction. Lindemann's theory, Hinshelwood's theory for unimolecular reaction. Activated complex theory of reaction rate.

Kinetics of reactions in solution-salt effects, effect of dielectric constant (single sphere and double sphere model), effect of pressure, volume and entropy change on reaction rates. Cage effect with an example. Oscillatory reactions: oxidation of malonic acid. Kinetics of heterogeneous reactions - Langmuir's theory, unimolecular and bimolecular surface reactions.

Linear free energy relationship: Hammett equation, Taft equation. Isokinetic relationship and significance of isokinetic temperature.

Enzyme kinetics: Effect of substrate concentration (Michaelis Menton equation), Effect of *p*H, effect of catalysts and inhibitors, effect of temperature.

[16 HOURS]

UNIT – III

Electrochemistry: Arrhenius theory of strong and weak electrolytes and its limitations. Factor effecting conductance, Debye-Huckel-Onsager equation of conductivity and its validity. Walden`s rule. Debye-Huckel theory - concept of Ionic strength, Debye-Huckel limiting law (DHL), its modification for appreciable concentrations. Determination of transference number by moving boundary and Hittorf's methods. True and apparent transference numbers (TrN). Abnormal TrN, effect of temperature on TrN. Liquid junction potential-determination and minimization.

Energetics of cell reactions: Effect of temperature, pressure and concentration on energetics of cell reactions (calculation of ΔG, ΔH and ΔS). Electrochemical energy sources – batteries, classification, primary & secondary.

Corrosion: Manifestations of corrosion, types of corrosion, basis of electrochemical corrosion, theories of corrosion. Local cell theory (Wagner and Traud theory), Corrosion inhibition and prevention.

[16 HOURS]

References:

1. Thermodynamics for Chemists by S. Glasstone, Affiliated East-West Press, New Delhi, (1965).
2. Chemical Thermodynamics by I.M. Klotz, W.A. Benzamin Inc. New York, Amsterdam (1964).
3. Basic Physical Chemistry by W.J. Moore, Prentice Hall of India Pvt. Ltd., New Delhi (1986).
4. Text Book of Physical Chemistry by Samuel Glasstone, MacMillan Indian Ltd., 2nd edition (1974).
5. Theoretical Chemistry by S. Glasstone.
6. Elementary Statistical Thermodynamics by N.D. Smith Plenum Press, NY (1982).
7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Physical Chemistry by P.W. Atkins, ELBS, 4th edition, Oxford University Press (1990)

9. Chemical Kinetics by K.J. Laidler.
10. Chemical Kinetics by Frost and Pearson.
11. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C. Kuriacose.
12. Chemical Kinetics by L.K. Jain.
13. Chemical Kinetics by Benson.

PRACTICALS – HARD CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHA 050
Course Outcomes
After studying this course the student to:

COID	CO
CO1	Analyze various samples with different classical and simple instrumental skills.
CO2	Obtain knowledge for selection of analytical methods with suitable technique being adopted for the analysis different samples like, water, laboratory chemicals and reagents, body fluids such as urine etc.
CO3	Distinguish classical and instrumental methods.
CO4	Propose and conduct experiment for quantification of individual analytes.

[128 HOURS]

PART – I

1. Determination of total acidity of vinegar and wines by acid-base titration.
2. Determination of purity of a commercial boric acid sample, and Na_2CO_3 content of washing soda.
3. Determination of relative equivalent weight of a weak organic acid by titration with NaOH.
4. Determination of ephedrine and aspirin in their tablet preparations by residual acid-basetitrimetry.
5. Determination of carbonate and bicarbonate in a mixture by *p*H-metric titration and comparison with visual acid-base titration.
6. Determination of carbonate and hydroxide-analysis of a commercial washing soda by visual and *p*H-titrimetry.
7. Determination of purity of a commercial sample of mercuric oxide by acid-base titration.

8. Determination of benzoic acid in food products by titration with methanolic KOH in chloroform medium using thymol blue as indicator.
9. Determination of the *p*H of hair shampoos and *p*H determination of an unknown soda ash.
10. Analysis of water/ waste water for acidity by visual, *p*H metric and conductometric titrations.
11. Analysis of water/ waste water for alkalinity by visual, *p*H metric and conductometric titrations.
12. Determination of ammonia in house-hold cleaners by visual and conductometric titration.
13. Determination of chromate and dichromate in mixture by acid-base titration: visual and pH metric methods.
14. Potentiometric determination of the equivalent weight and Ka for a pure unknown weak acid.
15. Determination of purity of aniline by non-aqueous acid-base titration by visual and potentiometric methods.
16. Determination of purity of ethylene glycol and glycerol by oxidimetric method using periodate (Malprade reaction).
17. Spectrophotometric determination of creatinine and phosphorus in urine.
18. Flame emission spectrometric determination of sodium, potassium and calcium in river/ lake water.

PART – II

1. Determination of percentage of chloride in a sample by precipitation titration- Mohr, Volhard and Fajan's methods.
2. Determination of silver in an alloy and Na_2CO_3 in soda ash by Volhard method.
3. Mercurimetric determination of chloride in blood or urine.
4. Determination of total hardness, calcium and magnesium hardness and carbonate and bicarbonate hardness of water by complexation titration using EDTA.
5. Determination of calcium in calcium gluconate/ calcium carbonate tablets/ injections and of calcium in milk powder by EDTA titration.
6. Determination of zinc in a sample of foot powder and thallium in a sample of rodenticide by EDTA titration.
7. Analysis of commercial hypochlorite and peroxide solution by iodometric titration.
8. Determination of copper in an ore/ an alloy by iodometry and tin in stibnite by iodimetry.
9. Determination of ascorbic acid in vitamin C tablets by titrations with $KBrO_3$ and of vitamin C in citrus fruit juice by iodimetric titration.
10. Determination of iron in razor blade by visual and potentiometric titration using sodium metavanadate.

11. Determination of iron in pharmaceuticals by visual and potentiometric titration using cerium(IV) sulphate.
12. Determination of nickel in steel by synergic extraction and boron in river water/ sewage using ferroin.
13. Determination of total cation concentration of tap water by ion-exchange chromatography.
14. Determination of magnesium in milk of magnesium tablets by ion-exchange chromatography.
15. Cation exchange chromatographic separation of cadmium and zinc and their estimation by EDTA titration.
16. Gas chromatographic determination of ethanol in beverages.
17. Solvent extraction of zinc and its spectrophotometric determination.
18. Anion exchange chromatographic separation of zinc and magnesium followed by EDTA titration of the metals.
19. Separation and determination of chloride and bromide on an anion exchanger.
20. Separation of *o*- and *p*-nitroaniline and analysis by thin layer chromatography.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. Bothers Medical Publishers (P) Ltd., 1995.
7. Laboratory manual in biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
8. Practical Clinical Biochemistry by Harold Varley and Arnold.Heinmann, 4th edition.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHA 060
Course Outcomes
After studying this course the student to:

COID	CO
CO1	Prepare reagents required for analysis.
CO2	Propose and conduct experiment for quantitative analysis of inorganic samples such as ore, metals, complexes mixture of metals and complexes etc.
CO3	Propose schemes for semi-micro qualitative analysis.
CO4	Develop skills for the scientific and relevant documentation and risk and security assessment.

[128 HOURS]

PART – I

1. Determination of iron in haematite using cerium(IV) solution (0.02M) as the titrant, and gravimetric estimation of insoluble residue.
2. Estimation of calcium and magnesium carbonates in dolomite using EDTA titration, and gravimetric analysis of insoluble residue.
3. Determination of manganese dioxide in pyrolusite using permanganate titration.
4. Quantitative analysis of copper-nickel in alloy/ mixture:
    i. Copper volumetrically using KIO_3.
    ii. Nickel gravimetrically using DMG
5. Determination of lead and tin in a mixture: Analysis of solder using EDTA titration.
6. Quantitative analysis of chloride and iodide in a mixture:
    i. Iodide volumetrically using KIO_3
    ii. Total halide gravimetrically
7. Gravimetric analysis of molybdenum with 8-hydroxyquinoline.
8. Micro-titrimetric estimation of :
    a) Iron using cerium(IV)
    b) Calcium and magnesium using EDTA
9. Quantitative estimation of copper(II), calcium(II) and chloride in a mixture.
10. Circular paper chromatographic separation of: (Demonstration)
    a. Iron and nickel
    b. Copper and nickel

PART – II

Semimicro qualitative analysis of mixtures containing **TWO** anions and **TWO** cations (excluding sodium, potassium and ammonium cations) and **ONE** of the following less common cations: W, Mo, Ce, Th, Ti, Zr, V, U and Li.

References

1. Vogel's Text Book of Quantitative Chemical Analysis – 5th edition, J. Basset, R.C. Denney, G.H. Jeffery and J. Mendhom.
2. A Text Book of Quantitative Inorganic Analysis by A.I. Vogel, 3rd edition.
3. Spectrophotometric Determination of Elements by Z. Marczenko.
4. Vogel's Qualitative Inorganic Analysis – Svelha.
5. Macro and Semimicro Inorganic Qualitative Analysis by A.I. Vogel.
6. Semimicro Qualitative Analysis by F.J. Welcher and R.B. Halin.
7. Quantitative Chemical Analysis by Daniel C. Harris, 7th edition, (2006).

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHA 070
Course Outcomes

After studying this course, the student to:

COID	CO
CO1	Prepare several simple organic compounds and also propose suitable mechanisms.
CO2	Acquire knowledge of different reactions, conditions to be maintained, precautions to be exercised before/during/after the reaction.
CO3	Learn qualitative analysis and to separate a mixture of two components.
CO4	Gain confidence to set up reactions individually either in the pharma industry or for the Research.

PART – I

1. Preparation of *p*-nitro aniline from acetanilide.
2. Preparation of *p*-bromo aniline from acetanilide.
3. Preparation of benzoic acid from benzaldehyde
4. Preparation of n-butyl bromide from n-butanol.
5. Preparation of *p*-nitroiodobenzene from paranitroaniline.
6. Preparation of aniline from nitrobenzene.
7. Preparation of ß-*D*-Glucose penta acetate.

8. Preparation of phenoxy acetic acid.
9. Preparation of cyclohexanone from cyclohexanol.
10. Preparation of chalcone.
11. Preparation of *S*-benzylthiuronium chloride.
12. Condensation of anthracene and maleic anhydride (Diels-Alder reaction).
13. Preparation of *m*-nitrobenzoic acid from methyl benzoate.

PART – II

Qualitative analysis: Separation of binary mixtures, identification of functional groups and preparation of suitable solid derivatives.

References

1. Manual of Organic Chemistry -Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry -Robert, Wingrove etc.
4. A Text Book of Practical Organic Chemistry–A.I. Vogel, Vol.III.
5. Practical Organic Chemistry, Mann & Saunders.
6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet.
7. J. N. Guthru & R. Kapoor, Advance experimental Chemistry, New Delhi-1991.
8. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PGE International (P) LTd. London, 3rd edition. 1996.18
9. N. K. Visno, Practical Organic Chemistry, New PGE International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICAL CHEMISTRY PRACTICALS
Course Code: CHA 080
Course Outcomes
After studying this course, the student to:

COID	CO
CO1	An idea about handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
CO2	Determine the concentration of the species in given solutions using kinetic methods.

CO3	Distinguish between different physical properties of substances or compounds.
CO4	Acquire knowledge of different thermodynamic parameters.

[128 HOURS]

PART – I (Non-instrumental)

1. Study of kinetics of hydrolysis of an ester using HCl/ H_2SO_4 at two different temperature, determination of rate constants and energy of activation.
2. Study of kinetics of the iodine-hydrogen peroxide clock reaction.
3. Determination of activation energy for the bromide-bromate reaction.
4. Determination of heat of solution of benzoic acid by variable temperature method (graphical method).
5. Determination of partial molar volume of NaCl-H_2O system.
6. Determination of critical solution temperature of phenol-water system.
7. Binary analysis of two miscible liquids by viscometric method (Ethanol & Water).
8. To study oscillating or periodic or rhythmic reactions of malonic acid.
9. Thermometric titration of hydrochloric acid with NaOH.
10. Kinetics of photodegradation of indigocarmime(IC) using ZnO as photocatalyst and study the effect of [ZnO] and [IC] on the rate of photodegradation.

PART – II (Instrumental)

1. Conductometric titration of a mixture of HCl and CH_3COOH against NaOH.
2. Conductometric titration of orthophosphoric acid /formic acid/ oxalic acid against NaOH and NH_4OH.
3. Determination of PI of glycine by by potentiometric method.
4. Potentiometric titration of KI vs $KMnO_4$ solution.
5. pH Titration of (a) polybasic acid(H_3PO_4), (b) (CH_3COOH+HCl) and (c) $CuSO_4$*vs*NaOH and determination of K_a.
6. To obtain the absorption spectra of colored complexes, verification of Beer's law and estimation of Ni^{+2} ions from $[Ni(NH_3)_6]^{2+}$ by spectrophotometry.
7. Analysis of binary mixture (Glycerol and Water) by the measurement of refractive index.
8. Study the kinetics of reaction between CAT and indigo carmine spectrophotometrically and determination of rate constant.
9. Spectrophotometric titration of $FeSO_4$ against $KMnO_4$.
10. Determination of the molecular weight of a polymer material by viscosity measurements (cellulose acetate/methyl acrylate).

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – R.C. Das and B. Behera, Tata Mc Graw Hill.

THEORY – SOFT CORE

Course Title: APPLIED ANALYSIS-I
Course Code: CHA 500
Course Outcomes

After studying this course, the student to:

CO1: Describe the meaning of applied analysis.

CO2: Make out the causes for air pollution and water pollution, and knowledge an control devices or techniques or processes of such pollutions.

CO3: Understand the importance of food and drug analysis.

CO4: Acquire the knowledge to choose methodologies for the preliminary and complete analysis of air, water, food and drugs.

CO5: Adopt suitable analytical technique for sampling and analysis of air, water, food and drug samples for analysis.

CO6: Describe suitable analytical method for the determination of required analytes/components of the sample provided.

UNIT – I

Air pollution, analysis and control: Historical overview-global implications of air pollution, sources of pollutants, classification of pollutants. Sources and effects of particulates,

carbonmonoxide, sulphur oxides, nitrogen oxides, hydrocarbons and photochemical oxidants on human health, vegetation and materials.Standards for air pollutants.

Air quality monitoring: Sampling methods and devices for particulates and gaseous pollutants.SO_2: ambient air measurements and stack gas measurements-Turbidimetric,colorimetric, conductometric and coulometric methods, NOX: Griess-Ilosvay and Jacobs-Hockheiser colorimetric methods, Hydrocarbons: total and individual hydrocarbons by gas chromatography. Oxidants and ozone: colorimetric, titrimetric and chemiluminescence methods.

Control devices for particulates: Gravitational settlers, centrifugal collectors, wet collectors, electrostatic precipitation and fabric filtration.

Control devices for gaseous pollutants: adsorption, absorption, condensation and combustion processes. Automative emission control-catalytic converters.

Water pollution and analysis: Water resources, origin of wastewater, types of water pollutants; their sources and effects, chemical analysis for water pollution control-objectives of analysis, parameters of analysis, sample collection and preservation. Environmental and public health significance and measurement of colour, turbidity, total solids, acidity, alkalinity, hardness, chloride, residual chlorine, chlorine demand,sulphate, fluoride, phosphates, total nitrogen, NO_3^- and NO_2^-nitrogesn in natural and waste/ polluted waters, heavy metal pollution-public health significance of Pb, Cd, , Hg, andAs, general survey of the instrumental techniques for the analysis of heavy metals in aquatic systems, organic loadings-significance and measurement of DO, BOD, COD, TOD, and TOC.

[16 HOURS]

UNIT – II

Food analysis: Objectives of food analysis. Sampling procedures.Detection and determination of sugars and starch.Methods for protein determination.Oils and fats and their analysis-iodine value, saponification value and acid value. Rancidity-detection and determination (peroxide number). Tests for common edible oils.Analysis of foods for minerals-phosphorus, sodium, potassium and calcium.General methods for the determination of moisture, crude fibre and ash contents of food.Analysis of milk for fat and added water.Non-alcoholic beverages-determination of chicory and caffeine in coffee; caffeine and tannin in tea.Alcoholic beverages-methanol in alcoholic drinks and chloral hydrate in toddy. Food additives-chemical, preservatives-inorganic preservatives-sulphur dioxide and sulphites, their detection and determination. Organic preservatives-benzoic acid and benzoates, their detection and determination.Flavouring agents-detection and determination of vanilla and vanillin. Coloring matters in foods-classification, certified colors, detection of water soluble dyes, color in citrus fruits, beet dye in tomato

products, mineral color. Pesticide residues in foods-determination of chlorinated organic pesticides. Control food quality-codex alimentarius, Indian standards.

Drugs and pharmaceutical analysis: Importance of quality control; drugs and pharmaceuticals. Sources of impurities in pharmaceutical chemicals.Analytical quality control in finished/ final products.Common methods of assay. Analysis of common drugs; Analgesics-aspirin, paracetamol; Anthelmintics-mebendazole; Antiallergies-chlorpheneraminemalleate; Antibiotics-penicillin, chloromecytin; Anti-inflammatory agents-oxyphenbutazone; Antimalarials-primaquine phosphate; Antituberculosists-INH; Narcotics-nicotine, morphine; Expectorants-Benadryl; Sedative-diazepam; Vitamins-A. C, B1, B2, B6, niacin and folic acid.

[16 HOURS]

References

1.Standard Methods of Chemical Analysis, A.J.Weleher(Part B), Robert E.KriegorPublishing Co.USA, 1975.

2. Environmental Chemistry, S.E. Manahan Willard grant press, London, 1983.

3. Environmental Chemical Analysis, Iain L Marr and Malcolm S. Cresser, Blackie and Son Ltd., London, 1983.

4. Chemistry for Environmental Engineering, Chair N. Sawyer and Perry L.M Canty,Mcgraw Hill Book, Co., New York, 1975.

5. The Air Pollution Hand Book, Richard Mabey, Penguin, 1978.

6. The Pollution Hand Book, Richard Mabey, Ponguin 1978.

7. Soil Chemical Analysis, M.L.Jackson, Prentice Hall of India Pvt, Ltd., New Delhi, 1973.

8. Experiments in Environmental Chemistry,P.D.Vowler and D.W. Counel, Pergamon press,Oxford 1980.

9. Manual Soil Laboratory Testing, vol I, K.H. Head, Pentech Press, London 1980.

10. A Text Book of Environmental Chemistry and Pollution Control, S.S. Dara, S.Chand andco. Ltd. New Delhi 2004.

11. Air pollution Vol II edition by A.C. Stern, Academic Press New York, 1968.

12. Instrumental Methods for Automatic Air Monitoring Systems in Air Pollution Control, Part-III edition by W.Stranss, John-Wiley and Sons, New York, 1978.

13. Analysis of Air pollutants, P.O.Warner, John Wiley and Sons, New York, 1976.

14. The Chemical Analysis Air pollutants, Interscience, New York, 1960.

15. The Analysis of Air Pollutants, W.Liethe, Ann Arbor Science Pub.Inc. Michigan 1970.

16. Environmental Chemistry, A. K. De.

17. Food Analysis, A.G. Woodman, McGraw Hill. 1971.

18. Chemical Analysis of Foods, H.E. Cox and Pearson.
19. Analysis of Foods and Food Products, J.B. Jacob.
20. A First Course in Food Analysis, A.Y. Sathe, New Age Internationals (P) Ltd., Publishers, Bangalore, 1999.
21. Analytical Agricultural Chemistry, S.L. Chopra and J.S. Kanwar, Kalyani Publishers, New Delhi, 1999.
22. Pharmaceutical Analysis, (Ed). T. Higuchi and E.B. Hanssen, John Wiley and Sons, New York, 1997.
23. Pharmaceutical Analysis-Modern Methods, Part A and B, (Ed). James W. Hunson.
24. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rd edition. CBS Publishers and Distributors, New Delhi, 1997.

Course Title: FRONTIERS IN INORGANIC CHEMISTRY
Course Code: CHA 510
Course Outcomes

After studying this course, the student to:

CO1: Know the significance of materials chemistry

CO2: Acquire knowledge of various characterization techniques

CO3: Obtain the skills about the inorganic pigments.

CO4: Obtain the skills about the nanomaterials, nanoscience and nanotechnology.

UNIT – I

Materials chemistry

General principles-Defects, nonstoichiometric compounds and solid solutions, atom and ion diffusion, solid electrolytes. Synthesis of materials-The formation of extended structures, chemical deposition.

Metal oxides, nitrides and fluorides: Monoxides of the 3d metals, higher oxides and complex oxides, oxide glasses, nitrides and fluorides.

Chalcogenides, intercalation chemistry and metal rich phases: Layered MS_2 compounds and intercalation, Chevrel phases.

Framework structures: Structures based on tetrahedral oxoanions, structures based on octahedral and tetrahedral.

Inorganic pigments: Coloured pigments, white and black inorganic materials.

Molecular materials and fullerides: Fullerides, Molecular material chemistry.

Silicates: Structure, classification - silicates with discrete anions, silicates containing chain anion, silicates with layer structure, silicones with three dimensional net work and applications.

[16 HOURS]

UNIT – II

Nanomaterials, nanoscience and nanotechnology

Fundamentals-Terminology and history, novel optical properties of nanomaterials.

Characterization and fabrication: Characterization methods. Top-down and bottom-up fabrication. Solution based synthesis of nanoparticles. Vapour-phase synthesis of nanoparticles. Synthesis using frameworks, supports and substrates.

Artificially layered materials: Quantum wells and multiple quantum wells. Solid state superlattices. Artificially layered crystal structures.

Self-assembled nanostructures: Self-assembly and bottom-up fabrication. Supramolecular chemistry and morphosynthesis. Dimensional control in nanostructures.

Bioinorganic nanomaterials: DNA and nanomaterials. Natural and artificial nanomaterials-Biomimetics. Bionanocomposites.

Inorganic-organic nanocomposites: Uses and design strategies. Polymer nanocomposites.

[16 HOURS]

References:

1. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2006).
2. Inorganic Chemistry Principles of Structure and Reactivity: James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi, Delhi University, New Delhi (2006)
3. Chemistry of the Elements – N.N. Greenwood and A. Earnshaw, Pergamon Press (1985).
4. Industrial Inorganic Chemistry – 2nd edition. K.H. Buchel, H.H. Moretto and P. Woditsh, Wiley - VCH (2000).
5. Basic Inorganic Chemistry – 3rd edition. F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons (2002).
6. 6.Inorganic Chemistry, 3rd edition. James E. Huheey, Harper and Row Publishers (1983).
7. Inorganic Chemistry, 3rd edition. G.L. Miessler and D.A. Tarr, Pearson Education (2004).
8. Inorganic Chemistry, 2nd edition. C.E. Housecroft and A.G. Sharpe, Pearson Education.

Course Title: REACTION MECHANISMS
Course Code: CHA 520
Course Outcomes

CO1: Identify the reactivity of the molecules

CO2: Fate of the reaction by knowing the thermodynamic and kinetic requirements.

CO3: Identify the products, structure, and stability through mechanistic approach.

CO4: Mechanistic pathway of different reactions.

CO5: Know the nucleophilic, electrophilic and elimination reactions. Each of these will have different mechanistic route.

UNIT – I

Structure and reactivity: Brief discussion on effects of hydrogen bonding, resonance, inductive and hyperconjugation on strengths of acids and bases.

Methods of determining organic reaction mechanism: Thermodynamic and kinetic requirements for reactions, kinetic and thermodynamic control. Hammonds postulates and Curtin-Hammett principle.

Identification of products. Formation, structure, stability, detection and reactions of carbocations (classical and non-classical), carbanions, free radicals, carbenes, nitrenes, nitrile oxides, nitrile imines, nitrile ylides and arynes. Determination of reaction intermediates, isotope labeling and effects of cross over experiments. Kinetic and stereochemical evidence, solvent effect. Linear free energy relationship-Hammet equation and Taft treatment.

[16 HOURS]

UNIT – II

Basics of organic reactions: Meaning and importance of reaction mechanism, classification and examples for each class.

Aliphatic substitution reactions:

Nucleophilic substitution reactions: Kinetics, mechanism and stereochemical factors affecting the rate of $S_N1, S_N2, S_Ni, S_N1', S_N2'$ and S_Ni' reactions, Neighbouring group participation.

Electrophilic substitution reactions: S_E1 and S_E2 reactions

Aromatic substitution reactions:

Nucleophilic substitution reactions: S_N1, S_N2 and benzyne mechanism, Bucherer reaction.

Electrophilic substitution reactions: Mechanism of Friedel-Crafts alkylation and acylation, Mannich reaction, chloromethylation, Vilsmeier-Haack reaction.

Mechanism of hydrolysis of carboxylic acid derivatives: Hydrolysis of esters, amides and acid chlorides.

Elimination reactions: Mechanism and stereochemistry of eliminations - E_1, E_2, E_1cB. *cis* elimination, Hofmann and Saytzeff eliminations, competition between elimination and substitution, decarboxylation reactions. Chugaev reaction.

[16 HOURS]

References:

1. Organic Chemistry by Morrison and Boyd.
2. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mc Graw Hill, New York, 1987.
3. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II, 1984.
4. E.L. Eliel and S.H. Wilen, Stereochemistry of Organic Compounds, John Wiley and Sons, New York. 1994.
5. Basic Principles of Organic Chemistry by Roberts & Caserio
6. N.S. Issacs, Reactive Intermediates in Organic Chemistry, John Wiley and Sons, New York.1974.
7. R.K. Bansal, Organic Reaction Mechanism, Wiley Eastern Limited, New Delhi, 1993.
8. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
9. A Guide Book to Mechanism in Organic Chemistry by Petersykes
10. Stereochemistry and Mechanism through Solved Problems by P.S. Kalsi.
11. Text book of Organic Chemistry by P.S. Kalsi.
12. F.A. Carey and Sundberg, Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York, 1990.
13. S.K. Ghosh, Advanced General Organic Chemistry, Book and Alleied (P) Ltd, 1998.
14. Organic chemistry, Gram Solomons.

Course Title: SOLID STATE CHEMISTRY AND CHEMISTRY OF NANOMATERIALS
Course Code: CHA 530
Course Outcomes

After studying this course, the student to:

CO1: Learn solid state chemistry, X-ray crystallography, etc.

CO2: Learn the fundamentals of semiconductors, superconductors, nanomaterials and the methods by which nanoparticle is synthesized.

UNIT – I

Solid state chemistry: Types of imperfections, classification of imperfections, point defects, Schottky defects, Frenkel defects, disordered crystals, line defects, dislocation types, plane defects, small-angle and large-angle boundaries, stacking faults, crystal growth and twinning.

X-ray crystallography: law of interfacial angles, laws of symmetry, Miller indices, Bragg equation (no derivation), Experimental methods – powder and rotating crystal methods, indexing of powder and rotating crystal photographs. Atomic scattering factor, structure factor, Fourier synthesis and electron density diagrams. Electron diffraction of gases, experimental technique, Scattering-Intensity curves, Wierl equation (no derivation), Radial distribution method determination of bond lengths and bond angles. Heat capacity of solids: Einstein and Debye equations (with derivation).

[16 HOURS]

UNIT – II

Semiconductors: Band theory, energy bands, intrinsic and extrinsic semiconductors. Conductivity: electrons and holes, temperature dependence on conductivity, Optical properties: absorption spectrum, photoconductivity, photovoltaic effect and luminescence. Junction properties: metal-metal junctions, metal-semiconductor junctions, p-n junctions, transistors, industrial applications of semiconductors: Mixed oxides, spinels and other magnetic materials.

Superconductors: Meissner effect, type I and II super conductors, isotope effect, basic concepts of BCS theory, manifestations of the energy gap, Josephson devices.

Chemistry of nanomaterials: Nano particles. Synthesis - Laser abalation, chemical vapour transportor (CVT) and sol-gel methods. Metal oxides nanoparticles with supercritical water and precursor method. Synthesis of metal oxides and its composite nanoparticles by solvothermal and hydrothermal methods. Carbon nanotube, carbon nanowires and its composites. Applications of nanomaterials in renewable energy. Inorganic and organic nanoporous aerogels.

[16 HOURS]

References:

1. Solid State Chemistry and its Applications, Anthony R. West.
2. Solid State Chemistry: An Introduction, 3rd edition, Lesley E. Smart and Elaine A. Moore.
3. Introduction to Solid State Physics - C. Kittel, 5th edition, Wiley Eastern Ltd.

4. Advances in Technologically Important Crystals - Binay Kumar, R.P. Tandon, Mcmillan.
5. Hand Book of Nanotechnology, Bharat Bhushan, Springer Publisher.
6. Nanotechnology - Importance and Applications, M. H. Fulekar, Ink International publisher.

SECOND SEMESTER

THEORY – HARD CORE

Course Title: SEPARATION TECHNIQUES
Course Code: CHB 090
Course Outcomes:
After completion of this course, a student will be able to

COID	CO
51645	Learn the details of Solvent extraction, Extraction systems, Solid Phase Extraction, Chromatography.
51652	Learn the classification and characteristics of Gas chromatography, HPLC, Ion exchange, Size-exclusion chromatography.
51670	Learn in details with examples Thin layer, Affinity chromatography.
51682	Understand the details of Supercritical fluid exraction and Electrophoretic methods.

UNIT – I

Solvent extraction: Theory-Nernst partition law, efficiency and selectivity of extraction.

Extraction systems: Extraction of covalent neutral molecules, extraction of uncharged metal chelates and synergic extraction, extraction of ion-association complexes-non chelated complexes, chelated complexes and oxonium systems. Use of salting out agents.Methods of extraction-batch and continuous extractions.applications.

Solid Phase Extraction (SPE): Principles,apparatus and instrumentation. Solid phase sorbents, extraction formats - Automated solid phase extraction. Solid phase micro extraction (SPME).Applications of SPE and SPME.

Chromatography: Definition, principles and mechanism of separation, classification of chromatographic techniques. General descriptions of column chromatography-frontal analysis, displacement analysis and elution analysis. General theory of column chromatography: characterizing a chromatogram-retention time, retention volume and baseline width. Chromatographic resolution, capacity factor, column selectivity.Column efficiency-band

broadening-rate theory and plate theory.Peak capacity, non ideal behavior.Optimizing chromatographic separations using capacity factor, column selectivity and column efficiency-van Deemter equation, and its modern versions, Golay equation and Huber-Knox equations.

[16 HOURS]

UNIT – II

Gas chromatography (GC): Principles, instrumentation-mobile phase, chromatographic columns, stationary phases, sample introduction, temperature control, and detectors for gas chromatography. Quantitative and qualitative applications.

Highperformance liquid chromatography (HPLC): Principles, instrumentation- columns (analytical and guard columns), stationary phases, mobile phases, choosing a mobile phase, isocratic *vs*gradient elution, HPLC plumbing, sample introduction. Detectors for HPLC-spectroscopic, electrochemical and others, quantitative applications.

Ion exchange chromatography (IEC): Definitions, requirements for ion-exchange resin, synthesis and types of ion-exchange resins, principle, basic features of ion-exchange reactions, resin-properties-ion-exchange capacity, resin selectivity and factors affecting the selectivity, applications of IEC in preparative, purification and recovery processes.Ion chromatography (IC) : Double column IC and single column IC.

Size-exclusion chromatography: Theory and principle of size-exclusion chromatography, experimental techniques of gel-filtration chromatography (GFC) and gel-permeation chromatography (GPC), materials for packing-factors governing column efficiency, methodology and applications.

[16 HOURS]

UNIT – III

Thin layer chromatography: Principle, apparatus and methodology, applications, HPTLC

Affinity chromatography: Definitions, separation-mechanism-matrices, matrix activation, role of spacer arms and applications.

Supercritical fluid chromatography (SFC): Properties of supercritical fluids, instrumentation and operating variables, comparison of SFC with other types of chromatography, applications.

Supercritical fluid extraction: Advantages of supercritical fluid extraction, instrumentation, supercritical fluid choice, off-line and on-line extractions, typical applications of supercritical fluid extraction.

Electrophoretic methods - Electrophoresis & Capillary Electrophoresis**:** Theory-electrophoretic mobility, electroosmotic mobility, electroosmotic flow velocity, total mobility, migration time, efficiency, selectivity and resolution. Instrumentation-capillary tubes, hydrodynamic and electrokinetic methods of sample injection, applying electric field and detectors. Capillary

electrophoresis methods-capillary zone electrophoresis, micellarelectrokinetic capillary chromatography, capillary gel electrophoresis and capillary electrochromatography.

[16 HOURS]

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Introduction to Instrumental Analysis, Robert. D. Braun, Pharm. Med. Prem. India, 1987.
7. Instrumental Method of Analysis, W.M. Dean and Settle, 7th edition, 1986, CBS Publishers, New Delhi.
8. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva Books Pvt. Ltd., 2002.
9. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
10. Principles and Practice of Analytical Chemistry, F. W. Fifield and Kealey, 5th edition, 2000, Blackwell Sci., Ltd. Malden, USA.

Course Title: ADVANCED COORDINATION CHEMISTRY
Course Code: CHB 100
Course Outcomes:
After studying this course, the student to:

COID	CO
47143	Learn in depth Preparation of coordination compounds, Stability of coordination compounds, Geometries of metal complexes, Determination of stability constants, Crystal field theory.
47150	Understand in details with examples Molecular Orbital Theory, Electronic spectra and Magnetic properties.

47159	Learn in details with examples Reaction and Mechanisms, Substitution reactions.
47165	Identify in details with examples Inner-sphere mechanism and outer-sphere mechanism.

UNIT – I

Preparation of coordination compounds: Introduction, Preparative methods - simple addition reactions, substitution reactions, oxidation-reduction reactions, thermal dissociation reactions, reactions of coordinated ligands, the trans-effect & other methods.

Stability of coordination compounds: Introduction, trends in stepwise stability constants, factors influencing the stability of metal complexes with reference to the nature of metal ion and ligands, the Irving-William series, chelate effect.

Geometries of metal complexes: Coordination numbers 2-8.

Determination of stability constants: Theoretical aspects of determination of stability constants of metal complexes by spectrophotometric, *p*H metric and polarographic methods.

Crystal field theory: Salient features of CFT, d-orbital splitting in octahedral, tetrahedral, square planar and tetragonal complexes, Jahn-Teller distortions, measurement of 10 Dq and factors affecting it. Evidences for metal-ligand covalency.

[16 HOURS]

UNIT – II

Molecular Orbital Theory: Introduction, Principles of Molecular orbital theory, sigma and pi-bonds in MOT. Applications to Ligand filed theory. MOT to octahedral, tetrahedral and square planar complexes with and without pi-bonding.

Electronic spectra: Introduction, selection rules and intensities, electronic spectra of octahedral and tetrahedral complexes, Term symbols for d^n ions, Orgel and Tanabe-Sugano diagrams, charge-transfer spectra. Ligand-field transition, Optical rotatory dispersion and Circular dichroism.

Magnetic properities: Origin of magnetism, types of magnetism, Curie law, Curie Weiss law, magnetic susceptibility and its measurements. Spin and orbital contributions to the magnetic moment, the effects of temperature on μeff, spin-cross over, ferromagnetism, antiferromagnetism and ferrimagnetism.

[16 HOURS]

UNIT - III

Reaction and Mechanisms: Introduction

Substitution reactions - Inert and labile compounds, mechanisms of substitution.

Kinetic consequences of Reaction pathways - Dissociation, interchange and association. Experimental evidence in octahedral substitution - Dissociation, associative mechanisms, the conjugate base mechanism, the kinetic chelate effect.

Stereochemistry of reactions- Substitution in trans and its complexes, isomerization of chelate rings.

Substitution reactions of square-planar complexes - kinetics and stereochemistry of square-planar substitutions, evidence for associative reactions, explanations of the trans effect.

Electron-transfer processes: Inner-sphere mechanism and outer-sphere mechanism, conditions for high and low oxidation numbers.

[16 HOURS]

References

1. Physical Inorganic Chemistry - A Coordination Chemistry Approach- S.F.A. Kettle, Spektrum, Oxford, (1996).
2. Inorganic Chemistry - 2nd edition, C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd., (2005).
3. Inorganic Chemistry - 3rd edition, G.L. Miessler and D.A. Tarr, Pearson Education, (2004).
4. Inorganic Chemistry - 2nd edition, D.F. Shriver, P.W. Atkins and C.H. Langford, Oxford University Press, (1994).
5. Inorganic Chemistry- 3rd edition, James E. Huheey, Harper and Row Publishers, (1983).
6. Basic Inorganic Chemistry- 3rd edition, F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons, (2002).

Course Title: ORGANIC CHEMISTRY-II
Course Code: CHB 170
Course Outcomes:

After studying this course, the student to:

COID	CO
50609	Understand in depth Reductions and Oxidations
50614	Learn in depth Reagents in organic synthesis, Green Synthesis
50628	Understand in details with examples Photochemistry and concerted reactions,Electrocyclic reactions

50648	Learn the details of Cycloaddition reactions, dipolar cycloadditions, cycloaddition reactions, Sigmatropic reactions

UNIT – I

Reductions: Catalytic hydrogenations (homogeneous and heterogeneous) - catalysts, reduction of functional groups, catalytic hydrogen transfer reactions. Wilkinson catalyst. Baker's yeast, $LiAlH_4$, $NaBH_4$, metal dissolving reactions (Birch reduction). Leukart reaction (reductive amination), diborane, Meerwein-Ponndorf-Verley reduction, Wolf-Kishner reduction, Clemensen reduction, tributyl tinhydride, stannous chloride.

Oxidations: Oxidation with chromium and manganese compounds (CrO_3, $K_2Cr_2O_7$, PCC, PDC, Sarret reagent, Jones reagent, MnO_2, $KMnO_4$), ozone, peroxides and peracids, lead tetra acetate, periodic acid, OsO_4, SeO_2, NBS, chloramine-T, Sommelet oxidation, Oppenauer oxidation, Sharpless epoxidation, Woodward and Prevost hydroxylation. Electrochemical Oxidation and reduction of organic compounds, green oxidation agents.

[16 HOURS]

UNIT – II

Reagents in organic synthesis: Use of following reagents in organic synthesis and functional group transformations: Lithium disopropylamide (LDA), Gilmann reagent, dicyclohexyl carbodimide (DCC), dichloro dicyano quinone (DDQ), trialkyl silyl halides, phase transfer catalyst, crown ethers, Fenton's reagent, Ziegler-Natta catalyst, diazomethane, Stark enamine reaction, Phosphorus ylides – Wittig and related reactions, 1,3-dithiane anions - Umpolung reaction, sulphur ylides – reactions with aldehydes and ketones, Peterson reactions - synthesis of alkenes.

Green Synthesis: Designing of green synthesis, choice of reagents and catalysis. Microwave induced organic synthesis, ionic liquids in organic synthesis, polymer supported reagents and synthesis and the use of ultra sound in organic synthesis.

[16 HOURS]

UNIT – III

Photochemistry and concerted reactions: Introduction, light absorption and electronic transitions, Jablonski diagram, intersystem crossing, energy transfer, sensitizers, quenchers.

Photochemistry of olefins, conjugated dienes, aromatic compounds, ketones, enones, photooxidations, photoreductions, Norrish type I and II reactions, Paterno-Buchi reaction, Barton reaction, Di-pi-rearrangements.

Electrocyclic reactions: Stereochemistry, symmetry and Woodward-Hofmann rules for electrocyclic reactions, FMO theory of electrocyclic reactions, correlation diagram for cyclobutadiene and cyclohexadiene systems.

Cycloaddition reactions: Classification, analysis by FMO and correlation diagram method. **1,3-dipolar cycloadditions**: involving nitrile oxide, nitrile imine, nitrile ylide cycloaddition. Intra and intermolecular 3+2 cycloaddition and their application in organic synthesis. **[4+2] cycloaddition reactions**: Deils-Alder reacion, hetero Diels-Alder reaction and their applications.

Sigmatropic reactions: Classification, stereochemistry and mechanisms. suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties. [3,3] and [5,5]- sigmatropic rearrangement, Claisen, Cope and aza-Cope rearrangement

[16 HOURS]

References

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow Hill, New York, 1987.
2. Organic Chemistry - Morrison and Boyd
3. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. 1 & II, 1984.
4. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
5. E.S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 1964.
6. F.A. Carey and Sundberg. Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York. 1990.
7. Principles of Organic Synthesis - ROC Norman and Coxon
8. S.K. Ghosh, Advanced General Organic Chemistry, Book and Allied (P) Ltd. 1998.
9. R.K. Kar, Frontier orbital and symmetry controlled Pericyclic reaction.

Course Title: PHYSICAL CHEMISTRY-II
Course Code: CHB 120
Course Outcomes:
After studying this course, the student to:

COID	CO
50689	Learn in depth Quantum Chemistry

50698	Learn in details with examples Microwave and Vibration spectroscopy
50709	Understand in depth Raman and UV-Visible spectroscopy
50728	Learn the classification and characteristics of NQR, Mössbauer, ESR spectroscopy

UNIT – I

Quantum Chemistry: A brief resume of black body radiation, and atomic spectra-Bohr's theory of hydrogen atom. Photoelectric and Compton effects, de-Broglie concept, uncertainty principle, operators (algebra of operators, commutative and non-commutative operators, linear operator, Laplacian operator, Hermitian operator-Hamiltonian operator, turn over rule. Schrodinger wave equation for particles, Eigen values and Eigen functions, postulates of quantum mechanics. Application of Schrodinger equation to a free particle and to a particle trapped in a potential field (one dimension and three dimensions). Degeneracy, Wave equation for H-atom, separation and solution of R, ϕ and θ equations. Application of Schrodinger equation to rigid rotator and harmonic oscillator. Quantum numbers and their characteristics, orbital diagrams.

Approximate methods – Necessity of approximate methods, perturbation method, and the theory of perturbation method – first order and second order correction, application to He-atom (first order correction only).

[16 HOURS]

UNIT-II

Microwave spectroscopy: Rotation spectra of diatomic Molecules - rigid and non rigid rotator model. Rotational quantum number and the selection rule. Effect of isotopic substitution on rotation spectra. Relative intensities of the spectral lines. Classification of polyatomic molecules based on moment of inertia - Linear, symmetric top, asymmetric top and spherical molecules. Rotation spectra of polyatomic molecules (OCS,CH_3F and BCl_3). Moment of inertia expression for linear tri-atomic molecules. Applications - Principles of determination of Bond length and moment of inertia from rotational spectra. Stark effect in rotation spectra and determination of dipole moments.

Vibration spectroscopy: Vibration of diatomic molecules, vibrational energy curves for simple harmonic oscillator. Effects of anharmonic oscillation. Vibration - rotation spectra of carbon monoxide. Expressions for fundamental and overtone frequencies. Vibration of polyatomic molecules – The number of degrees of freedom of vibration. Parallel and perpendicular vibrations (CO_2 and H_2O). fundamental, overtone, combination and difference bands. Fermi resonance. Force constant and its significance. Theory of infrared absorption and theoretical group frequency. Intensity of absorption band and types of absorptions. Correlation chart. Important spectral regions - hydrogen stretching region, double and triple bonds regions, fingerprint region. Factors affecting the group frequency – Physical state, vibrational coupling,

electrical effect, hydrogen bonding, steric effect and ring strain. Applications: Structures of small molecules: XY_2 – linear or bent, XY_3 – planar or pyramidal.

[16 HOURS]

UNIT- III

Raman spectroscopy: Introduction, Raman and Rayleigh scattering, Stokes and anti-Stokes lines, polarization of Raman lines, depolarization factor, polarizability ellipsoid. Theories of Raman spectra - classical and quantum theory. Rotation-Raman and vibration-Raman spectra. Comparison of Raman and IR spectra, rule of mutual exclusion principle. Vibration modes of some simple molecules and their activity in Raman.

UV Visible spectroscopy: Quantitative aspects of absorption – Beer's law, Technology associated with absorption measurements. Limitations of the law – real, chemical, instrumental and personal.

NQR Spectroscopy: Quadrupolar nuclei, electric field gradient, nuclear quadrupole coupling constants, energies of quadrupolar transitions, effect of magnetic field. Applications.

Mössbauer spectroscopy: The Mössbauer effect, chemical isomer shifts, quadrupole interactions, measurement techniques and spectrum display, application to the study of Fe^{2+} and Fe^{3+} compounds, Sn^{2+} and Sn^{4+} compounds, nature of M-L bond, coordination number and structure), detection of oxidation states and inequivalent Mössbauer atoms.

Electron Spin Resonance Spectroscopy: Basic principles, hyperfine couplings, the 'g' values, factors affecting 'g' values, isotropic and anisotropic hyperfine coupling constants, Zero Field splitting and Kramer's degeneracy. Measurement techniques and Applications to simple inorganic and organic free radicals and to inorganic complexes.

[16 HOURS]

References

1. Vibrational Spectroscopy - Theory and Applications- D.N. Sathyanarayana, New Age International Publications, New Delhi (1996).
2. Spectroscopy, B.P. Straughan and S. Walker, John Wiley & Sons Inc., New York, Vol. 1 and 2, 1976.
3. Vibration Spectroscopy Theory and Applications, D.N. Satyanarayana, New Age International, New Delhi.
4. Spectroscopy, B.P. Straughan and S. Salker, John Wiley and Sons Inc., New York, Vol.2, 1976.

5. Organic Spectroscopy, William Kemp, English Language Book society, Macmillan, 1987.
6. Quantum Chemistry – A.K. Chandra. 2nd edition, Tata McGraw Hill Publishing Co. Ltd., (1983).
7. Quantum Chemistry – Eyring, Walter and Kimball. John Wiley and Sons, Inc., New York.
8. Quantum Chemistry – I.N. Levine. Pearson Education, New Delhi, (2000).
9. Theoretical Chemistry – S. Glasstone. East West Press, New Delhi, (1973).
10. Quantum Chemistry – R.K. Prasad, New Age International Publishers, (1996).
11. Valence Theory – Tedder, Murel and Kettle.
12. Quantum Chemistry – D.A. McQuarrie.
13. Theoretical Inorganic Chemistry – Day and Selbin.
14. Fundamentals of Molecular Spectroscopy, C.N. Banwell and E.M. McCash. 4th edition, Tata McGraw Hill, New Delhi.
15. Introduction to Spectroscopy - Pavia, Lampman and Kriz, 3rd edition, Thomson.
16. Spectroscopy, B.P. Straughan and S. Walker, John Wiley & Sons Inc., New York, Vol. 1 and 2, 1976.
17. Vibration Spectroscopy Theory and Applications, D.N. Satyanarayana, New Age International, New Delhi.
18. D. A. McQuarrie and J.D. Simon –Physical Chemistry, VIVA Students Ed. (2003).
19. J. D. Graybeat. Molecular Spectroscopy, McGraw-Hill International Edition (1988). Spectroscopy of Organic Compounds-3rd Ed.-P.S. Kalsi (New Age, New Delhi) 2000.
20. E.A.V. Ebsworth, D.W.H. Ranklin and S. Cradock: Structural Methods in Inorganic Chemistry, Blackwell Scientific, 1991.
21. J. A. Iggo: NMR Spectroscopy in Inorganic Chemistry, Oxford University Press, 1999.
22. C. N. R. Rao and J. R. Ferraro: Spectroscopy in Inorganic Chemistry, Vol I & II (Academic) 1970.
23. Spectroscopy, B. P. Straughan and S. Salker, John Wiley and Sons Inc., New Yourk, Vol.2, 1976.

PRACTICALS – HARD CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHB 130
Course Outcomes
After studying this course the student to:

COID	CO
CO1	Analyze various samples with different classical and simple instrumental skills.

CO2	Obtain knowledge for selection of analytical methods with suitable technique being adopted for the analysis different samples like, water, laboratory chemicals and reagents, body fluids such as urine etc.
CO3	Distinguish classical and instrumental methods.
CO4	Propose and conduct experiment for quantification of individual analytes.

[128 HOURS]

PART – I

1. Determination of total acidity of vinegar and wines by acid-base titration.
2. Determination of purity of a commercial boric acid sample, and Na_2CO_3 content of washing soda.
3. Determination of relative equivalent weight of a weak organic acid by titration with NaOH.
4. Determination of ephedrine and aspirin in their tablet preparations by residual acid-basetitrimetry.
5. Determination of carbonate and bicarbonate in a mixture by *p*H-metric titration and comparison with visual acid-base titration.
6. Determination of carbonate and hydroxide-analysis of a commercial washing soda by visual and *p*H-titrimetry.
7. Determination of purity of a commercial sample of mercuric oxide by acid-base titration.
8. Determination of benzoic acid in food products by titration with methanolic KOH in chloroform medium using thymol blue as indicator.
9. Determination of the *p*H of hair shampoos and *p*H determination of an unknown soda ash.
10. Analysis of water/ waste water for acidity by visual, *p*H metric and conductometric titrations.
11. Analysis of water/ waste water for alkalinity by visual, *p*H metric and conductometric titrations.
12. Determination of ammonia in house-hold cleaners by visual and conductometric titration.
13. Determination of chromate and dichromate in mixture by acid-base titration: visual and pH metric methods.
14. Potentiometric determination of the equivalent weight and Ka for a pure unknown weak acid.
15. Determination of purity of aniline by non-aqueous acid-base titration by visual and potentiometric methods.
16. Determination of purity of ethylene glycol and glycerol by oxidimetric method using periodate (Malprade reaction).
17. Spectrophotometric determination of creatinine and phosphorus in urine.

18. Flame emission spectrometric determination of sodium, potassium and calcium in river/ lake water.

PART – II

1. Determination of percentage of chloride in a sample by precipitation titration- Mohr, Volhard and Fajan's methods.
2. Determination of silver in an alloy and Na_2CO_3 in soda ash by Volhard method.
3. Mercurimetric determination of chloride in blood or urine.
4. Determination of total hardness, calcium and magnesium hardness and carbonate and bicarbonate hardness of water by complexation titration using EDTA.
5. Determination of calcium in calcium gluconate/ calcium carbonate tablets/ injections and of calcium in milk powder by EDTA titration.
6. Determination of zinc in a sample of foot powder and thallium in a sample of rodenticide by EDTA titration.
7. Analysis of commercial hypochlorite and peroxide solution by iodometric titration.
8. Determination of copper in an ore/ an alloy by iodometry and tin in stibnite by iodimetry.
9. Determination of ascorbic acid in vitamin C tablets by titrations with $KBrO_3$ and of vitamin C in citrus fruit juice by iodimetric titration.
10. Determination of iron in razor blade by visual and potentiometric titration using sodium metavanadate.
11. Determination of iron in pharmaceuticals by visual and potentiometric titration using cerium(IV) sulphate.
12. Determination of nickel in steel by synergic extraction and boron in river water/ sewage using ferroin.
13. Determination of total cation concentration of tap water by ion-exchange chromatography.
14. Determination of magnesium in milk of magnesium tablets by ion-exchange chromatography.
15. Cation exchange chromatographic separation of cadmium and zinc and their estimation by EDTA titration.
16. Gas chromatographic determination of ethanol in beverages.
17. Solvent extraction of zinc and its spectrophotometric determination.
18. Anion exchange chromatographic separation of zinc and magnesium followed by EDTA titration of the metals.
19. Separation and determination of chloride and bromide on an anion exchanger.
20. Separation of *o*- and *p*-nitroaniline and analysis by thin layer chromatography.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003, Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. Bothers Medical Publishers (P) Ltd., 1995.
7. Laboratory manual in biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
8. Practical Clinical Biochemistry by Harold Varley and Arnold.Heinmann, 4th edition.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHB 140
Course Outcomes

After studying this course the student to:

COID	CO
CO1	Prepare reagents required for analysis.
CO2	Propose and conduct experiment for quantitative analysis of inorganic samples such as ore, metals, complexes mixture of metals and complexes etc.
CO3	Propose schemes for semi-micro qualitative analysis.
CO4	Develop skills for the scientific and relevant documentation and risk and security assessment.

[128 HOURS]

PART – I

1. Determination of iron in haematite using cerium(IV) solution (0.02M) as the titrant, and gravimetric estimation of insoluble residue.
2. Estimation of calcium and magnesium carbonates in dolomite using EDTA titration, and gravimetric analysis of insoluble residue.

3. Determination of manganese dioxide in pyrolusite using permanganate titration.
4. Quantitative analysis of copper-nickel in alloy/ mixture:
    a) Copper volumetrically using KIO_3.
    b) Nickel gravimetrically using DMG
5. Determination of lead and tin in a mixture: Analysis of solder using EDTA titration.
6. Quantitative analysis of chloride and iodide in a mixture:
    a) Iodide volumetrically using KIO_3
    b) Total halide gravimetrically
7. Gravimetric analysis of molybdenum with 8-hydroxyquinoline.
8. Micro-titrimetric estimation of :
    a) Iron using cerium(IV)
    b) Calcium and magnesium using EDTA
9. Quantitative estimation of copper(II), calcium(II) and chloride in a mixture.
10. Circular paper chromatographic separation of: (Demonstration)
    a) Iron and nickel
    b) Copper and nickel

PART – II

Semimicro qualitative analysis of mixtures containing **TWO** anions and **TWO** cations (excluding sodium, potassium and ammonium cations) and **ONE** of the following less common cations: W, Mo, Ce, Th, Ti, Zr, V, U and Li.

References

1. Vogel's Text Book of Quantitative Chemical Analysis – 5th edition, J. Basset, R.C. Denney, G.H. Jeffery and J. Mendhom.
2. A Text Book of Quantitative Inorganic Analysis by A.I. Vogel, 3rd edition.
3. Spectrophotometric Determination of Elements by Z. Marczenko.
4. Vogel's Qualitative Inorganic Analysis – Svelha.
5. Macro and Semimicro Inorganic Qualitative Analysis by A.I. Vogel.
6. Semimicro Qualitative Analysis by F.J. Welcher and R.B. Halin.
7. Quantitative Chemical Analysis by Daniel C. Harris, 7th edition, (2006).

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHB 150
Course Outcomes
After studying this course, the student to:

COID	CO
CO1	Prepare several simple organic compounds and also propose suitable mechanisms.
CO2	Acquire knowledge of different reactions, conditions to be maintained, precautions to be exercised before/during/after the reaction.
CO3	Learn qualitative analysis and to separate a mixture of two components.
CO4	Gain confidence to set up reactions individually either in the pharma industry or for the Research.

[128 HOURS]

PART – I

1. Preparation of *p*-nitro aniline from acetanilide.
2. Preparation of *p*-bromo aniline from acetanilide.
3. Preparation of benzoic acid from benzaldehyde
4. Preparation of n-butyl bromide from n-butanol.
5. Preparation of *p*-nitroiodobenzene from paranitroaniline.
6. Preparation of aniline from nitrobenzene.
7. Preparation of ß-*D*-Glucose penta acetate.
8. Preparation of phenoxy acetic acid.
9. Preparation of cyclohexanone from cyclohexanol.
10. Preparation of chalcone.
11. Preparation of *S*-benzylthiuronium chloride.
12. Condensation of anthracene and maleic anhydride (Diels-Alder reaction).
13. Preparation of *m*-nitrobenzoic acid from methyl benzoate.

PART – II

Qualitative analysis: Separation of binary mixtures, identification of functional groups and preparation of suitable solid derivatives.

References

1. Manual of Organic Chemistry -Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry -Robert, Wingrove etc.

4. A Text Book of Practical Organic Chemistry–A.I. Vogel, Vol.III.

5. Practical Organic Chemistry, Mann & Saunders.

6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet.

7. J. N. Guthru & R. Kapoor, Advance experimental Chemistry, New Delhi-1991.

8. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PGE International (P) LTd. London, 3rd edition. 1996.18

10. N. K. Visno, Practical Organic Chemistry, New PGE International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICAL CHEMISTRY PRACTICALS
Course Code: CHB 160
Course Outcomes

After studying this course, the student to:

COID	CO
CO1	An idea about handling of instruments like UV-Visible Spectrophotometer, Potentiometer, pH meter, etc.
CO2	Determine the concentration of the species in given solutions using kinetic methods.
CO3	Distinguish between different physical properties of substances or compounds.
CO4	Acquire knowledge of different thermodynamic parameters.

[128 HOURS]

PART – I (Non-instrumental)

1. Study of kinetics of hydrolysis of an ester using HCl/ H_2SO_4 at two different temperature, determination of rate constants and energy of activation.
2. Study of kinetics of the iodine-hydrogen peroxide clock reaction.
3. Determination of activation energy for the bromide-bromate reaction.
4. Determination of heat of solution of benzoic acid by variable temperature method (graphical method).
5. Determination of partial molar volume of NaCl-H_2O system.
6. Determination of critical solution temperature of phenol-water system.
7. Binary analysis of two miscible liquids by viscometric method (Ethanol & Water).
8. To study oscillating or periodic or rhythmic reactions of malonic acid.
9. Thermometric titration of hydrochloric acid with NaOH.

10. Kinetics of photodegradation of indigocarmime(IC) using ZnO as photocatalyst and study the effect of [ZnO] and [IC] on the rate of photodegradation.

PART – II (Instrumental)

1. Conductometric titration of a mixture of HCl and CH_3COOH against NaOH.
2. Conductometric titration of orthophosphoric acid /formic acid/ oxalic acid against NaOH and NH_4OH.
3. Determination of PI of glycine by by potentiometric method.
4. Potentiometric titration of KI vs $KMnO_4$ solution.
5. pH Titration of (a) polybasic acid(H_3PO_4), (b) (CH_3COOH+HCl) and (c) $CuSO_4$*vs*NaOH and determination of K_a.
6. To obtain the absorption spectra of colored complexes, verification of Beer's law and estimation of Ni^{+2} ions from $[Ni(NH_3)_6]^{2+}$ by spectrophotometry.
7. Analysis of binary mixture (Glycerol and Water) by the measurement of refractive index.
8. Study the kinetics of reaction between CAT and indigo carmine spectrophotometrically and determination of rate constant.
9. Spectrophotometric titration of $FeSO_4$ against $KMnO_4$.
10. Determination of the molecular weight of a polymer material by viscosity measurements (cellulose acetate/methyl acrylate).

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – R.C. Das and B. Behera, Tata Mc Graw Hill.

THEORY – SOFT CORE

All the courses are same as that of I Semester and a student can chose any course of his/ her choice provided that the same course has not been studied in the I Semester.

THIRD SEMESTER

THEORY – HARD CORE

Course Title: INSTRUMENTAL METHODS OF ANALYSIS
Course Code: CHC 030
Course Outcomes:
After studying this course, the student to:

COID	CO
48402	Learn the details of Electro analytical methods, Electrogravimetric analysis, Coulometric and Amperometric, Voltammetry.
48415	Understand in details with examples Thermal method of analysis, Thermogravimetric analysis, Differential thermal analysis and Differential scanning calorimetry.
48422	Learn in details with examples Enthalpimetric analysis, Microscopic analysis.

UNIT – I

Flame photometry and Atomic absorption spectrometry: Energy level diagrams-atomic absorption spectra. Flame characteristics. Flame atomizers and electrothermal atomization.Comparison of spectral interferences, chemical and physical interferences in FP and AAS. Background correction methods in AAS.Use of organic solvents. Quantitative techniques-calibration curve procedure and the standard addition technique. Typical commercial instruments for FP and AAS (Single and double beam atomic absorption spectrophotometers), applications of FES and AAS.Qualitative analysis and quantitative evaluations. Relative detectabilities of atomic absorption and flame emission spectrometry.

Molecular luminescence spectrometry: Theoretical basis for fluorescence and phosphorescence. Singlet and triplet excited states. Variables affecting luminescence-quantum efficiency, transition types, structure and structural rigidity, temperature and solvent effects, effect of *p*H, dissolved oxygen and concentration effect. Excitation spectra *vs* emission spectra.Origin of fluorescence, relationship between fluorescence and concentration.Fluorescence instrumentation-fluorometers and spectrofluorometers.Sensitivity and selectivity.Modification necessary to measure phosphorescence.Applications of fluorometry: inorganic and organic analyses.

Nephelometry and turbidometry: Principles, instrumentation and applications.

[16 HOURS]

UNIT – II

Electroanalytical methods: Classification. Potentiometers, galvanostats and potentiostats. Potentiometric methods of analysis.Potentiometric electrochemical cells.The Nernst equation.Liquid junction potentials.Reference electrodes-SHE, calomel electrode and silver/ silver chloride electrode.Metallic indicator electrodes-electrodes of first kind and second kind.Redox electrodes.Membrane electodes –membrane potential, selectivity of membranes.Glass ion selective electrodes.Crystalline solid state ion selective electrodes.Liquid-based ion selective electrodes.Gas sensing electrodes.Potentiometric biosensors.Quantitative applications.Activity *vs* concentration.Quantitative analysis using external standards and the method of standard additions. Measurement of*p*H. Clinical and environmental applications.

Electrogravimetric analysis: Theory, apparatus, cell processes, deposition and separation, electrolytic separation of metals, applications.

Coulometric methods of analysis: General discussion, coulometry at controlled potential, apparatus and general technique, applications,coulometric titrations (amperometriccoulometric)-principles, apparatus, comparison of coulometric titrations with conventional titrations, automatic coulometric titrations, applications.

Amperometric titrations: Principle, titration curve, apparatus and techniques, applications.

Voltammetry: Fundamentals of voltammetry. Cyclic voltammetry**:** Principles and applications. Stripping analysis:Stripping voltammetry-basic principles, electrodes used for stripping analysis, apparatus for stripping analysis, applications, determination of lead in water voltammetry with micro electrodes.

[16 HOURS]

UNIT – III

Thermal method of analysis: Introduction,

Thermogravimetric analysis (TGA): Types of thermogravimetric analysis, principles and general thermal decomposition curve. Factors affecting the results-heating rate, furnace, instrument control/ data handling. Applications-purity and thermal stability, evaluation of correct drying temperature, analysis of complex mixture and determination of kinetic parameters of thermal degradation.

Differential thermal analysis (DTA): General principles. Theory-variables affecting the DTA curves. Instrumentation. Applications-analysis of the physical mixtures and thermal behaviour study. Determination of melting point, boiling point and decomposition point.

Differential scanning calorimetry (DSC): Basic principle. Instrumentation-power compensated DSC, Heat flux DSC. Applications- studies of thermal transitions and isothermal crystallization. Testing the purity of the pharmaceutical samples.

Thermomechanical analysis.Dynamic mechanical analysis**.**

Enthalpimetric analysis: Thermometric titrations and direct injection enthalpimetry: Principles, apparatus and applications.

Microscopic analysis: Principle and mechanism in characterization of compounds by scanning electron and transmission electron microscopic (SEM & TEM) techniques.Components of instruments of SEM and TEM.

[16 HOURS]

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean,7th Edition, CBS Publishers, New Delhi, 1988.
7. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva Books Pvt. Ltd., New Delhi, 2002.
11. Analytical Transmission Electron Microscopy, An Introduction for OperatorsThomas, Jürgen, Gemming, Thomas., Springer, 2014.
12. Scanning Transmission Electron Microscopy, Imaging and Analysis.Pennycook, Stephen J., Nellist, Peter D. (Eds.), Springer, 2011.

Course Title: SPECTROSCOPY
Course Code: CHC 040
Course Outcomes:
After studying this course, the student to:

COID	CO
51691	Understand in details with examples UV-Visible and IR spectroscopy.
51705	Understand in depth Nuclear magnetic resonance spectroscopy, Chemical shift.
51710	Learn the characteristics of 13C-NMR spectroscopy.
51714	Understand the details of Mass spectroscopy and problems.

UNIT – I

UV Visible spectroscopy: Introduction, electronic transitions, simple chromophoric groups - systems of extended conjugation - aromatic systems - types of auxochromes - Functions of auxochromes - absorption and intesity shift - types of trasitions - transition probability - types of absorption bonds - solvent effects and choice of solvent - effect of polarity on various type of bonds Woodwards empirical rules for predicting the wavelength of maximum absorption for conjugated dienes, cyclic trienes and polyenes, α,ß-unsaturated aldehydes and ketones, benzene and substituted benzene rings.

IR spectroscopy: Introduction, instrumentation, sample handling, modes of vibrations, Hooks law, Characteristic group frequencies and skeletal frequencies. Finger print region, Identification of functional groups - alkenes, aromatics, cabonyl compounds (aldehydes and ketones, esters and lactones), halogen compounds, sulphur and phosphorus compounds, amides, lactums, amino acids and amines. Factors affecting group frequencies and band shapes, conjugation, resonance and inductance, hydrogen bonding and ring strain. Tautomerism, *Cis-trans* isomerism. Applications of IR spectroscopy.

[16 HOURS]

UNIT – II

Nuclear magnetic resonance spectroscopy: General introduction and definition, magnetic properties of nuclei (magnetic moment, g factor) and theory of nuclear resonance. Larmor precession frequency, resonance condition and relaxation processes.

Chemical shift: Standards employed in NMR, factors affecting chemical shift, electronegativity, shielding and deshielding mechanism, van der Waals deshielding, H-bonding, diamagnetic and paramagnetic anisotropics. Spin-spin coupling, chemical shift values and correlation for protons bonded to carbon and other nuclei. Instrumentation and sample handling.

Equivalence and magnetic equivalence proton exchange reactions, effects of chiral center, complex spin-spin interaction, stereochemistry, hindered rotation, Karplus curve - variation of coupling constants with dihedral angles. Simplification of complex spectra: isotopic substitution, increasing magnetic field strength, double resonance, spin decoupling, contact shift reagents, FT-NMR: Principle and applications, variable temperature profile, Nuclear Overhauser Effect (NOE).

[16 HOURS]

UNIT – III

^{13}C-NMR spectroscopy: Comparison of ^{1}H-NMR and ^{13}C-NMR. Multiplicity - proton decoupling, noise decoupling, off resonance decoupling, selective proton decoupling, noise decoupling by FT mode, chemical shift, application of ^{13}C-NMR. ^{31}P & ^{19}F, Two dimensional NMR.

Mass spectroscopy: Principles, instrumentation, different methods of ionization. EI, CI, FD and FAB, Ion separators - single focusing separator with magnetic deflection, double focusing analyzer, time-of-fight separator and quadrupole analyzer, Mass spectra – molecular ion, base peak, meta-stable peak. General rules for fragmentation pattern. Nitrogen rule, ortho effect, Hydrogen transfer rearrangement and McLafferty rearrangement. Mass spectral fragmentation of organic compounds (acids, esters, hydrocarbons, halogenated hydrocarbons, alcohols, carbonyl compounds, amines, ethers and heterocyclic compounds).

Composite problems: Problems involving the application of the above spectroscopic techniques for structural elucidation of organic molecules.

[16 HOURS]

References:

1. Spectroscopy, B.P. Straughan and S. Salker, John Wiley and Sons Inc., New York, Vol.2, 1976.
2. Organic Spectroscopy, William Kemp, English Language Book society, Macmillan, 1987.
3. Application of Absorption Spectroscopy of Organic Compounds, John R. Dyer, Prentice Hall of India Private Ltd., New Delhi, 1974.
4. Spectrometric Identification of Organic Compounds, 4th edition, Robert M. Silverstein, G. Clayton Bassler and Terence C. Morrill, John Wiley & Sons, New York, 1981.
5. Organic Spectroscopy, V.R. Dani, Tata MeGraw-Hall Publishing Company Limited, New Delhi. 1995.
6. Interpretation of Carbon-13 NMR Spectra, F.W. Wehrli and T. Wirthin, Heyden, London, 1976.
7. NMR spectroscopy – Powai.
8. Introduction to spectroscopy 3^{ed}, Pavia, Lampman, Kriz.

THEORY – OPEN ELECTIVE

Course Title: SELECTED TOPICS IN CHEMISTRY
Course Code: CHC 600
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Gain knowledge on importance of chemistry or different branches of chemistry.
CO2	Acquire knowledge about the use of chemistry in everyday life.
CO3	Get knowledge about the extraction and purification techniques.
CO4	Learn importance of metals in biology; natural products and also various physical aspects.

UNIT – I

Solvent extraction: Basics of solvent extraction principal and application of solvent extraction.

Purification techniques: Crystallization, fractional crystallization, distillation techniques (simple distillation, steam distillation, distillation under reduced pressure, fractional distillation).

Chromatography: Definition, terms, classification of chromatographic techniques, principles of column and planar chromatography

Column chromatography: gas chromatography, high performance liquid chromatography, ion exchange chromatographic method.

Planar chromatography: Paper chromatography and TLC principles, mechanism of separation and application.

Electrophoretic methods: principles, definition, terms, types and applications.

[16 HOURS]

UNIT – II

An overview of metals in Biology: Introduction, the element content of living systems, biological chemistry of hydrogen, the economical use of resources- abundance and availability. Biological need for and the behaviors of inorganic elements.

Basic coordination chemistry for biologists: Introduction, ionic bonding, covalent bonding, coordination geometry, crystal field and ligand field theory.

Metal assimilation pathways: Introduction, metal assimilation in bacteria, plants, fungi and in mammals (iron, copper and zinc).

Metals in medicine: Introduction, *cis*-platin, radioactive pharmaceuticals, lithium compounds in therapy.

[16 HOURS]

UNIT – III

Chemistry of natural products: Carbohydrates (classification and structure of glucose, fructose, galactose, sucrose, maltose and lactose, carbohydrates as source of energy and breakdown process.

Proteins: amino acids classification and structure of α-amino acid, zwitter ion, isoelectric point and its determination by electrophoretic method, Elementary aspect of primary and secondary structures.

Vitamins: Classification, importance of vitamin A, D, E, K, B & C.

[16 HOURS]

UNIT – IV

Thermodynamics: First and second laws of thermodynamics. Concept of entropy and free energy, entropy as a measure of unavailable energy. Entropy and free energy changes and spontaneity of process. Variation of free energy with temperature and pressure. **Chemical kinetics**: Factor affecting the rate of reaction. Order of reaction and its determination. Energy of activation and its determination. Assumption of activated complex theory. **Electrochemistry:** Arrhenius theory of strong and weak electrolytes. Assumptions of Debye-Huckel theory of strong electrolytes. Electrode potential and construction of electrochemical cells. Corrosion and its prevention. **Photochemistry:** Laws of photochemistry, quantum yield and its determination, photodegradation.

[16 HOURS]

References:

1. Arthur I Vogel, Elementary Practical Organic Chemistry, Part I, II and III, CBS Publishers and Distributors, New Delhi, India.
2. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. I and II, 1984.
3. S K. Ghosh, Advanced General Organic Chemistry, Book and Allied (P) Ltd, 1998.
4. Organic Spectroscopy, William Kemp, English Language Book society, Macmillan, 1987.
5. Application of Absorption Spectroscopy of Organic Compounds, John R. Dyer, Prentice Hall of India Private Ltd., New Delhi, 1974.

6. Spectrometric Identification of Organic Compounds, 4th edition, Robert M. Silverstein, G. Clayton Bassler and Terence C. Morrill, John Wiley & Sons, New York, 1981.
7. Basic Inorganic Chemistry- 3rd edition, F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons, (2002).
8. Inorganic Chemistry Principles of Structure and Reactivity: James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi, Delhi University, New Delhi (2006)
9. Elements of Physical Chemistry – Lewis and Glasstone.
10. Physical Chemistry by P.W. Atkins, ELBS, 4th edition, Oxford University Press (1990).
11. Basic Physical Chemistry by W.J. Moore, Prentice Hall, New Delhi, (1986).
12. Physical Chemistry – G.M. Barrow, McGraw Hill International Service (1988).

THEORY – SOFT CORE

Course Title: INORGANIC CHEMISTRY-II
Course Code: CHC 500
Course Outcomes:
After studying this course, the student to:
CO1: Gain knowledge from basic concepts of ionic solids, modern concept of acids and bases.
CO2: Demonstrate and understand the basic principles of acid-base chemistry and nonaqueous solvents.
CO3: Acquire knowledge to handle homogeneous and heterogeneous catalysis.

UNIT – I

Ionic solids: Introduction, Characteristic structures of ionic solids (NaCl, CsCl, ZnS, fluorite, rutile, β-crystobalite and cadmium iodide). The rationalization of structures.

The energetics of ionic bonding: Lattice enthalpy and Born-Haber cycle. Calculation of lattice enthalpies. Comparison of experimental and theoretical values of lattice enthalpy. The Kapustinskii equation. Consequences of lattice enthalpies.

Modern concept of acids and bases: Lux-Flood and Usanovich concepts, solvent system and leveling effect. Hard-Soft Acids and Bases, Classification and Theoretical backgrounds.

Supercritical fluids: Properties of supercritical fluids and their uses as solvents. Supercritical fluids as media for inorganic chemistry.

[16 HOURS]

UNIT – II

Biological and Medicinal Applications: Organomercury, boron, silicon and aresenic compounds.

Catalysis: General principles-The language of catalysis. Homogeneous and heterogeneous catalysts.

Homogeneous catalysis: Alkene hydrogenation, hydroformylation, The Wacker's process, Monsanto acetic acid process and L-DOPA synthesis, alkene oligomerizations, water-gas shift reactions. Palladium catalysed C-C bond forming reactions.

Heterogeneous catalysis: Alkene polymerization: Ziegler-Natta catalysis, Fischer-Tropsch carbon chain growth.

Zeolites as catalysts for organic transformation: Uses of ZSM - 5

Alkene metathesis, hydroboration, arylation or vinylation of olefins (Heck reaction).

Hybrid catalysts: Tethered catalysis. Biphasic systems.

Hydrosilylation: Platinum catalyst, Asymmetric palladium catalyst, Rhodium catalysts for asymmetric ketone reduction.

Asymmetric catalysis: General features of chiral ligands and complexes; mechanisms and catalytic cycles in hydrogenation, isomerization, epoxidation and catalytic reactions of C-C bond formation.

[16 HOURS]

References:

1. Basic Organometallic Chemistry - B.D. Gupta and A.J. Elias, Universities Press (2010).
2. Organometallics - A Concise Introdution, 2nd edition, Chistoph Elschenbroich and Albert salzer VCH, (1992).
3. Inorganic Chemistry, 2nd edition, C.E. Housecroft and A.G. Sharpe, Pearson Education Ltd., (2005).
4. Inorganic Chemistry- 3rd edition, G.L. Miessler and D.A. Tarr, Pearson Education, (2004).
5. Inorganic Chemistry, 4th edition. P. Atkins, T. Overton, J. Rourke, M. Weller and F. Armstrong, Oxford University Press (2004).

Course Title: STRUCTURAL METHODS IN INORGANIC CHEMISTRY

Course Code: CHC 510

Course Outcomes:

After studying this course, the student to:

CO1: Gain knowledge from basic concepts of instrumentation.

CO2: Demonstrate and understand basic principles of spectroscopic techniques.

CO3: Acquire knowledge about applications of spectroscopic techniques.

UNIT – I

NMR spectroscopy: Basic principles, chemical shift and factors affecting it, coupling constants. ^{19}F, ^{31}P, ^{11}B - NMR and NMR of paramagnetic complexes. Double resonance technique, The Nuclear Overhauser Effect, Magnetic susceptibility measurements by Evan's method. NMR to solids.

ESR spectroscopy: Theory, presentation of the spectrum, hyperfine coupling, the g value and factors affecting the magnitude of the g value. Zero-field splitting and Kramers' degeneracy. Application to simple inorganic and organic free radicals and to metal complexes.

NQR spectroscopy: Theory, energies of the quadrapole transitions, instrumentation, effect of magnetic field on the spectra, relationship between electric field gradient and molecular structures. Applications - interpretation of e^2Qq data, structural information from NQR data.

[16 HOURS]

UNIT – II

Vibrational spectroscopy: Introduction, theory of infrared absorption, theoretical group frequencies, correlation chart. Applications to coordination compounds - aquo, amine, urea, DMSO, *cis* and *trans* metal complexes. Change in spectra accompanying change in symmetry upon coordination (nitrite, sulphate, nitrate, perchlorate and carbonate)

Mossbauer spectroscopy: Theoretical basis, interpretation of Mossbauer spectra - isomer shift, quadrupole splitting and magnetic hyperfine structures. Application: $I_2Br_2Cl_4$, $Fe_3(CO)_{12}$, Prussian blue, nitroprusside, hexacyanoferrate.

Photoelectron spectroscopy: Introduction, principles, chemical shifts, photoelectron spectra of simple molecules, X-ray photoelectron and Auger electron spectroscopy. Applications.

Mass spectrometry: Theory, experimental techniques, molecular ions, fragmentation and ion reaction, Applications to coordination compounds.

[16 HOURS]

References:

1. Electronic Absorption Spectroscopy and Related Techniques – D.N. Sathyanarayana, Universities Press (2001).
2. Structural Methods in Inorganic Chemistry – E.A.V. Ebsworth, D.W.H. Ranklin and Cradock, Blackwell Scientific Publications (1988).
3. Physical Methods in Inorganic Chemistry – R.S. Drago, Saunders Publishers (1966).

Course Title: BIOPHYSICAL CHEMISTRY AND POLYMERS
Course Code: CHC 520

Course Outcomes:

After studying this course, the student to:

CO1: Learn electrophoresis, kinetics of polymerization, phase transition in polymer, polymers in solutions.

CO2: Distinguish different types of electrophoresis like free electrophoresis, zone electrophoresis, gel electrophoresis.

UNIT – I

Electrokinetic phenomena: Electrophoresis - principles of free electrophoresis, zone electrophoresis, gel electrophoresis and its applications in qualitative and quantitative study of proteins. Determination of isoelectric point of a protein. Electroosmosis and streaming potential and its biological significance. Biological significance of Donnan membrane phenomenon. Micelles and its involvement during digestion and absorption of dietary lipids. Diffusion of solutes across biomembranes and its application in the mechanism of respiratory exchange. "Salting In" and "Salting Out" of proteins. Osmotic behaviour of cells and osmo-regulation and its application in the evolution of excretory systems of organisms. Effect of temperature and *p*H on the viscosity of biomolecules (albumin solution). Significance of viscosity in biological systems - mechanism of muscle contraction, detection of intrastrand disulfide bonds in proteins, polymerization of DNA and nature of blood flow through different vessels. Effect of temperature, solute concentration (amino acids) on surface tension. Biological significance of surface tension - stability of Alveoli in lungs, interfacial tension in living cells (Danielli and Davson model). Application of sedimentation velocity and sedimentation equilibrium method for molecular weight determination of proteins.

[16 HOURS]

UNIT – II

Polymers: Fundamentals of polymers - monomers, repeat units, degree of polymerization. Linear, branched and network polymers. Classification of polymers. Polymerization - condensation, addition, free radical, ionic, co-ordination polymerization and ring opening polymerization. Molecular weight and size. Polydispersion. Average molecular weight concepts – number, weight and viscosity average molecular weight. Determination of molecular weights - viscosity method, osmotic pressure method, sedimentation and light scattering method.

Kinetics of Polymerization - condensation, addition, free radical, ionic, co-ordination polymerization. Kinetics of copolymerisation and polymer degradation.

Phase transitions in polymers and thermal characterization: Glass transition, crystallinity and melting- correlation with the polymer structure.

Polymers in solution: Criteria of polymer solubility. Thermodynamics of polymer solutions.

[16 HOURS]

References

1. Introduction to Physical Organic Chemistry, R.D. Gilliom, Madison – Wesley, USA (1970).
2. Physical Organic Chemistry, Reaction Rate and Equilibrium Mechanism – L.P. Hammett, McGraw HillBook, Co., (1970).
3. Biophysical Chemistry, Principle and Technique – A. Upadhyay, K. Upadhyay and N. Nath, Himalaya Publishing House, Bombay, (1998).
4. Essentials of Physical Chemistry and Pharmacy – H. J. Arnikar, S. S. Kadam, K.N. Gujan, Orient Longman, Bombay, (1992).
5. Text book of polymer Science. F.W. Billmeyer, Jr., John Wiley. London (1994).
6. Polymer Science. V. R. Gowrikar, N. V. Vishwanathan and J. Sreedhar, Wiley Eastern, New Delhi (1990).
7. Fundamentals of Polymer Science and Engineering. A. Kumar and S.K. Gupta, Tata – McGraw Hill New Delhi (1978).
8. Polymer Characterization, D. Campbell and J. R. White, Chapman and Hall, New York.

Course Title: APPLICATIONS OF CHEMICAL KINETICS AND QUANTUM CHEMISTRY

Course Code: CHC 530

Course Outcomes:

After studying this course, the student to:

CO1: Understand the fundamentals of polymers, degree of polymerization and classification of polymers.

CO2: Acquire knowledge on different methods for the classification of compounds based on their molecular weights.

CO3: Develop knowledge on different methods for the classification of homogeneous catalysis.

UNIT - I

Homogenous catalysis: Acid-base catalysis, specific acid and base catalysis. General acid and base catalysis. Oxidation of amino acids and carbohydrates in presence of acid and base catalysis. Acidity functions - Bronstead, Hückel, Hammett and Bunnett hypothesis.

Chain reactions: Rice-Herzfeld mechanism for the thermal decomposition of acetaldehyde, Kinetics of explosive reactions, explosion limits (H_2 and O_2 reaction). Kinetics of autocatalytic and oscillatory chemical reactions, oscillatory chemical reaction of oxidation of malic acid by bromate ion catalyzed by Ce(III). Catalyzed and uncatalyzed reaction: Ru(III) catalyzed oxidation reaction of primary amines by chloramine – T in HCl medium.

[16 HOURS]

UNIT – II

Applications of quantum chemistry: Variation theorem- statement and proof. Application of variation method to He atom, the structure of many electron systems/ atoms (secular equations & determinants), Spin-orbit interaction, antisymmetry and Pauli exclusion principle. Angular momenta (commutations, relations, operators), Term symbols, Russell-Saunders terms and coupling schemes, Slater orbitals and SCF method for many electron systems.

Molecular wave functions: Born-Oppenheimer approximations. Covalent bond –valence bond and molecular orbital approaches with comparisons. MO theory applied to homonuclear and heteronuclear diatomics by LCAO methods, correlation diagrams, non-crossing rule.

Theory of directed valence-hybridization and geometry of molecules in terms of molecular orbitals (bond angle, dihedral angle), localised and delocalised molecular orbitals.

Conjugated and aromatic molecules: Huckel molecular orbital (HMO) theory of linear conjugated systems (ethane & allyl systems) and aromatic molecules (benzene as an example). Calculation of delocalization energies, bond order & charge density.

[16 HOURS]

References:

1. Statistical Thermodynamics by B.C. Mclelland, Chapman and Hall, London (1973).
2. Elementary Statistical Thermodynamics by N.D. Smith, Plenum Press, NY (1982).
3. Elements of Classical and Statistical Thermodynamics by L.K. Nash, Addison-Wesley (1970).
4. Statistical Thermodynamics by I.M. Klotz.
5. Introduction to Statistical Thermodynamics by M. Dole, Prantice Hall, (1962).
6. Text Book of Physical Chemistry by Samuel Glasstone, McMillan Indian Ltd., 2nd edition (1974).

7. Elements of Physical Chemistry by Lewis and Glasstone.
8. Physical Chemistry by P.W. Atkins, ELBS, 4th edition, Oxford University Press (1990).
9. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C. Kuriacose.
10. Chemical Kinetics – L.K. Jain.
11. Chemical Kinetics – Benson.
12. Physical Organic Chemistry, Reaction Rate and Equilibrium Mechanism – L.P. Hammett, McGraw HillBook, Co., (1970).
13. Fundamentals of Photochemistry – Rohatgi and Mukherje (New Age Bangalore) 2000.

PRACTICALS – SOFT CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHC 210
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by following multistep reactions.
CO2	Acquire the knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO3	Acquire industrial skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed analytical methods.

[128 HOURS]

PART – III

1. Determination of calcium in limestone by redox, acid-base and complexation titrations.
2. Determination of vitamin C in orange juice by titration with cerium(IV) and with 2,6-dichlorophenol indophenol.
3. Determination of mercury in an algaecide by EDTA titration; and arsenic in ant control preparation by redox titration.
4. Determination of aluminium and magnesium in antacids by EDTA titration.
5. Analysis of a copper-nickel alloy sample for copper and nickel by EDTA titration using masking and selective demasking reactions.
6. Determination of saccharin in tablets by precipitation titration.
7. Determination of iodine value and saponification value of edible oils.

8. Determination of ascorbic acid in goose berry/bitter gourd by titrimetry and spectrophotometry using *N*-bromosuccinimide (NBS).
9. Analysis of a mixture of iron(II) and iron(III) by EDTA titration using *p*H control.
10. Determination of sulpha drugs by potentiometry using $NaNO_2$ and iodometric assay of penicillin.
11. Solvent extraction method for determination of silver as ion-associate with 1,10-phenanthroline and bromopyragallol red.
12. Electrolytic determination of copper and lead in brass.
13. Polarographic determination of copper and zinc in brass.
14. Determination of sodium, potassium and calcium in mineral waters by atomic emission spectrometry.
15. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
16. Analysis of waste water for anionic detergents and phenol by spectrophotometry.
17. Fluorimetric determination of riboflavin (vit.B_2) in tablets.
18. Colorimetric analysis of procaine by diazotization and coupling reaction.
19. Determination of manganese in steel by extraction-free spectrophotometry and molybdenum in steel by extractive spectrophotometry.
20. Determination of ethanol in wine by titrimetric and spectrophotometric dichromate methods

PART – IV

1. Analysis of waste waters for DO and COD by titrimetry.
2. Analysis of a ground water sample for sulphate by titrimetry (EDTA) and turbidimetry.
3. Potentiometric determination of formula and stability constant of a silver-ammonia complex ion.
4. Determination of aspirin, phenacetin and caffeine in mixture and APC tablets by solvent extraction and UV spectrophotometry.
5. Kinetic determination of urinary creatinine and purity of a commercial H_2O_2 sample.
6. Determination of chromium(III) and iron(III) in a mixture by kinetic masking methods.
7. Catalytic determination of traces of selenium in biological materials and iodide in blood serum.
8. Photometric and potentiometric titration of iron(III) with EDTA.
9. Photometric and potentiometric titration of copper with EDTA.
10. Determination of copper(II) and iron(III) in mixture by photometric titration with EDTA.

11. Analysis of brackish water for chloride content by a**)** spectrophotometry (mercuric thiocyanate method), b) conductometry (silver nitrate) and c**)** potentiometry (silver nitrate).
12. Conductometric titration of sodium acetate with HCl and NH_4Cl with NaOH.
13. Ascorbic acid determination in natural orange juice by coulometry.
14. Spectrophotometric determination of iron in natural waters using thiocyanate and 1,10-phenanthroline as reagents.
15. Determination of fluoride in drinking water/ground water by spectrophotometry(alizarin red lake method).
16. Analysis of waste water for
    a) phosphate by molybdenum blue method
    b) ammonia-nitrogen by Nessler's method
    c) nitrite-nitrogen by NEDA method

15. Analysis of a soil sample for
    a) calcium carbonate and organic carbon by titrimetry.
    b) calcium and magnesium by EDTA titration.

16. Analysis of a soil sample for
    a) Nitrogen content by Kjeldahl method
    b) Available phosphorus by spectrophotometry.
    c) Nitrate-nitrogen/nitrite nitrogen/ammonia nitrogen by spectrophotometry.
    d) sodium and potassium by flame photometry.

17. Analysis of urine for
    a) urea and uric acid by titrimetrysnd spectrophotometry.
    b) Sulphate by precipitation titration after ion-exchange separation.
    c) Sugar by Benedict's reagent.

18. Analysis of blood for
    a) cholesterol by spectrophotometry
    b) bicarbonate by acid-base titration.

19. Fluorimetric determination of quinine in an antimalarial tablet.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8thedition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.

3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson EducationPvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rdedition, CBS Publishers & Distributors, New Delhi, 1997.
7. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. BothersMedical Publishers (P) Ltd., 1995.
8. Laboratory Manual in Biochemistry, J. Jayaraman, New Age International Publishers,New Delhi, 1981.
9. Experiments on Water Pollution, D.I.Williams and D. Anglesia, Wayland Publishers Ltd., England, 1978.
10. Experiments on Land Pollution, D.I. Williams and D. Anglesia, Wayland PublishersLtd., England, 1978.
15. Experiments in Environmental Chemistry, P.D. Vowler and D.W. Counel, Pergamon Press,Oxford 1980.
16. Manual Soil Laboratory Testing, vol.I, K.H. Head, Pentech Press, London 1980.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHC 220
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by multistep reactions.
CO2	Acquire knowledge on handling instruments.
CO3	Acquire skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed preparative methods.
CO5	Synthesize and characterization of complexes.

[128 HOURS]

PART – III

1. Determination of aluminium and bismuth by complexometric titration.
2. Determination of lead and tin in a mixture.
3. Determination of calcium and lead in a mixture by pH control and complexation method.
4. Determination of zinc, manganese and magnesium in a mixture using fluoride as a demasking agent.
5. Quantitative analysis of copper(II) and iron(II) in a mixture:
   i. Copper gravimetrically as CuSCN and
   ii. Iron volumetrically using cerium(IV) solution
6. Determination of iron as the 8-hydroxyquinolate by solvent extraction method.
7. Determination of the composition of iron-phenanthroline complex by:
   (a) Job's method
   (b) Mole-ratio method and
   (c) Slope-ratio method.
8. Polarographic estimation of cadmium and zinc.
9. Spectrophotometric determinations of:
   a. Titanium using hydrogen peroxide
   b. Chromium using diphenyl carbazide in industrial effluents
   c. Nickel using dimethylglyoxime in steel solution
10. Solvent extraction of ferric thiocyanate complex and determination by colorimetry.

PART – IV

1. Preparation of hexaamminecobalt(III) chloride and estimate cobalt ion.
2. Preparation and characterization of Chloropentaamminecobalt(III) chloride and estimate cobalt ion.
3. Using chloropentaamminecobalt(III) chloride, prepare nitro and nitritopentamamine cobalt(III) chloride. Record the IR spectra of the isomers and interpret.
4. Preparation of potassium tris-oxolatochromate(III) trihydrate.
5. Preparation of mercurytetrathiocyanatocobaltate(II) and estimation of mercury by gravimetry.
6. Preparation of tetraamminecopper(II) sulphate terahydrate

7. Preparation and characterization of manganese dioxide nano-particles
8. Preparation of bis-dichlorotriphenyl phosphine nickel (II).
9. Preparation and characterization of hexaamminenickel(II) chloride.
10. Demonstration Experiments:
    (a) Recording and interpretation of IR and NMR spectra of complexes.
    (b) Spectrochemical series - Evaluation of Dq value.
    (c) DNA interaction with metal complexes by UV-visible absorption and viscosity methods.

References

1. Basic principles of Practical Chemistry – V. Venkateswaran, R. Veeraswamy and A.R. Kulandraivelu
2. Instrumental Analysis Manual - Modern Experiments for Laboratory – G.G. Guilbault and L.G. Hargis.
3. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 5th edition.
4. Experimental Inorganic Chemistry – G. Palmer.
5. Inorganic Synthesis – O. Glemser.
6. Experimental Inorganic/ Physical Chemistry- Mounir A. Malati.
7. Quantitative Chemical Analysis – Daniel C. Harris, (2006) 7th edition.
8. Spectrophotometric Determination of Elements – Z. Marczenko

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHC 230
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Develop experience in multistep synthesis and also mechanisms.
CO2	Learn different kinds of reactions under multistep synthesis.
CO3	Learn isolation experiments, preliminary identification and separation.
CO4	Acquire knowledge of various estimations like sugars, enol content, ketones, nitro, protein etc.

[128 HOURS]

PART – III

Multi step synthesis

1. Oxidation of cyclohexanol to adipic acid via cyclohexanone
2. Preparation of benzoccaine from *p*-nitrotoluene
3. Preparation of *p*-chlorobenzoic acid from *p*-toluidine (Sandmeyer's reaction)
4. Molecular rearrangement:
   i. Preparation of *o*-chlorobenzoic acid from phthalic anhydride
   ii. Preparation benzilic acid from benzaldehyde
   iii. Preparation of *o*-hydroxy benzophenone from phenyl benzoate via Fries rearrangement
   iv. Prepartion of benzanilide from benzophenone (Beckmann rearrangement).
5. Grignard reaction: Prepearation of triphenyl carbinol
6. Preparation of luminol from phthalic anhydride
7. Synthesis of isoxazolines and pyrazolines via 1,3-dipolar cycloaddition.
8. Synthesis of tetralones from aryl aldehydes.
9. Synthesis of *m*-chloroiodobenzene from *m*-dinitrobenzene
10. Synthesis of Schiff base from nitro compound.

PART – IV

Isolation of natural products

1. Fractional crystallization: separation of mixture of naphthalene and biphenyl
2. Fractional distillation: Separation of mixture of hexane and toluene.
3. Thin layer chromatography: Separation of plant pigments
4. Column chromatography: Separation of mixture of *o* and *p*-nitro anilines
5. Isolation of piperine from pepper
6. Isolation of caffeine from tea
7. Isolation of azeleic acid from castor oil
8. Isolation of clove oil from clove
9. Estimation of sugars by Fehlings method
10. Determination of enol content by Meyer's method
11. Estimation of ketones by haloform reaction
12. Estimation of sugars by Bertrand's method
13. Estimation of nitro groups
14. Estimation of protein by biuret method

Spectral analysis: Structural elucidation of some simple organic compounds by UV, IR, NMR and mass. The spectra have to be provided by the teachers.

References

1. Manual of Organic Chemistry - Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry - Robert, Wingrove etc.
4. A Text Book of Practical Organic Chemistry – A.I. Vogel, Vol.III
5. Practical Organic Chemistry - Mann & Saunders
6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet .
7. R.K. Bansal, Laboratory Manual of Organic Chemistry, New Age International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICALCHEMISTRY PRACTICALS
Course Code: CHC 240
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Acquire knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO2	Learn concepts of rate constants, energy of activation, order of the reaction and also thermodynamics parameters.
CO3	Learn concepts of kinetics experiments.

[128 HOURS]

PART – III (NON-INSTRUMENTAL)

1. Determination of energy of activation for reaction between sodium formate and iodine.
2. To study the kinetics of reaction between acetone and iodine-determination of order of reaction w.r.t. iodine and acetone.
3. Determination of rate of decomposition of hydrogen peroxide with manganese dioxide.
4. Determination of order and rate constant of hydrolysis of ethyl acetate in acid medium.
5. Kinetics of decomposition of benzene diazonium chloride, determination of energy of activation and thermodynamic parameters.
6. Kinetics of decomposition of diacetone alcohol by NaOH-determination of energy of activation.

7. To determine the eutectic point of a two component system (Naphthalene-*m*-dinitrobenzene system).
8. Study of phase diagram of a three component system (e.g. acetic acid-chloroform water and system).Construction of binodal curve and indicating tie line.
9. Determination of heat of solution and lattice energy of calcium chloride.
10. Determination of partition co-efficient of acetic acid in water and butanol.
11. Study of kinetics of reaction between $K_2S_2O_8$ and KI, first order, determination of rate constants at two different temperatures and E_a.
12. To determine the rate constant for the reaction glycine and CAT.

PART IV (INSTRUMENTAL)

1. Kinetics of saponification of ethyl acetate by conductivity method and study the effect of dielectric constant of the medium (using CH_3OH).
2. Simultaneous spectrophotometric determination ofmanganese and chromium in $KMnO_4$ and $K_2Cr_2O_7$ mixture.
3. Determination of ionic product of water and study the effect of temperature.
4. Coulometric titration I_2 *vs* $Na_2S_2O_3$.
5. Conductometric study of charge transfer complex of p-phyenylenediamine with phthalic acid.
6. Determination of mean ionic activity coefficient of a weak electrolyte (acetic acid) by conductometric measurements.
7. Conductometric determination of the degree of hydrolysis and hydrolysis constant of aniline hydrochloride.
8. Conductometric titration of potassium iodide with mercuric perchlorate.
9. Determination of pK value of an indicator (methyl orange).
10. Potentiometric titration of mixture of KCl+KBr+KI*vs* $AgNO_3$.
11. Conductometric titration of a mixture of HCl, CH_3COOH and $CuSO_4$ against NaOH.
12. Thermometric titration of HCl and H_3BO_3 with NaOH.
13. Determination of quantum yield for the photolysis of Chloramine-T.
14. Determination of quantum yield for the photolysis of Chloramine-B.

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.

3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – Das. R.C. and Behera B, Tata Mc Graw Hill.

FOURTH SEMESTER

THEORY – HARD CORE

Course Title: BIOINORGANIC CHEMISTRY
Course Code: CHD 010
Course Outcomes:
After studying this course, the student to:

COID	CO
47414	Understand in details with examples Structural and molecular biology, Bioenergetics, Sodium and potassium-channels and pumps, Biochemistry of calcium, Vitamin B12 and Coenzymes.
47426	Understand the characteristics of Electron transport proteins and redox enzymes, Non-redox metalloenzymes.
47438	Specify the classification and characteristics of Identify the details of Metal ion transport and storage, Oxygen transport and oxygen uptake proteins.
47447	Learn the details of Metals in medicine, Disease due to metal deficiency and treatment, Metal complexes as drugs and therapeutic agents, Treatment of toxicity.

UNIT – I

Structural and molecular biology: Introduction, The structural building blocks of proteins, the structural building block of nucleic acids. Metal ion interactions with nucleosides and nucleotides.

General features of DNA - metal complex interaction.

Bioenergetics: Introduction, Redox reactions in metabolism, the central role of ATP in metabolism. Kinetic stability of ATP, Mitochondrial flow of electrons from NADH to O_2. Oxidative phosphorylation and respiratory chain.

Sodium and potassium-channels and pumps: Introduction, transport across membranes. Potassium and sodium channels, The sodium-potassium ATPase, Macro cyclic crown ether compounds, cryptands and ionophores.

Biochemistry of calcium: Introduction - comparison of Ca^{2+} and Mg^{2+}. Biological roles of calcium, binding sites of calcium and proteins, storage of calcium, calcium in muscle contraction, calcium in blood clotting process.

Vitamin B_{12} and Coenzymes: Structural feature, names of different forms, chemistry of cobalamin, biochemical functions of cobalamins, model compounds. Special characteristics of B_{12} co-enzyme.

[16 HOURS]

UNIT – II

Metal ion transport and storage:

Iron storage and transport: Transferrin, ferratin, phosvitin and gastroferrin.

Iron transport in microbes: siderophores, *in vivo* microbial transport of iron

Oxygen transport and oxygen uptake proteins: Properties of dioxygen (O_2): Thermodynamic and kinetic aspects of dioxygen as an oxidant, activation of dioxygen through complexation with metal ions.

Haemoglobin (Hb) and Myoglobin (Mb) in oxygen transport mechanism: Introduction to porphyrin system, substituent effects on porphyrin rings, functions of Hb and Mb. Characteristics of O_2^- binding interaction with Hb and Mb. Model compounds for oxygen carriers (Vaska's complex and cobalt(III) – Schiff base complexes). Hemerythrin and hemocyanin.

Electron transport proteins and redox enzymes: Iron – sulfur proteins (rubredoxins and ferredoxins) and cytochromes including cytochrome P450. Catalase and peroxidase: Structure and reactivity.

Superoxide dismutase: Structure and reactivity.

Molybdenum containing enzymes: Aspects of molybdenum chemistry, Xanthine oxidase, aldehyde oxidase, sulfite oxidase, nitrogenase and nitrite reductase.

Non-redox metalloenzymes - Structure and reactivity: Carboxypeptidase-A, alcohol dehydrogenase, leucine aminopeptidase and carbonic anhydrase.

[16 HOURS]

UNIT - III

Therapeutic uses of Metals - Metals in medicine: Introduction, metals and human biochemistry, general requirements.

Disease due to metal deficiency and treatment: Iron, zinc, copper, sodium, potassium, magnesium, calcium and selenium.

Metal complexes as drugs and therapeutic agents: Introduction, antibacterial agents, antiviral agents, metal complexes in cancer therapy, metal complexes for the treatment of rheumatoid arthritis, vanadium diabetes, metal complexes as radio diagnostic agents.

Treatment of toxicity due to inorganics: General aspects of mechanism of metal ion toxicity,

(i) Mechanism of antidote complex with poison, rendering it inert: arsenic, lead, mercury, iron, copper.

(ii) Antidote accelerated metabolic conversion of poison to non-toxic product: cyanide and carbon monoxide.

[16 HOURS]

References:

1. The Inorganic Chemistry of Biological Process- 2nd edition, M. N. Hughes, John Wiley and Sons, (1988).
2. Bioinorganic Chemistry - R.W. Hay, Ellis Horwood Ltd., (1984).
3. Biological Inorganic Chemistry – An Introduction, R.R. Crichton, Elsevier, (2008).
4. Bioinorganic Chemistry - A.K. Das, Books and Allied (P) Ltd, (2007).
5. Bioinorganic Chemistry - K. Hussain Reddy, New Age International Ltd. (2003).
6. Bioinorganic Chemistry: A Survey - Eiichiro Ochiai, Academic Press, (2008).
7. Bioinorganic Chemistry: A Short Course - 2nd edition, R.M. Roat-Malone, Wiley Interscience, (2007).
8. Medicinal Applications of Coodination Chemistry - Chris Jones and John Thornback, RSC Publishing, (2007).
9. Transition Metal Complexes as Drugs and Chemotherapeutic Agents - N. Farrell, Kluwer Academic Publishers (1989).
10. The Biological Chemistry of the Elements: The Inorganic Chemistry of Life - 2nd edition, J.J.R. Frausto da Silva and R.J.P. Williams, Oxford University Press,(2001).

Course Title: ADVANCED PHYSICAL CHEMISTRY
Course Code: CHD 020
Course Outcomes:
After studying this course, the student to:

COID	CO
47184	Learn in depth Photochemistry, Mechanism of absorption and emission of radiation, Photophysical kinetics.

UNIT – I

Kinetics and Thermodynamics of Polymerization: Kinetics of addition, condensation and radiation induced polymerization. Thermodynamics of polymer solutions, The Flory-Huggins Theory, Flory Krigbaum and modified Flory-Huggins Theory.

Copolymerization: Kinetics of copolymerization, Copolymer equation, Monomer reactive ratios. Properties of Polymers: Crystalline melting point and the glass transition temperature.

Polymer molecular weights: Molecular weight distribution, Number average and Weight average molecular weight. Methods for determination of molecular weight – Osmometry-membrane osmometry, vapour pressure osmometry, light scattering, viscosity, ultracentrifugation.

Conducting Polymers: Structure, properties, characterization and applications.

Polymer Degradation, Stability and Environmental Issues: Types of degradation, Thermal degradation, Mechanical degradation, Photodegradation, Degradation by high energy radiation. Chemical, hydrolytic and UV stability. Recycling and biodegradation.

[16HOURS]

UNIT – II

Photochemistry: Introduction to photochemistry, quantum yield and its determination, factors affecting quantum yield, Actinometry - Uranyloxalate and potassium ferrioxalate actinometers, acetone and diethylketone actinometers. Photosensitization: by mercury, dissociation of H_2. Photochemical kinetics of: Decomposition of CH_3CHO, formation of HCl. Photodegradation: Photocatalyst – ZnO, TiO_2, principle, application of ZnO/ TiO_2 in the photo degradation of dyes (IC), pesticides (DDT) and in industrial effluents. Effect of photo degradation on COD value.

Mechanism of absorption and emission of radiation: Einstein's treatment, selection rules, Life times of excited electronic states of atoms and molecules Types of electronic transitions in organic

molecules photochemical pathways, Jablonski diagram, Fluorescence, Phosphorescence. Fluorescence emission, factors affecting fluorescence, viz. structure, solvent, pH, temperature etc. Triplet state and phosphorescence**.**

Photophysical kinetics: kinetics of unimolecular processes, delayed fluorescence mechanisms, kinetics of collisional quenching, Stern-Volmer equation, quenching by added substances charge transfer mechanism, energy transfer mechanism.

[16 HOURS]

UNIT – III

Nuclear Chemistry: Radioactive decay – General characteristics, decay kinetics, parent – daughter decay growth relationships, determination of half-lives, Nuclear stability – packing fraction, binding energy, Brief survey of alpha, beta and gamma decays. Nuclear reactions – Bethe's notation, types of nuclear reactions – specific nuclear reactions, photonuclear reactions, Oppenheimer – Phillips process, spallation reactions. Definition of Curie and related calculations. Szilard-Chalmers process. Geiger-Muller counters – G.M. Plateau, dead time, coincidence loss, determination of dead time.

Radiation Chemistry: Introduction, units, interaction of electromagnetic radiation with matter, G-value, LET of radiation, dosimetry, Fricke dosimeter. Radiolysis - cysteine, and biphenyl. Radioisotopes as tracers, use of isotopic tracers in the elucidation of reaction mechanism, structure determination and solubility of sparingly soluble substances. ^{14}C dating, medical applications of isotopic tracers. Hazards in radiochemical work and radiation protection.

[16 HOURS]

References

1. Polymer Science and Technology by Joel R. Fried Third edition, 2002.
2. Polymer Science, V.R.Gowarikar , N.V.Vishwanathan and Jaydev Sreedhar Reprint edition, 2002.
3. Text book of Polymer Science, Fred W. Billmeyer Jr. Third edition, 2000.
4. Principles of Polymerization, George Odian, Third edition 2002.
5. Handbook on Conducting Polymers – T.A.Skotheim, Ed Marcel Dekker Inc, New York, 1 and 2, 1986.
6. Essentials of Nuclear Chemistry, H. J Arnikar, Wiley Eastern Limited, 4th Edition, (1995).

7. Nuclear and Radiochemistry, G. Friedlander, J. W. Kennedy and J. M. Miller, John Wiley (1981).
8. Introduction to Radiation Chemistry, J. W. T. Spinks and R. J. Woods, John Wiley (1990)
9. Introduction to Nuclear Physics and Chemistry, B.G. Harvey, Prentice hall (1963).
10. Sourcebook on Atomic Energy-S. Glasstone, Van Nostrand Company (1967).
11. Radiochemistry and Nuclear methods of analysis-W.D.Ehman and D.E. Vance, John Wiley (1991).
12. Fundamentals of photochemistry by K.K.Rohatgi-Mukherjee, New Age International Publishers Revised Edition (Reprint 2003).
13. Chemistry and light by Paul Suppan, The Royal Society of Chemistry.
14. Nuclear Chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
15. Nuclear Physics and Chemistry by G. Harvey.
16. Essentials of Nuclear Chemistry by H.J. Arnikar, Eastern Wiley (1990).
17. Nuclear Chemistry by U.N. Dash, Sultan Chand and Sons (1991).
18. Source Book on Atomic Energy by S. Glasstone, 3rd edition Van Nonstrand (1967).
19. Nuclear Chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
20. Essentials of Nuclear Chemistry by H.J. Arnikar, Eastern Wiley (1990).
21. Fundamentals of Radiochemistry by D.D. Sood, A.V.R. Reddy and N. Ramamoorthy

THEORY – SOFT CORE

Course Title: APPLIED ANALYSIS II
Course Code: CHD 500
Course Outcomes:
After studying this course, the student to:
CO1: Acquire knowledge on fertility and essential minor and major nutrients of soil for better growth of plants

CO2: Learn meaning, classification, characteristic features and components of fuels.

CO3: Describe feasible analytical methods for the quantitative analysis of fuels

CO4: Learn importance of analysis of different components of body fluids with adequate knowledge and skills to employ a suitable analytical method

CO5: Know background on forensic analysis with reference to its importance and analytical Methods.

UNIT – I

Soil Analysis: Inorganic and organic components of soil, collection and preparation of soil samples for analysis. Measurement of soil *p*H and conductivity. Determination of organic carbon, total nitrogen, 53 available nitrogen, ammonia nitrogen, nitrate nitrogen and nitrite nitrogen. Available phosphorus and sulphur-their determination. Analysis of soil for sodium, potassium and calcium and magnesium. Micronutrient elements and their analysis. Pesticide residues in soil, their separation and determination.

Fuel analysis- Fuels and their classification. Solid fuels and their classes - natural, artificial and industrial solid fuels. Coal and its analysis - proximate analysis and ultimate analysis. Liquid fuels and their types. Aniline point, flash point and fire point and their determination, octane number of liquid fuels. Gaseous fuels and their classes, advantages. Combustion of a carbonaceous fuel – flue gas. Analysis of flue gas or automobile exhaust for CO_2, CO, O_2 and N_2 by Orsat's apparatus. Calorific value of fuel - net and gross calorific values. Determination of calorific value of solid and liquid fuels by bomb calorimeter method.

[16 HOURS]

UNIT - II

Biomedical and forensic analysis: Composition of body fluids and detection of abnormal levels of certain constituents leading to diagnosis of disease. Sample collection and preservation of physiological fluids. Analytical methods for the constituents of physiological fluids (blood, serum, urine).

Blood - estimation of glucose, cholesterol, urea, haemoglobin and bilirubin.

Urine - urea, uric acid, creatinine, calcium phosphate, sodium, potassium and chloride.

Biological significance, analysis and assay of enzymes (pepsin, monoaminoxidase, tyrosinase); and hormones (progesterone, oxytocin, insulin). Chemical, instrumental and biological assays to be discussed wherever necessary.

Forensic analysis: General discussion of poisons with special reference to mode of action of cyanide, organophosphates and snake venom. Estimation of poisonous materials such as lead, mercury and arsenic in biological materials.

[16 HOURS]

Course Title: APPLIED ANALYSIS III

Course Code: CHD 510

Course Outcomes:

After studying this course, the student to:

CO1: Learn meaning, laws and techniques of chemical kinetics.

CO2: Know importance of chemical kinetics in enzyme catalysed and non-enzyme

catalysed reactions.

CO3: Acquire knowledge on automated and automatic methods of analysis with choice on instrumental methods

CO4: Distinguish between conventional and radio-chemical methods

CO5: Know about Type of samples subjected to radio-chemical analysis and radioimmunoassay.

UNIT – I

Kinetic methods of analysis: Introduction, basis of kinetic methods, rate law expressions. Classifying chemical kinetic methods – direct-computation integral methods, direct-computation rate methods, curve-fitting methods. Instrumentation. Quantitative applications - enzyme catalyzed reactions, non-enzyme catalyzed reactions, non-catalytic reactions. Determining V_{max}, K_m for enzyme catalyzed reactions. Elucidating mechanism for the inhibition of enzyme catalysis. Determination of enzymes, LDH, GOT and GPT. Determination of substrates – urea, uric acid, blood glucose and blood alcohol. Analysis of closely related compounds - neglect of reaction of slow reacting component method and logarithmic extrapolation method.

Automated methods of analysis: An overview. Principles of automation. Automated instruments: process control. Continuous analyzers. Discrete autoanalyzers. Instruments used in automated process control. Automatic instruments - discrete and continuous flow sampling instruments. Flow injection analysis – principles - dispersion co-efficient. Factors affecting peak height, sample volume, channel length and flow rate, and channel geometry. Applications - limited dispersion applications, medium dispersion applications, stopped flow methods and flow injection titrations. Discrete automatic systems - centrifugal fast scan analyzer, automatic organic elemental analyzers.

Analysis based on multilayer films-general principles, film structures, instrumentation, performance and applications – blood urea nitrogen, blood glucose and potassium.

[16 HOURS]

UNIT – II

Radiometric methods: Radioactive isotopes. Nuclear emissions - α and β-particles, neutrons, gamma rays and miscellaneous nuclear particles. Nuclear reactions, radiochemical decay and activity. Instrumentation and measurement of radioactivity. Radiation detectors - gas ionization, scintillation and semiconductor detectors. Pulse height analysis. Autoradiography. Statistics of radioactive measurements.

Radiochemical analysis: **Neutron activation methods -** neutrons and their sources. Interaction of neutrons with matter. Theory, experimental considerations and applications. **Isotope dilution methods -** direct isotope dilution and inverse isotope dilution methods and their applications. Radiometric titrations. Radiorelease methods. Radioactive tracers.

Radio immunoassay: Principles of immunoassay. Specificity of immuno assays. Preparation of the antibody, incubation period for the assay, separation of the bound and free antigen. Fluorescence immunoassay. Enzyme immunoassay.

[16 HOURS]

References:

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th edition, (1988).
7. Principles and Practice of Analytical Chemistry, F.W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instrumental Method of Analysis, W. M. Dean and Settle, 7th edition, 1986, CBS Publishers, New Delhi.
11. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva books Pvt. Ltd., 2002.
12. Soil Chemical Analysis, M.L. Jackson, Prentice Hall of India Pvt. Ltd., New Delhi, 1973.
13. Clinical Chemistry, Principles and Procedures, J.S. Annino, 2nd edition, Boston: Little, Brown, 1960.
14. Methods of Geochemical Analysis, D. Click, Ed., A Multi volume series, NewYork, Inter science.
15. Clinical Chemistry, Principles and Techniques, R.J. Henry, D.C. Cannon and J.W. Winkleman, Eds., 2nd edition, Hagerstorm, M.D: Harper and Row, 1974.

16. Fundamentals of Clinical Chemistry, N.W. Tietz, Ed., 2nd edition, Philaddphia: W.B. Saunders, 1976.

Course Title: RETROSYNTHESIS AND ORGANOMETALLIC CHEMISTRY

Course Code: CHD 520

Course Outcomes:

After studying this course, the student to:

CO1: Acquire knowledge of protection and deprotection in organic synthesis.

CO2: Learn about different named reactions which are highly useful for competitive exams and interviews.

CO3: Learn disconnection approach, their principles and terminologies.

CO4: Learn retrosynthesis of different complex organic molecules.

UNIT – I

Protecting groups: Protection of hydroxyl, carboxyl, carbonyl, thiol and amino groups. Illustration of protection and deprotection in synthesis.

Named reactions: Keto-enol tautomerism, mechanism and synthetic applications of aldol condensations, Claisen reaction, Schmidt reaction, Perkin reaction, Knoevenagel, benzoin and Stobbe condensation, Darzens glysidic ester condensation, Cannizaros reaction, Tischenko reaction. Michael addition, Robinson's annulation reaction.

Retrosynthesis: Introduction to disconnection approach: Basic principles and terminologies used in disconnection approach. One group C-X and two group C-X disconnections. Synthons and synthetic equivalents.

Retrosynthesis and synthesis of benzofurans, *p*-methoxy acetophenone, saccharine, α-bisabolene, nuciferal, penicillin-V.

[16 HOURS]

UNIT - II

Chemistry of organometallic compounds: Synthesis and reactions of organolithium (n-BuLi, PhLi) and organomagnesium (Grignard reagent) compounds.

Organoaluminium reagents: Preparation, site selective and stereoselctive additions of nucleophiles mediated by organoaluminum reagents, reaction with acid chlorides, allyl vinyl ethers, 1,2-addition to imines and application in the synthesis of natural products.

Organopalladium compounds: Suzuki coupling, Heck reaction.

Organotin reagents: Barton decarboxylation reaction, Barton deoxygenation reaction, Stille coupling, Stille-Kelley coupling reactions, Barton McCombie reaction, Keck stereoselective allylation and other applications.

Organozinc reagents: Preparation - oxidative addition and transmetallation, addition reactions of alkyl, aryl, allylic and propargylic zinc reagents, diastereoselective and enantioselective addition reaction with aldehydes, Reformatsky reaction.

[16 HOURS]

References:

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow Hill, New York, 1987.
2. Organic Chemistry - Morrison and Boyd
3. Organic Chemistry- Crabtree
4. Organic Chemistry- Clayden
5. I.L. Finar, Organic Chemistry, ELBS Longmann, Vol. 1 & II, 1984.
6. J. March, Advanced Organic Chemistry, Wiley Interscience, 1994.
7. E.S. Gould, Mechanism and Structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 1964.
8. F.A. Carey and Sundberg. Advanced Organic Chemistry – Part A & B, 3rd edition, Plenum Press, New York. 1990.
9. Principles of Organic Synthesis - ROC Norman and Coxon.
10. S.K. Ghosh, Advanced General Organic Chemistry, Book and Allied (P) Ltd. 1998.

Course Title: BIOMOLECULES AND NATURAL PRODUCTS
Course Code: CHD 530
Course Outcomes:

After studying this course, the student to:

CO1: Know about amino acids, peptides, proteins: their structure, function and properties.

CO2: Learn structural determination of the proteins which are called as energy of the body.

CO3: About the chemistry lying behind the heredity.

CO4: Learn nomenclature, classification and biological importance of other natural Products.

UNIT - I

Amino Acids: General structure, Physiological properties

Peptides: Structure and conformation of peptide bond, peptide synthesis: Solution phase and Merrifield's solid phase synthesis, Racemization and use of HOBt, Synthesis of oxytocin and

vasopressin, biological importance of insulin, selective cleavage of polypeptide bonds (chemical and enzymatic).

Proteins: Structure determination: *C* and *N* terminal residue determination, primary, secondary, tertiary and quartenary structure determination, denaturing and renaturing of proteins.

Nucleic acids: Introduction, structure and synthesis of nucleosides and nucleotides, Solid phase synthesis of oligonucleotides, Structure of RNA and DNA, Crick-Watson model, role of nucleic acids in the biosynthesis of proteins.

[16 HOURS]

UNIT – II

Carbohydrates: Synthesis, industrial and biological importance of glycosides, amino sugars, sucrose, maltose and lactose. General methods of structure elucidation. Industrial importance and biological importance of cellulose, starch, glycogen, dextran, hemicellulose, pectin, agar-agar. Photosynthesis and biosynthesis of carbohydrates.

Carbohydrates Metabolism: Glycolysis and Krebs cycle.

Lipids: Nomenclature, classification, purification, synthesis of lipids, phospholipids, sphingolipids, biological importance of lipids: Lecithin, sphingolipids, oils and fats.

Terpenoids: Introduction, classification (natural and essential oils), isoprene rule and biological importance of terpenoids.

Steroids: Introduction, classification and biological significance of Testosterone, Progesterone, Estrogen

[16 HOURS]

References:

1. I. L. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II, 1984.
2. Essentials of physiological chemistry – Anderson, John Wiley & Sons, New York, 1953.
3. K. Albert, L. Lehninger, D.L. Nelson, M.M. Cox, Principles of Biochemistry, CBZ publishers, 1st edition, New Delhi, 1993.
4. Harper's Biochemistry, Ed. R.Harper, 22nd edition, Prenctic Hall Press, New York, 1990
5. Carbohydrates – Chemistry and Biochemistry by Pigmann and Harton.
6. An introduction to carbohydrate chemistry by Guthri and Honeymon.
7. Protein chemistry by Neurth, Vol. I, II and III.
8. Peptide chemistry by Bodanski, Vol. I, II and III.
9. Introduction to the chemistry of fats and fatty acids by F. D. Gunstone.

PRACTICALS – SOFT CORE

Course Title: ANALYTICAL CHEMISTRY PRACTICALS
Course Code: CHD 210
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by following multistep reactions.
CO2	Acquire the knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO3	Acquire industrial skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed analytical methods.

[128 HOURS]

PART – III

1. Determination of calcium in limestone by redox, acid-base and complexation titrations.
2. Determination of vitamin C in orange juice by titration with cerium(IV) and with 2,6-dichlorophenol indophenol.
3. Determination of mercury in an algaecide by EDTA titration; and arsenic in ant control preparation by redox titration.
4. Determination of aluminium and magnesium in antacids by EDTA titration.
5. Analysis of a copper-nickel alloy sample for copper and nickel by EDTA titration using masking and selective demasking reactions.
6. Determination of saccharin in tablets by precipitation titration.
7. Determination of iodine value and saponification value of edible oils.
8. Determination of ascorbic acid in goose berry/bitter gourd by titrimetry and spectrophotometry using *N*-bromosuccinimide (NBS).
9. Analysis of a mixture of iron(II) and iron(III) by EDTA titration using *p*H control.
10. Determination of sulpha drugs by potentiometry using $NaNO_2$ and iodometric assay of penicillin.
11. Solvent extraction method for determination of silver as ion-associate with 1,10-phenanthroline and bromopyragallol red.
12. Electrolytic determination of copper and lead in brass.
13. Polarographic determination of copper and zinc in brass.

14. Determination of sodium, potassium and calcium in mineral waters by atomic emission spectrometry.
15. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
16. Analysis of waste water for anionic detergents and phenol by spectrophotometry.
17. Fluorimetric determination of riboflavin (vit.B_2) in tablets.
18. Colorimetric analysis of procaine by diazotization and coupling reaction.
19. Determination of manganese in steel by extraction-free spectrophotometry and molybdenum in steel by extractive spectrophotometry.
20. Determination of ethanol in wine by titrimetric and spectrophotometric dichromate methods

PART – IV

1. Analysis of waste waters for DO and COD by titrimetry.
2. Analysis of a ground water sample for sulphate by titrimetry (EDTA) and turbidimetry.
3. Potentiometric determination of formula and stability constant of a silver-ammonia complex ion.
4. Determination of aspirin, phenacetin and caffeine in mixture and APC tablets by solvent extraction and UV spectrophotometry.
5. Kinetic determination of urinary creatinine and purity of a commercial H_2O_2 sample.
6. Determination of chromium(III) and iron(III) in a mixture by kinetic masking methods.
7. Catalytic determination of traces of selenium in biological materials and iodide in blood serum.
8. Photometric and potentiometric titration of iron(III) with EDTA.
9. Photometric and potentiometric titration of copper with EDTA.
10. Determination of copper(II) and iron(III) in mixture by photometric titration with EDTA.
11. Analysis of brackish water for chloride content by a**)** spectrophotometry (mercuric thiocyanate method), b) conductometry (silver nitrate) and c**)** potentiometry (silver nitrate).
12. Conductometric titration of sodium acetate with HCl and NH_4Cl with NaOH.
13. Ascorbic acid determination in natural orange juice by coulometry.
14. Spectrophotometric determination of iron in natural waters using thiocyanate and 1,10-phenanthroline as reagents.
15. Determination of fluoride in drinking water/ground water by spectrophotometry(alizarin red lake method).
16. Analysis of waste water for

a) phosphate by molybdenum blue method
b) ammonia-nitrogen by Nessler's method
c) nitrite-nitrogen by NEDA method

15. Analysis of a soil sample for
    a) calcium carbonate and organic carbon by titrimetry.
    b) calcium and magnesium by EDTA titration.
16. Analysis of a soil sample for
    a) Nitrogen content by Kjeldahl method
    b) Available phosphorus by spectrophotometry.
    c) Nitrate-nitrogen/nitrite nitrogen/ammonia nitrogen by spectrophotometry.
    d) sodium and potassium by flame photometry.
17. Analysis of urine for
    a) urea and uric acid by titrimetrysnd spectrophotometry.
    b) Sulphate by precipitation titration after ion-exchange separation.
    c) Sugar by Benedict's reagent.
18. Analysis of blood for
    a) cholesterol by spectrophotometry
    b) bicarbonate by acid-base titration.
19. Fluorimetric determination of quinine in an antimalarial tablet.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8thedition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th edition, 2001 John Wiley & Sons, Inc. India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D.Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint, 2003 Pearson EducationPvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders CollegePublishing, California, 1990.
6. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3rdedition, CBS Publishers & Distributors, New Delhi, 1997.
7. Practical Clinical biochemistry methods and interpretations, R. Chawla, J.P. BothersMedical Publishers (P) Ltd., 1995.

8. Laboratory Manual in Biochemistry, J. Jayaraman, New Age International Publishers,New Delhi, 1981.
9. Experiments on Water Pollution, D.I.Williams and D. Anglesia, Wayland Publishers Ltd., England, 1978.
10. Experiments on Land Pollution, D.I. Williams and D. Anglesia, Wayland PublishersLtd., England, 1978.
15. Experiments in Environmental Chemistry, P.D. Vowler and D.W. Counel, Pergamon Press,Oxford 1980.
16. Manual Soil Laboratory Testing, vol.I, K.H. Head, Pentech Press, London 1980.

Course Title: INORGANIC CHEMISTRY PRACTICALS
Course Code: CHD 220
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Get experience on analysis of various complex mixtures by multistep reactions.
CO2	Acquire knowledge on handling instruments.
CO3	Acquire skills required for sampling, analytical and interpretation and presentation of results.
CO4	Possess adequate knowledge on literature search for developed preparative methods.
CO5	Synthesize and characterization of complexes.

[128 HOURS]

PART – III

1. Determination of aluminium and bismuth by complexometric titration.
2. Determination of lead and tin in a mixture.
3. Determination of calcium and lead in a mixture by pH control and complexation method.
4. Determination of zinc, manganese and magnesium in a mixture using fluoride as a demasking agent.
5. Quantitative analysis of copper(II) and iron(II) in a mixture:
   a) Copper gravimetrically as CuSCN and
   b) Iron volumetrically using cerium(IV) solution

6. Determination of iron as the 8-hydroxyquinolate by solvent extraction method.
7. Determination of the composition of iron-phenanthroline complex by:
    a) Job's method
    b) Mole-ratio method and
    c) Slope-ratio method.
8. Polarographic estimation of cadmium and zinc.
9. Spectrophotometric determinations of:
    a) Titanium using hydrogen peroxide
    b) Chromium using diphenyl carbazide in industrial effluents
    c) Nickel using dimethylglyoxime in steel solution
10. Solvent extraction of ferric thiocyanate complex and determination by colorimetry.

PART – IV

1. Preparation of hexaamminecobalt(III) chloride and estimate cobalt ion.
2. Preparation and characterization of Chloropentaamminecobalt(III) chloride and estimate cobalt ion.
3. Using chloropentaamminecobalt(III) chloride, prepare nitro and nitritopentamamine cobalt(III) chloride. Record the IR spectra of the isomers and interpret.
4. Preparation of potassium tris-oxolatochromate(III) trihydrate.
5. Preparation of mercurytetrathiocyanatocobaltate(II) and estimation of mercury by gravimetry.
6. Preparation of tetraamminecopper(II) sulphate terahydrate
7. Preparation and characterization of manganese dioxide nano-particles
8. Preparation of bis-dichlorotriphenyl phosphine nickel (II).
9. Preparation and characterization of hexaamminenickel(II) chloride.
10. Demonstration Experiments:
    a) Recording and interpretation of IR and NMR spectra of complexes.
    b) Spectrochemical series - Evaluation of Dq value.
    c) DNA interaction with metal complexes by UV-visible absorption and viscosity methods.

References

1. Basic principles of Practical Chemistry – V. Venkateswaran, R. Veeraswamy and A.R. Kulandraivelu

2. Instrumental Analysis Manual - Modern Experiments for Laboratory – G.G. Guilbault and L.G. Hargis.
3. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 5th edition.
4. Experimental Inorganic Chemistry – G. Palmer.
5. Inorganic Synthesis – O. Glemser.
6. Experimental Inorganic/ Physical Chemistry- Mounir A. Malati.
7. Quantitative Chemical Analysis – Daniel C. Harris, (2006) 7th edition.
8. Spectrophotometric Determination of Elements – Z. Marczenko

Course Title: ORGANIC CHEMISTRY PRACTICALS
Course Code: CHD 230
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Develop experience in multistep synthesis and also mechanisms.
CO2	Learn different kinds of reactions under multistep synthesis.
CO3	Learn isolation experiments, preliminary identification and separation.
CO4	Acquire knowledge of various estimations like sugars, enol content, ketones, nitro, protein etc.

[128 HOURS]

PART – III

Multi step synthesis

1. Oxidation of cyclohexanol to adipic acid via cyclohexanone
2. Preparation of benzoccaine from *p*-nitrotoluene
3. Preparation of *p*-chlorobenzoic acid from *p*-toluidine (Sandmeyer's reaction)
4. Molecular rearrangement:
    a. Preparation of *o*-chlorobenzoic acid from phthalic anhydride
    b. Preparation benzilic acid from benzaldehyde
    c. Preparation of *o*-hydroxy benzophenone from phenyl benzoate via Fries rearrangement
    d. Prepartion of benzanilide from benzophenone (Beckmann rearrangement).
5. Grignard reaction: Prepearation of triphenyl carbinol
6. Preparation of luminol from phthalic anhydride
7. Synthesis of isoxazolines and pyrazolines via 1,3-dipolar cycloaddition.

8. Synthesis of tetralones from aryl aldehydes.
9. Synthesis of *m*-chloroiodobenzene from *m*-dinitrobenzene
10. Synthesis of Schiff base from nitro compound.

PART – IV

Isolation of natural products

1. Fractional crystallization: separation of mixture of naphthalene and biphenyl
2. Fractional distillation: Separation of mixture of hexane and toluene.
3. Thin layer chromatography: Separation of plant pigments
4. Column chromatography: Separation of mixture of *o* and *p*-nitro anilines
5. Isolation of piperine from pepper
6. Isolation of caffeine from tea
7. Isolation of azeleic acid from castor oil
8. Isolation of clove oil from clove
9. Estimation of sugars by Fehlings method
10. Determination of enol content by Meyer's method
11. Estimation of ketones by haloform reaction
12. Estimation of sugars by Bertrand's method
13. Estimation of nitro groups
14. Estimation of protein by biuret method

Spectral analysis: Structural elucidation of some simple organic compounds by UV, IR, NMR and mass. The spectra have to be provided by the teachers.

References

1. Manual of Organic Chemistry - Dey and Seetharaman.
2. Modern Experimental Organic Chemistry by John H. Miller and E.F. Neugil, p 289.
3. An Introduction to Practical Organic Chemistry - Robert, Wingrove etc.
4. A Text Book of Practical Organic Chemistry – A.I. Vogel, Vol.III
5. Practical Organic Chemistry - Mann & Saunders
6. Semimicro Qualitative Organic Analysis by Cheronis, Entrikin and Hodnet .
7. R.K. Bansal, Laboratory Manual of Organic Chemistry, New Age International (P) Ltd. London, 3rd edition, 1996.

Course Title: PHYSICALCHEMISTRY PRACTICALS
Course Code: CHC 240
Course Outcomes:
After studying this course, the student to:

COID	CO
CO1	Acquire knowledge on handling instruments and to overcome the general problems arises during the analysis.
CO2	Learn concepts of rate constants, energy of activation, order of the reaction and also thermodynamics parameters.
CO3	Learn concepts of kinetics experiments.

[128 HOURS]

PART – III (NON-INSTRUMENTAL)

1. Determination of energy of activation for reaction between sodium formate and iodine.
2. To study the kinetics of reaction between acetone and iodine-determination of order of reaction w.r.t. iodine and acetone.
3. Determination of rate of decomposition of hydrogen peroxide with manganese dioxide.
4. Determination of order and rate constant of hydrolysis of ethyl acetate in acid medium.
5. Kinetics of decomposition of benzene diazonium chloride, determination of energy of activation and thermodynamic parameters.
6. Kinetics of decomposition of diacetone alcohol by NaOH-determination of energy of activation.
7. To determine the eutectic point of a two component system (Naphthalene-*m*-dinitrobenzene system).
8. Study of phase diagram of a three component system (e.g. acetic acid-chloroform water and system).Construction of binodal curve and indicating tie line.
9. Determination of heat of solution and lattice energy of calcium chloride.
10. Determination of partition co-efficient of acetic acid in water and butanol.
11. Study of kinetics of reaction between $K_2S_2O_8$ and KI, first order, determination of rate constants at two different temperatures and E_a.
12. To determine the rate constant for the reaction glycine and CAT.

PART IV (INSTRUMENTAL)

1. Kinetics of saponification of ethyl acetate by conductivity method and study the effect of dielectric constant of the medium (using CH_3OH).

2. Simultaneous spectrophotometric determination ofmanganese and chromium in $KMnO_4$ and $K_2Cr_2O_7$ mixture.
3. Determination of ionic product of water and study the effect of temperature.
4. Coulometric titration I_2 *vs* $Na_2S_2O_3$.
5. Conductometric study of charge transfer complex of p-phyenylenediamine with phthalic acid.
6. Determination of mean ionic activity coefficient of a weak electrolyte (acetic acid) by conductometric measurements.
7. Conductometric determination of the degree of hydrolysis and hydrolysis constant of aniline hydrochloride.
8. Conductometric titration of potassium iodide with mercuric perchlorate.
9. Determination of pK value of an indicator (methyl orange).
10. Potentiometric titration of mixture of KCl+KBr+KI*vs* $AgNO_3$.
11. Conductometric titration of a mixture of HCl, CH_3COOH and $CuSO_4$ against NaOH.
12. Thermometric titration of HCl and H_3BO_3 with NaOH.
13. Determination of quantum yield for the photolysis of Chloramine-T.
14. Determination of quantum yield for the photolysis of Chloramine-B.

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry – F. Daniels *et al*.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments – J. Rose.
7. Practical Physical Chemistry – S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry – D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry – Das. R.C. and Behera B, Tata Mc Graw Hill.

PROJECT WORK/ DISSERTATION–SOFT CORE

Course Title: PROJECT WORK/ DISSERTATION–SOFT CORE
Course Code: CHD 250
Course Outcomes

After studying this course, the student to:

COID	CO
CO1	Carry out literature survey on the problem/s to be solved.
CO2	Learn and follow suitable research methodologies to propose and to perform Experiments.
CO3	Attain the state of ability to take up research work.
CO4	Better understanding about research articles, patents, book chapters or books on relevant research problem
CO5	Acquire skills of writing research reports in the form of articles or thesis.

Each student can take up Project Work/ Dissertation under the guidance of the faculty of the department during the IV Semester as a Soft Core course.

Credit Matrix, Course of Study and Scheme of Examination for M.Sc. Degree Programme in Biochemistry

(With effect from 2019-20)

Programme Code: BIC

Course Type	Credits to be earned				Total Credits
	I Semester	II Semester	III Semester	IV Semester	
Hard Core Course	12	12	12	16	**52**
Soft Core Course	04	04	04	–	**12**
Elective Course	04	04	–	–	**08**
Open Elective Course*	–	–	04	–	**04**
Semester Total	**20**	**20**	**20**	**16**	**76**

*An Open Elective course offered by PG Dept. of Biochemistry to the students of other Depts.

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – I				
BCA040	HC	Analytical Biochemistry–I	3:1:0	4
BCA050	HC	Chemistry and Metabolism of Proteins and Nucleic Acids	3:1:0	4
BCA060	HC	Experiments in Biochemical Techniques and Enzymology** and Seminar	0:0:4	4
BCA230	SC	Enzymology	3:1:0	4
BCA250	**Choose any ONE from the following**		3:1:0	4
	SC	(i) Chemical Principles and Biochemical Reactions (ii) Plant Biochemistry (iii) Microbial Biochemistry		
			Semester Total Credits	**20**

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – II				
BCB040	HC	Analytical Biochemistry–II	3:1:0	4
BCB050	HC	Chemistry and Metabolism of Carbohydrates and Lipids	3:1:0	4
BCB060	HC	Experiments in Immunology and Biochemical Estimations** and Seminar	0:0:4	4
BCB250	SC	Immunology and Microbiology	3:1:0	4
BCB260	**Choose any ONE from the following**		3:1:0	4
	SC	(i) Human Physiology and Nutrition (ii) Research Methodology and Biostatistics (iii) Clinical Research Methods and Industrial Biochemistry		
			Semester Total Credits	**20**

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – III				
BCC070	HC	Cell Biology, Endocrinology and Cell Signaling	3:1:0	4
BCC050	HC	Clinical Biochemistry	3:1:0	4
BCC060	HC	Experiments in Clinical Biochemistry and Molecular Biology** and Research Paper Presentation	0:0:4	4
BCC220	**Choose any ONE from the following**		4:0:0	4
	SC	(i) Genomics, Proteomics and Bioinformatics (ii) Biotechnology (iii) Pharmaceutical Biochemistry		
BCC630	OE	Nutrition and Health	4:0:0	4
		Semester Total Credits		**20**

Course Code	Course Type	Course Title	Credit Pattern (L:T:P)	Credits
Semester – IV				
BCD010	HC	Molecular Biology and Gene Regulation	3:1:0	4
BCD070	HC	Genetics and Genetic Engineering	3:1:0	4
BCD060	HC	Project Work OR Dissertation***	0:4:4	8*
		Semester Total Credits		**16**
		Total CREDITS to be earned for M.Sc. BIOCHEMISTRY		**76**

* Grade Point will be calculated with respect to the allotted credits

HC	Hard Core Course
SC	Soft Core Course
E	Elective Course
OE	Open Elective Course
C1	Component 1 of Internal Assessment (IA)
C2	Component 2 of Internal Assessment (IA)
C3	Component 3 (Semester-end Exam)
L	Lecture (1 Credit=1 hr)
T	Tutorial (1 Credit=2 hrs)
P	Practical (1 Credit=2 hrs)

** Weekly Four hrs of practical for Two days

*** Project work OR Dissertation should be in-house only and may be allotted to the students in the 2nd/3rd semester

Note: Two Practical examinations of four hrs duration each for C3 (component 3) of Hardcore Course with Practical Component Only.

SCHEME OF ASSESSMENT

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - I							
BCA040	HC	Analytical Biochemistry–I	3	15	15	70	100
BCA050	HC	Chemistry and Metabolism of Proteins and Nucleic Acids	3	15	15	70	100
BCA060	HC	Experiments in Biochemical Techniques and Enzymology and Seminar	–	15	15	70	100
BCA230	SC	Enzymology	3	15	15	70	100
BCA250	**Choose any ONE from the following**		3	15	15	70	100
	E	(i) Chemical Principles and Biochemical Reactions (ii) Plant Biochemistry (iii) Microbial Biochemistry					
Semester Total Marks							**500**

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - II							
BCB040	HC	Analytical Biochemistry–II	3	15	15	70	100
BCB050	HC	Chemistry and Metabolism of Carbohydrates and Lipids	3	15	15	70	100
BCB060	HC	Experiments in Immunology and Biochemical Estimations and Seminar	–	15	15	70	100
BCB250	SC	Immunology and Microbiology	3	15	15	70	100
BCB260	**Choose any ONE from the following**		3	15	15	70	100
	SC	(i) Human Physiology and Nutrition (ii) Research Methodology and Biostatistics (iii) Clinical Research Methods and Industrial Biochemistry					
Semester Total Marks							**500**

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - III							
BCC070	HC	Cell Biology, Endocrinology and Cell Signaling	3	15	15	70	100
BCC050	HC	Clinical Biochemistry	3	15	15	70	100
BCC060	HC	Experiments in Clinical Biochemistry and Molecular Biology and Research Paper Presentation	–	15	15	70	100
BCC220	**Choose any ONE from the following**		3	15	15	70	100
	SC	(i) Genomics, Proteomics and Bioinformatics (ii) Biotechnology (iii) Pharmaceutical Biochemistry					
BCC630	OE	Clinical Research and Drug Development	3	15	15	70	100
						Semester Total Marks	**500**

Course Code	Course Type	Course Title	Exam Hrs	Max. Marks			
				IA		Exam C3	Total
				C1*	C2*		
Semester - IV							
BCD010	HC	Molecular Biology and Gene Regulation	3	15	15	70	100
BCD070	HC	Genetics and Genetic Engineering	3	15	15	70	100
BCD060	HC	Project Work OR Dissertation**	–	15	15	70	100
						Semester Total Marks	**300**

- C1* & C2* Internal test will be conducted for 20 marks of one hour duration and it is reduced to 10 marks + 5 marks for continuous assessment
- Continuous assessment comprise of assignments, group discussions, seminars and tutorials
- ** The Project evaluation is as below

  Component 1 (C1): Periodic Progress Report (15%)
  Component 2 (C2): Periodic Progress Report (15%)
  Component 3 (C3): Final Viva-Voce and Evaluation (70%)
  (The report evaluation is for 40% and the Viva-Voce examination is for 30%)

Program Outcome(s):

PO	PO Code	Group
Provides with the necessary knowledge and skills to undertake a career in research, either in industry or in an academic setting	PO1	2019
Provides the breadth and depth of scientific knowledge in 'Biochemistry' and allied areas	PO2	2019
Equips to apply for a PhD or to gain employment in biochemistry and allied areas	PO3	2019
Provides a substantial element of hands-on research experience, with enhanced experimental skills	PO4	2019
Demonstrates detailed knowledge and understanding of the principles and theories of biochemistry	PO5	2019
Helps to understand the principal techniques of biomolecular structural characterization, including spectroscopy	PO6	2019

Program Specific Outcome(s): The Specific Outcome of this programme is to train and provide the candidate with knowledge related to

PSO	PSO Code	Group
Global level research opportunities to pursue PhD programme targeted approach of CSIR–NET examination	PSO1	2019
Enormous job opportunities at all level of chemical, pharmaceutical, food products, life oriented material industries	PSO2	2019
Specific placements in R & D and Quality Control or Analysis division of nutraceutical, pharmaceutical industries & Allied Division	PSO3	2019

Course Code	Title of the Course	Credits
BCA040	ANALYTICAL BIOCHEMISTRY–I	4

COURSE OUTCOME(S):

CO1 Specify in depth cell fractionation techniques

CO2 Write down in details with application, if applicable, chromatography and spectroscopy

CO3 Write down in details with application, if applicable, principle and applications of electrophoresis

CO4 Understand the classification and characteristics of centrifugation and microscopy

		No. of Lectures
Unit I:		
1.1	**Cell Fractionation**	
1.1.1	Cell fractionation techniques: Preparation of extracts for biochemical investigations. Physico-chemical properties of solvents, solubility and miscibility, salting–in and salting–out.	**08**
1.1.2	Choice of solvent for solvent extraction, mixed solvents, solid phase extraction. Cell lysis, dialysis, precipitation and ultra filtration.	

Unit II:		
2.1	**Chromatography and Spectroscopy**	
2.1.1	Adsorption *vs.* Partition chromatography. Paper, TLC, Ion exchange, Reverse phase, Gel filtration, Affinity, HPLC, and Gas chromatographic techniques.	**14**
2.1.2	Beer-Lamberts Law, Its verifications and Deviations, Concept of Absorptions, Transmission, Scattering, Phosphorescence, Fluorescence, Luminescence, Diffraction Spectra.	
2.1.3	Principle, instrumentation, working and applications of–UV and Visible Spectroscopy,	
2.1.4	Turbidometry and Nephlometry.	

Unit III:		
3.1	**Electrophoresis**	
3.1.1	Theory of electrophoresis, continuous and discontinuous PAGE, SDS-PAGE.	**12**
3.1.2	Other electrophoretic methods–Isoelectric focusing, 2–dimensional gel electrophoresis, Capillary electrophoresis and PFGE.	
3.1.3	Agarose gel electrophoresis of nucleic acids. Isotachophoresis.	
3.1.4	Separation of proteins, lipoproteins, visualizing separated	

	components–staining, fluorescence, PAS staining, zymogram and reverse zymogram,	

Unit IV:		
4.1	**Centrifugation and Microscopy**	
4.1.1	Analytical and Preparative Ultracentrifuge–Principle, instrumentation and applications.	**14**
4.1.2	Analysis of subcellular fractions, marker enzymes and determination of relative molecular mass–Svedberg's constant, sedimentation velocity and sedimentation equilibrium.	
4.1.3	Theories of Tissue Fixation and Staining Techniques. Principles of Transmission and Scanning Electron Microscopy.	
4.1.4	Principles of Phase Contrast and Fluorescence Microscopy, Confocal Microscopy	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011)

[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).

[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).

[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),

[5] Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)

[6] Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).

[7] Basic Mathematics for Biochemists; Cornish Bowden, Oxford University Press (1998),.

[8] Biophysical Tools for Biologists *In Vivo* Techniques; John Correia H. Detrich, III Elsevier (2008).

[9] Practical Biochemistry by Keith Wilson and Walker 5th ed. Cambridge.

[10] Biophysical chemistry, Upadhyaya, A., Upadhyaya, K. and Nath, N. Himalayan Publishing House.

[11] Practical biochemistry- Principles and Techniques. Wilson and Walker. J.Cambridge Uni. Press.

[12] Physical Biochemistry-David Freifelder, 2nd Edition.

[13] Principles of Instrumental Analysis. 5th Ed. Douglas A Skoog, James Holler and Timothy A Nieman.

[14] Introduction to Electron Microscopy for Biologists; Terry Allen, Academic Press (2008).

Course Code	Title of the Course	Credits
BCA050	CHEMISTRY AND METABOLISM OF PROTEINS AND NUCLEIC ACIDS	4

COURSE OUTCOME(S):

CO1 Identify the details of amino acids and proteins

CO2 Understand in details with application, if applicable, nitrogen metabolism and degradation

CO3 Write down the classification and characteristics of synthesis of amino acids and proteins

CO4 Write down in details with application, if applicable, metabolism of nucleic acids

		No. of Lectures
Unit I:		
1.1	**Chemistry of Amino acids and Proteins**	
1.1.1	Classification and structure of 20 amino acids, newly discovered amino acids, essential, non–essential, unusual and non-protein	
1.1.2	General properties of aa, acid–base titrations, pKa Peptide bond–stability and formation, chemical synthesis of peptide. Primary structure and determination, GN Ramachandran plots	
1.1.3	Secondary structure and motifs, α helix, β sheet, Leucine zipper, Zinc finger	**10**
1.1.4	Tertiary & Quaternary structure (myoglobin, hemoglobin) Protein-protein interactions (actin, tubulin) Small peptides (glutathione, peptide hormones), Cyclic peptides (Gramicidin)	
1.1.5	Classification of proteins-globular, fibrous, membrane, metallo–proteins, Denaturation (pH, temperature, chaotropic agents), refolding, Role of chaperones in folding	
Unit II:		
2.1	**Nitrogen Metabolism and Degradation of Amino Acids**	
2.1.1	Nitrogen cycle, Nitrogen fixation – symbiotic and non-symbiotic, Nitrogenase complex. Assimilation of ammonia	
2.1.2	Metabolic fate of dietary proteins and amino acids Degradations to glucose and ketone bodies	
2.1.3	Amino acids degraded to Pyruvate, Oxaloacetate	**14**
2.1.4	Amino acids degraded to Acetyl-CoA, Succinyl-CoA Metabolism of branched chain amino acids, urea cycle, regulation of urea cycle	
2.1.5	Genetic defects in metabolism of amino acids (albinism, Phenylketonuria, maple syrup urine disease, homocystinuria alkaptonuria, methyl malonic Acidemia)	

Unit III:		
3.1	**Biosynthesis of Amino Acids and Protein Degradation**	
3.1.1	Biosynthesis of amino acids and regulation of amino acid metabolism	**08**
3.1.2	Biosynthesis and degradation of heme	
3.1.3	Biosynthesis of polyamines, creatine, gramicidine and glutathione	
3.1.4	Biosynthesis and degradation of glycoproteins and proteoglycans	
3.1.5	Protein degradation pathway–Ubiquitin–Proteosome pathway, lysosomal pathway	

Unit IV:		
4.1	**Chemistry and Metabolism of Nucleic Acids**	
4.1.1	Purines, pyrimidines, nucleosides, nucleotides, unusual bases. Structure of DNA – Watson Crick Model, A- and Z- forms.	**16**
4.1.2	Supercoiling of DNA – negative and positive, linking number	
4.1.3	Structure of RNA, tRNA, rRNA, siRNA / miRNA Denaturation and renaturation, Tm (factors affecting Tm) and Cot curves, Isolation and purification of nucleic acids from biological sources.	
4.1.4	Biosynthesis of purines and pyrimidines, Degradation of purines and pyrimidines, Regulation: de novo, salvation, nucleotide analogs, conversion of nucleotides to deoxynucleotides, mechanism of action of methotrexate, 5–flurouridine, azathymidine.	
4.1.5	Gout and Lesch–Nyhan syndrome	
4.1.6	Biosynthesis of NAD, FAD and Co–enzyme A	

References

[1] Lehninger Principles of Biochemistry 4th Ed By David L. Nelson and Michael M. Cox, WH Freeman and Company.

[2] Biochemistry by Lubert Stryer. WH Freeman and Co.

[3] Biochemistry: The Molecular Basis of Life by Trudy McKee and James R McKee. Publisher: McGraw-Hill Higher education.

[4] Biochemistry and Molecular biology By William H. Elliott and Daphne C. Elliott. Oxford University Press.

[5] Biochemistry 3rd Ed. By Donald J. Voet and Judith G. Voet. John Wiley and Sons.

[6] Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 by D Voet. John Wiley and Sons.

Course Code	Title of the Course	Credits
BCA060	EXPERIMENTS IN BIOCHEMICALTECHNIQUES AND ENZYMOLOGY AND SEMINAR	4

COURSE OUTCOME(S):

CO1 Identify the details of spectrophotometer

CO2 Identify the details of specific activity of enzymes

CO3 Deliberate the characteristics of gel electrophoresis

CO4 Deliberate the characteristics of use of pipettes

Group I:	1. Determination of Normality, Molarity and Molality of solutions 2. Preparation of buffers: Acetate, Phosphate and Tris buffer 3. Colorimetry–Beer's law and its applications 4. Determination of Molar Extinction Coefficient 5. Chromatography–Separation of amino acids by ascending, descending, circular paper chromatography 6. TLC of amino acids 7. Gel filtration, Ion exchange chromatography	
Group II:	8. Estimation of protein by Lowry's method. 9. Estimation of protein by Biuret reagent method. 10. Estimation of amino acids by Ninhydrin method 11. Isolation of casein from milk and its quantification 12. Electrophoresis–Separation of proteins by Native and SDS-PAGE 13. Determination of *pKa* and *pI* of amino acid, formal titration. 14. Separation of nucleic acids by agarose gel electrophoresis	
Group III:	15. Isolation of microbes from air, soil and water 16. Gram's staining 17. Determination of growth curve of bacteria 18. Antibiotic sensitivity tests 19. Determination of specific activity of (i) Acid Phosphatase (ii) Alkaline Phosphatase (iii) Salivary Amylase (iv) Protease (v) Invertase (vi) Aminotransferase	

Group Study	Extraction, Isolation, Purification and enzyme characterization. Determination of specific activity, optimum pH, temperature, time and energy of activation. Determination of *Km* and *Vmax* Enzyme inhibition studies	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011).
[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).
[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).
[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),
[5] Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)
[6] Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).
[7] Physical Biochemistry, Kansal Edward Van Halde. Prentice Hall.
[8] Modern Experimental Biochemistry R.F.Boyer [Ed.] (1986) Addition Wesley.
[9] Analytical Biochemistry; D.J. Holme and H. Pick Longman (1983).
[10] Principles and techniques of Biochemistry and Molecular Biology; Keith Wilson and John Walker; 6th Edn. (2005) Cambridge University Press.
[11] Biochemical Calculations, Irwin H. Segel (1976) 2nd Ed. John Wiley and Sons.

Course Code	Title of the Course	Credits
BCA230	ENZYMOLOGY	4

COURSE OUTCOME(S):

CO1 Write down in details with examples enzyme kinetics

CO2 Identify in details with examples enzyme catalysed reactions

CO3 Identify the characteristics of cooperativity reactions

CO4 Learn the classification and characteristics of multienzyme complex reactions

		No. of Lectures
Unit I:		**16**
1.1	**Enzyme Kinetics and Inhibition**	
1.1.1	Nature of enzymes, Nomenclature and IUB classification of enzymes, Units of enzyme activity, IU and activity and specific activity. Localization, isolation, purification and characterization of enzymes. Criteria of purity of enzymes. Assay methods–coupled enzyme assays, continuous, end point and kinetic assay.	
1.1.2	Enzyme Kinetics: Rate of a reaction, order and molecularity. Michaelis Menten equation, initial velocity approach, steady state approach. Vmax, Km and their significance. Linear transformation of Michaelis Menten equation–Lineweaver Burk plot, Eadie Hofstee, Haynes–Wolf and Cornish–Bowden.	
1.1.3	Inhibition: Reversible inhibition–Competitive, Non competitive and Uncompetitive, product inhibition, irreversible inhibition–suicide inhibition. Determination of *Ki.* Fast reactions–Stopped flow, temperature jump method with examples of enzymes.	
Unit II:		**08**
2.1	**Enzyme Catalyzed Reactions**	
2.1.1	Bisubstrate enzyme catalysed reactions–Cleland's notation with examples for ordered, ping pong, and random.	
2.1.2	General rate equation. Primary and secondary plots. Mechanisms of enzyme catalysis–Active site structure and its investigation.	
2.1.3	Methods of determining active site structure–isolation of ES/EI complex, affinity labeling, chemical modification studies.	

Unit III:		
3.1	**Enzyme Catalysis and Cooperativity**	
3.1.1	Nature of enzyme catalysis: Transition state theory, proximity and orientation, orbital steering, acid base catalysis, covalent catalysis, metal ion catalysis, nucleophilic and electrophilic catalysis, intramolecular catalyses, entropy effects.	**12**
3.1.2	Effect of temperature and pH on enzyme catalyzed reactions.	
3.1.3	Oligomeric proteins and Cooperativity: Binding of ligands to macromolecules–Scatchard plot, Positive and Negative cooperativity. Oxygen binding to hemoglobin.	
3.1.4	Hill equation, homotropic and heterotropic effectors. Allosteric enzyme–Aspartyl transcarbamylase.	

Unit IV:		
4.1	**Multienzyme Complex and Coenzymes**	
4.1.1	Mechanisms of action of specific enzyme: Chymotrypsin zymogen activation, acid–base catalysis, charge relay net work. Lysozyme, alcohol dehydrogenase, ribonuclease, Carboxypeptidase–A, RNA as enzyme, coenzymic action of NAD+ FAD, TPP, PLP, biotin, CoA, folic acid and lipoic acid.	**12**
4.1.2	Multienzyme complexes: Isoenzymes, eg. LDH. Multifunctional enzyme (DNA polymerase) multi enzyme complex (PDC)	
4.1.3	Metabolic regulation of enzyme activity–Feedback regulation.	

References

[1] Fundamentals of Enzymology; 3rd Edn. Nicholas C. Price and Lewis Stevens, Oxford University Press (2012).
[2] Enzymes; Trevor Palmer, East - West Press Pvt. Ltd., Delhi (2004).
[3] Enzymes: A Practical Introduction to Structure, Mechanism, and Data Analysis; Robert A. Copeland, Wiley-VCH Publishers (2000).
[4] Enzyme Kinetics and Mechanism; Paul F. Cook, W. W. Cleland, Garland Science (2007).
[5] Enzyme Kinetics; Roberts, D.V. (1977), Cambridge University Press.
[6] The Enzymes; Boyer, Academic Press, (1982).
[7] Principles of Enzymology for Food Sciences; Whitaker, Marcel Dekker (1972) Academic Press.
[8] Introduction to Enzyme and Co-enzyme Chemistry. Ed. T. Bugg, (2000), Blackwell Science.

Course Code	Title of the Course	Credits
BCA250	CHEMICAL PRINCIPLES AND BIOCHEMICAL REACTIONS	4

COURSE OUTCOME(S):

CO1 Specify in details with examples chemical principles and bonding

CO2 Write down in depth thermodynamics

CO3 Learn in details with application, if applicable, stereochemistry

CO4 Deliberate in depth secondary metabolites

		No. of Lectures
Unit I:		**16**
1.1	**Chemical Principles and Bonding**	
1.1.1	Chemical principles: Acids and bases, Buffers. Buffering capacity. Ionic strength- Molarity, Normality, Mole concept, Avogadro number, structure and special properties of water.	
1.1.2	Bonding: Covalent bond, ionic bond, Coordinate bond. Coordinate bond formation by transition metals in biological complex structures.	
1.1.3	Crystal field theory, ligand field theory, valence bond theory.	
1.1.4	Bonding of iron in hemoglobin and cytochromes, cobalt in Vit B12, and Mg2+ in chlorophyll. Chelates and complexes.	

Unit II:		**08**
2.1	**Thermodynamics**	
2.1.1	Physiological importance of electrolytes: Osmotic pressure, vapour pressure, vapour pressure osmometer, Donnan membrane equilibrium.	
2.1.2	Introduction to thermodynamics: I, II and III law. Enthalpy, entropy and free energy. Free energy and chemical equilibrium	
2.1.3	Electrodes: Hydrogen electrode, oxygen electrode, oxidation and reduction reactions, redox potential.	

Unit III:		**12**
3.1	**Stereochemistry and Heterocyclic Compounds**	
3.1.1	Importance of Stereochemistry, position and order of groups around carbon. Geometric and optical isomerism, absolute and relative configuration. Symmetry view of	
3.1.2	chirality, relation between chirality and optical activity, representation of chiral structures by Fischer.	
3.1.3	Structure and stereochemistry of glucose–anomers, epimers and sterioisomers, D and L, + and – R and S notations.	
3.1.4	Heterocyclic Compounds: Chemistry, biological	

	occurrence of furan, indole, thiazole, pterine, pteridine, isoalloxazine, pyrrole.	

Unit IV:		
4.1	**Organic Reactions and Secondary Metabolites**	
4.1.1 4.1.2 4.1.3	Mechanism of Organic Reactions: Classification of organic reactions. Reaction intermediates, reaction energetics, rate, order and molecularity of reactions. Mechanisms and stereochemistry of substitution, addition, and elimination. Rearrangements reactions. Mechanisms of ester hydrolysis. Aromaticity and resonance structure. Hydrogenation- homogenous and heterogenous hydrogenation Secondary metabolites: Phytochemicals, terpenes, polyphenols, procyanidins, flavonoids, xanthones, alkaloids and pigments.	**12**

References

[1] Basic principles of organic chemistry- Robers and Caserio
[2] Organic chemistry, Hendrickson, Cram and Hammonal.
[3] Organic chemistry, I. L. Finar, Longman group Ltd.
[4] Organic chemistry, Morrison and Boyd, 4th edition Allyn and Bacon Inc.

Course Code	Title of the Course	Credits
BCA250	PLANT BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1 Specify in details with examples Photosynthetic pathways and its regulations

CO2 Write down in depth plant growth hormones in the agriculture

CO3 Learn in details with application, if applicable, Medicinal plants

CO4 Deliberate in depth secondary metabolites of plants and its significance

		No. of Lectures
Unit I:		
1.1	**Plant Cell and Photosynthesis**	
1.1.1	Plant cell–Structure and functions of subcellular organelles, plant cell wall, Mechanism of water absorption, Ascent of sap. Transpiration - types, stomatal opening, Mechanism and factors affecting transpiration.	**12**
1.1.2	Photosynthesis–Photosynthetic pigments, Photo synthetic apparatus, Light reactions, cyclic and non cyclic Phosphorylation. Calvin cycle, Hatch–Slack cycle, CAM plants.	
1.1.3	Regulation of photosynthesis, Photorespiration.	

Unit II:		
2.1	**Cycles of elements**	
2.1.1	Nitrogen cycle, Biochemistry of symbiotic and non symbiotic nitrogen fixation, Sulphur cycle, Phosphorus cycle.	**12**
2.1.2	Plant nutrition–Biological functions of micro and macro nutrients in plants and their deficiency symptoms.	

Unit III:		
3.1	**Growth Regulators**	
3.1.1	Plant growth regulators–chemistry, biosynthesis, mode of action, distribution and physiological effects of Auxins, Gibberellins, Cytokinins, ABA and Ethylene.	**16**
3.1.2	Biochemistry of seed dormancy, Seed germination,	
3.1.3	Fruit ripening and Senescence.	

Unit IV:		
4.1	**Medicinal Importance**	**08**
4.1.1	Medicinal value of different parts of plants.	
4.1.2	Basic methods to identify the secondary metabolites. Role of secondary metabolites in Ayurvedha and Siddha treatment.	
4.1.3	Medicinal value of Amla, Stevia, Aswagandha, Turmeric and other Indian medicinal plants.	

References

[1] Plant physiology, Verma, 7th Revised edition, Emkay Publications 2001.

[2] Plant Physiology, S. N. Pandey and B.K. Sinha, Vikas Publishing House Pvt. Ltd, 3rd edition, 1999.

[3] Plant Biochemistry and Molecular Biology, Peter Jhea, Richard C. Leegood,

[4] Introduction to plant physiology, William. G.Hopkins, Norman. P.A. Hunger, 3rd edition

[5] A Handbook of Medicinal Plants –Prajapathi, Purohit,Sharma, Kumar

[6] Medicinal Plants –a compendium of 500 species.

Course Code	Title of the Course	Credits
BCA250	MICROBIAL BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1	Specify in details with examples staining techniques used for the identification of microbes
CO2	Write down in depth Molecular biology of prokaryotes
CO3	Learn in details with application, if applicable, Operon systems in gene regulation of bacteria
CO4	Deliberate in depth antimicrobial drugs are used for the microbial infections

		No. of Lectures
Unit I:		**10**
1.1	**Pure Culture, Staining Technique and Growth**	
1.1.1	Principles of microbial nutrition: Nutritional requirements, different kinds of media, factors affecting growth.	
1.1.2	Enrichment culture techniques for isolation of chemoautotroph's, chemoheterotroph's and photosynthetic microorganisms. Modes of reproduction,	
1.1.3	Biosynthesis of cell wall components, enumeration, growth curve, generation time, synchronous growth, Chemostat. Adaptation to stationary phase, heat and cold shock, osmolarity and salinity, oxidative stress.	
1.1.4	Gram, Acid fast & flagellar staining. Mechanism of bacterial motility.	

Unit II:		**14**
2.1	**Regulation of Genes in Bacteria**	
2.1.1	Nucleic Acids as Carriers of Genetics Information, Arrangement and Organization of Gene in Prokaryotes:	
2.1.2	Operon Concept, Catabolite Repression, Instability of Bacterial RNA, Inducers and Co repressors E. coli Lac Operon: Negative Regulation and Positive Regulation, E. Coli Arabinose Operon: Regulation by Attenuation, His and Trp Operons: Anti-termination,	
2.1.3	Genetic Transfer: Conjugation, Transformation and Transduction.	

Unit III:		
3.1	**Virology and Biological Nitrogen Fixation**	
3.1.1	Introduction to Virus, Classification, Assay Methods, Properties and Characteristic of Bacterial, Plant and Animal Viruses	**16**
3.1.2	Virus Host Interaction, Acute Virus Infections, Persistent of Virus Infection, Influenza, Herpes, Hepatitis A and B.	
3.1.3	Nitrogen Metabolism: Mechanism and Regulation of Utilization of Ammonia, Nitrate and other Nitrogen Source	
3.1.4	Nitrogen Fixation: Mechanism and Regulation of Nitrogen Fixation, Symbiotic and Asymbiotic Nitrogen Fixation and Biochemistry of Nitrogenase.	

Unit IV:		
4.1	**Antimicrobial Agents**	
4.1.1	The Development of Antimicrobial Agents, Past, Present and Future, Selection of Antimicrobial Agents	**08**
4.1.2	Synthetic Organic Antimicrobials, β-Lactam Antibiotics, Amino glycoside Antibiotics, Antifungal Drugs, Antiviral Drugs	
4.1.3	Resistance to Antimicrobial Drugs	

References

[1] Microbial physiology, 2nd Edn. I.W. Dawes and I.W. Sutherland (1991) Blackwell Scientific.
[2] Microbial physiology, 4th Edn. Albert G. Moat, John W. Foster and Michael P. Spector, Wiley-Liss (2002).
[3] Biology of Microorganisms, Brock Prentice Hall (1996).
[4] Microbiology: Lansing M. Prescot, Hartley and Klein, 5th Edn. McGraw Hill (2002).
[5] General Microbiology, Stainer *et al.,* 4th Edn. McMillan (1975).
[6] Microbiology, Pelczer, Reid and Kreig Tata McGraw Hill (1996).

Course Code	Title of the Course	Credits
BCB040	ANALYTICAL BIOCHEMISTRY–II	4

COURSE OUTCOME(S):

CO1 Identify in details with application, if applicable, flow cytometry

CO2 Specify the characteristics of biosensor technology

CO3 Understand in details with examples spectroscopy

CO4 Write down the details of x-ray crystallography

		No. of Lectures
Unit I:		**08**
1.1	**Flow Cytometry and Model Systems**	
1.1.1	Flow Cytometry: Principle and design of flow cytometer, cell sorting.	
1.1.2	Animal models: Choice of animals, types of studies, mutant organisms, cultured cells, plant as models and tissue culture models.	

Unit II:		**16**
2.1	**Biosensor Technology and Radioactivity**	
2.1.1	Concept and design of biosensors, types and uses of biosensors.	
2.1.2	Principle and applications of biosensors for glucose, triglyceride, uric acid, cholesterol and oxalate.	
2.1.3	Units of radioactivity. Detection and measurement of radioactivity–solid and liquid scintillation counting, scintillation cocktails and sample preparation. Cerenkov counting. Applications of radioisotopes in biology. Radiation hazards.	
2.1.4	Principle and Applications of Autoradiography	

Unit III:		**10**
3.1	**Spectroscopy**	
3.1.1	Principle, instrumentation, working and application of– Spectrofluorimetry, Flame Spectrophotometry, Atomic Absorption Spectrometry.	
3.1.2	IR spectroscopy: Physical basis of IR spectroscopy. Instrumentation, use of IR in structure determination, Fourier Transfer–IR spectroscopy.	
3.1.3	NMR: Principle, effect of atomic, identity on NMR, chemical shift, spin coupling NMR, measurement of NMR spectra, biochemical application of NMR.	
3.1.4	ESR: Principle, measurement of ESR spectra, biochemical application of ESR.	
3.1.5	Principle, instrumentation and applications of ORD and CD	

Unit IV:		
4.1	**Mass spectroscopy, X-ray Crystallography and Nanoparticles**	
4.1.1	Theory and construction of mass spectrometer. Ionization, fragmentation, *m/z*, time of flight, MALDI and ESI.	**14**
4.1.2	Other methods: MS/MS, LC/MS, GC/MS, Peptide mapping, post translation modification analysis, determination of disulfide bridges	
4.1.3	X-ray crystallography–Bragg's law, Unit cell, Isomorphous replacement, Fibre pattern of DNA.	
4.1.4	Introduction to Nanoscience: Importance and fundamental science behind nanotechnology.	
4.1.5	Applications of Nanoparticles: Tools to make nanostructures, Nanoscale lithography, E–beam lithography, molecular synthesis, self assembly. Drug and Gene delivery for human health, Biosensors and sensors, cleaning environment (for heavy metal & Bioremediation).	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011)

[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).

[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).

[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),

[5] Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)

[6] Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).

[7] Basic Mathematics for Biochemists; Cornish Bowden, Oxford University Press (1998),.

[8] Biophysical Tools for Biologists *In Vivo* Techniques; John Correia H. Detrich, III Elsevier (2008).

[9] Practical Biochemistry by Keith Wilson and Walker 5th ed. Cambridge.

[10] Biophysical chemistry, Upadhyaya, A., Upadhyaya, K. and Nath, N. Himalayan Publishing House.

[11] Practical biochemistry- Principles and Techniques. Wilson and Walker. J.Cambride Uni. Press.

[12] Physical Biochemistry-David Freifelder, 2nd Edition.

[13] Principles of Instrumental Analysis. 5th Ed. Douglas A Skoog, James Holler and Timothy A Nieman.

Course Code	Title of the Course	Credits
BCB050	CHEMISTRY AND METABOLISM OF CARBOHYDRATES AND LIPIDS	4

COURSE OUTCOME(S):

CO1 Understand the classification and characteristics of chemistry of carbohydrates

CO2 Deliberate the classification and characteristics of bioenergetics

CO3 Write down the characteristics of chemistry of lipids

CO4 Learn in depth metabolism of lipids

		No. of Lectures
Unit I:		**10**
1.1	**Chemistry of Carbohydrates**	
1.1.1	Classification, monosaccharides (aldoses & ketoses) Configuration and conformation of monosaccharides (pyranose & furanose, chair & boat).	
1.1.2	Reducing and optical properties of sugars. Stability of glycosidic bond disaccharides, oligosaccharides.	
1.1.3	Structural polysaccharides–cellulose, hemicellulose, pectin, lignin, chitin, chitosan	
1.1.4	Storage polysaccharides: starch, glycogen, inulin Steric factors in polysaccharides folding, blood group polysaccharides and lectins. Glycosaminoglycans, mucopolysaccharides, hyaluronic acid Chondroitin sulfate, keratan sulfate, dermatan sulfate. Bacterial cell wall polysaccharides, proteoglycans (syndecan and agrecan)	

Unit II:		**14**
2.1	**Metabolism of Carbohydrates and Bioenergetics**	
2.1.1	Reactions and energy balance in Glycolysis, Gluconeogenesis, TCA cycle, HMP Shunt pathway, Pasteur and Crabtree effect, Anapleurotic reactions	
2.1.2	Glyoxylate cycle, Glucuronic acid cycle, Glycogen metabolism.	
2.1.3	Photosynthesis reactions for biosynthesis of glucose C3 and C4 cycle in plants	
2.1.4	Mitochondrial ETC–Organization of respiratory chain complexes, P/O ratio, ATP synthesis, Mitchell's hypothesis, uncouplers and inhibitors.	

Unit III:		**12**
3.1	**Chemistry of Lipids**	
3.1.1	Classification & biological significance of lipids, fatty acids and Steroids	
3.1.2	Bile acids and salts, Phospholipids, Oils, waxes, isoprene units, Lipoproteins, Glycolipids, Sphingolipids	

3.1.3	Cerebrosides, Gangliosides, Prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes, cysteinyl leukotrienes	

Unit IV:		**12**
4.1	**Metabolism of Lipids**	
4.1.1	Fate of dietary lipids and Apo-lipoproteins Fatty acid biosynthesis, Desaturation of fatty acids Beta oxidation, breakdown of odd chain fatty acids, energy yields	
4.1.2	Regulation of β–oxidation, ώ–oxidation & α–oxidation Metabolism of phospholipids &Sphingolipids Regulation and Biosynthesis of cholesterol, action of statins	
4.1.3	Fate of acetyl CoA, formation of ketone bodies and ketosis	
4.1.4	Biosynthesis of prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes, Action of aspirin	
4.1.5	Genetic defects in lipid metabolism, Medium chain acyl coenzyme A dehydrogenase deficiency MCAD, Long–chain 3–hydroxyacyl–CoA dehydrogenase (LCHAD) deficiency, Familial hypercholesterolemia	

References

[1] Lehninger Principles of Biochemistry 4th Ed By David L. Nelson and Michael M. Cox, WH Freeman and Company.

[2] Biochemistry by Lubert Stryer. WH Freeman and Co.

[3] Biochemistry: The Molecular Basis of Life by Trudy McKee and James R McKee. Publisher: McGraw-Hill Higher education.

[4] Biochemistry and Molecular biology By William H. Elliott and Daphne C. Elliott. Oxford University Press.

[5] Biochemistry 3rd Ed. By Donald J. Voet and Judith G. Voet. John Wiley and Sons.

[6] Biochemistry: Biomolecules, Mechanisms of Enzyme Action and Metabolism Vol 1 by D Voet. John Wiley and Sons.

Course Code	Title of the Course	Credits
BCB060	**EXPERIMENTS IN IMMUNOLOGY AND BIOCHEMICAL ESTIMATIONS**	4

COURSE OUTCOME(S):

CO1 Understand in details with examples antigen antibody reactions

CO2 Specify in details with application, if applicable, oils and fats estimation

CO3 Understand in depth acid value principle and determination

CO4 Identify in details with examples mitosis and meiosis

Group I:	1. Demonstration of Ag-Ab interaction: Radial immuno-diffusion and ODD. 2. Demonstration of direct agglutination reaction using human blood group antigens. 3. Demonstration of indirect agglutination reaction– latex agglutination. 4. Fluorescence emission of proteins and vitamins 5. UV–Vis spectra of proteins, nucleic acids and other aromatic compounds 6. Extraction of neutral lipids, phospholipids 7. TLC of lipids and estimation of phospholipids	
Group II:	8. Iodine No. of Oils/Fats 9. Saponification Value of Oils/Fats 10. Acid Value/Peroxide Value of Oils/Fats 11. Estimation of α-Keto-acid 12. Estimation of ascorbic acid 13. Estimation of Iron 14. Estimation of Calcium	
Group III:	15. Isolation of Starch from potato and purity determination 16. Colorimetric estimation of reducing sugars (DNS reagent method) 17. Estimation of reducing sugar: Hegedorn and Jensen Method 18. Estimation of Phosphate 19. Mitosis in onion root tips 20. Meiosis in *tradescantia/*grasshopper testis 21. Total and Differential Cell Counting of blood	

Group Study	Preparation of antigen adjuvant mixture, injection and raising antibodies in rat. Purification of antibodies Antibody titer and ELISA	

References

[1] Analytical techniques in Biochemistry and Molecular Biology; Katoch, Rajan. Springer (2011).
[2] Basic Methods for the Biochemical Lab; Martin Holtzhauer, Springer, (2007).
[3] Principles and Techniques of Biochemistry and Molecular Biology 7th Edn. Keith Wilson and John Walker, Cambridge University Press, (2010).
[4] Biochemistry LabFax, Ed. J.A.A. Chambers and D. Rickwood,, Blackwell Science, (1993),
[5] Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990)
[6] Laboratory Techniques in Biochemistry and Molecular Biology, Work and Work Vol. I & II, North Holland, (1969).
[7] Physical Biochemistry. Kansal Edward Van Halde. Prentice Hall.
[8] Modern Experimental Biochemistry R.F. Boyer [Ed.] (1986) Addition Wesley.
[9] Analytical Biochemistry; D.J. Holme and H. Pick Longman (1983).
[10] Principles and techniques of Biochemistry and Molecular Biology; Keith Wilson and John Walker; 6th Edn. (2005) Cambridge University Press.
[11] Biochemical Calculations, Irwin H. Segel (1976) 2nd Ed. John Wiley and Sons.
[12] Methods in Immunology and Immunochemistry; Curtis Williams, Academic Press (1971).
[13] Immuno Assay Hand Book; David Wild, Elsevier (2013).

Course Code	Title of the Course	Credits
BCB250	IMMUNOLOGY AND MICROBIOLOGY	4

COURSE OUTCOME(S):

CO1 Identify in details with examples antigens and antibodies

CO2 Understand the details of cellular basis of immunity

CO4 Identify the classification and characteristics of MHC Complex

CO4 Learn in depth basic concepts of microbiology

		No. of Lectures
Unit I:		**12**
1.1	**Antigens and Antibodies**	
1.1.1	Introduction: Historical development and milestones in immunology. Barriers to infection–skin, mucous membrane, Definitions–Antigenicity, Immunogenicity, primary and secondary lymphoid organs, self and non self discrimination. Innate and acquired immunity.	
1.1.2	Antigens and Antibodies: Haptens and determinants–Epitopes and paratopes. Antigenicity, carbohydrates, proteins, nucleic acids, and cells as antigens. Valency of antigen.	
1.1.3	Classes and subclasses of immunoglobulins, structure of immunoglobulins, hyper variable region, isotypic, allotypic and idiotypic variations.	
Unit II:		**12**
2.1	**Complement and Cellular Basis of Immunity**	
2.1.1	Complement: Structure, components, properties and functions of complement pathways, biological consequences of complement activation.	
2.1.2	Hyper sensitivity reactions (Type I, II, III and IV).	
2.1.3	Cellular basis of immunity: Primary and secondary immune response. Reticuloendothelial system. T, B and accessory cells. Subsets of T (T–helper cells, T–killer cells, T–suppressor cells) and B cells. Development of T and B cells. T and B cell receptors, antigen processing and presentation.	
2.1.4	Cytokines and co–stimulatory molecules–Lymphokines, interleukins structure and function of IL-2, TNFα. T and B interaction. Suppression of immune response, immunoglobulin, diversity of gene rearrangement, factors affecting diversity, class switching and clonal selection theory of Burnet.	

Unit III:		
3.1	**MHC, Transplantation, Tumor Immunology and Vaccines**	
3.1.1 3.1.2 3.1.3 3.1.4	MHC: MHC gene and its polymorphism, role of MHC in immune response. Transplantation: Autograft, isograft, allograft and xenograft, Graft rejection, graft *Vs* host reaction, MHC in transplantation. Immunochemical techniques: Precipitation, agglutination, complement fixation, immunodiffusion, immunoelectrophoresis, immunofluorescence, RIA, ELISA. Tumor immunology: Tumor associated antigens, factors favoring tumor growth, immune surveillance. Tumor necrosis factors α and β Disorders of immunity: Immunological tolerance, auto immune disorders, AIDS, SCID, lupus erythematosus Vaccines: Adjuvants; vaccines and their preparations. Polyclonal and monoclonal antibodies–hybridoma technique.	**16**
Unit IV:		
4.1	**Microbiology**	
4.1.1 4.1.2 4.1.3 4.1.4	Historical aspects - Discovery of microorganisms. Theory of spontaneous generation. Era of Louis Pasteur. Microbes and fermentation. Microbes and diseases-Koch's Postulates. General characteristics: Morphology, nomenclature and classification of bacteria, virus, yeasts and fungi. Microbial nutrition-Factors influencing growth, growth curve of bacteria. Measurement of growth, continuous culture, synchronous culture and chemostat. Auxotrophs, autotrophs, heterotrophs. Methods of cultivations and preservation of microorganisms. Methods of control of microorganisms-Sterilization Techniques: Definitions of physical methods, heat (dry & moist) filtration, radiation; chemical agents-phenols, alcohols, halogens, heavy metals, aldehydes, quaternary ammonium compounds & gases.	**08**

References

[1] Antibodies–A Laboratory Manual; E. D. Harlow, David Lane, 2nd Edn. CSHL Press (2014).
[2] Basic and Clinical Immunology; Stites *et al.,* [Ed] (1982) Lange.
[3] Roitt's Essential Immunology; Ivan, M. Roitt & Peter J Delves (2001) Blackwell Science.
[4] Immunology: Roitt *et al.,* Mosby (2001),
[5] Kuby Immunology; Oven, Punt, Stranford, 7th Edn. W. H. Freeman (2013).
[6] Immune System; M. C. Connel et al., Eds. (1981) Blackwell Science.
[7] Immunology at a Glance: J.H.L. Playfare [ed.] Blackwell Science, (1987).
[8] Immunology; Jan Klein [Ed.], Blackwell Science (1990).
[9] Introduction to Immunology; Kim Bell [Ed.,] 3rd Edn. McMillan (1990).

Course Code	Title of the Course	Credits
BCB260	HUMAN PHYSIOLOGY AND NUTRITION	4

COURSE OUTCOME(S):

CO1 Specify the classification and characteristics of blood and respiratory systems

CO2 Identify in depth digestive and excretory systems

CO3 Learn in details with application, if applicable, concepts of nutrition

CO4 Specify the details of vitamins and minerals

		No. of Lectures
Unit I:		
1.1	**Blood and Respiratory System**	
1.1.1	Blood–Composition, cells. Erythrocytes–structure and function, WBC–types and functions.	
1.1.2	Platelets and their function. Buffer systems; hemostasis–blood volume, blood pressure and its regulation. Blood clotting, Dissolution of clot; anticoagulants. CSF–composition and function.	**12**
1.1.3	Respiratory System–Mechanism of gas exchange, oxygen binding by hemoglobin and factors affecting oxygenation. Acid–base balance and its regulation.	

Unit II:		
2.1	**Hepatobiliary, Digestive and Excretory System**	
2.1.1	Hepatobiliary system–Anatomy of the liver, blood supply; cells–hepatocytes, endothelial cells, Kupffer cells and paranchymal cells.	
2.1.2	Secretory and excretory function; detoxification and formation of bile	**12**
2.1.3	Digestive system–GI tract, digestion and absorption of carbohydrates, proteins and lipids. Mechanism of HCl production in the stomach. Gastrointestinal hormones.	
2.1.4	Excretory System–Ultra structure of the nephron, glomerular filtration, tubular reabsorption and tubular secretion, formation of urine.	

Unit III:		
3.1	**Nutrition, Carbohydrates, Proteins and Fats**	
3.1.1	Nutrition–Concepts of macro and micro nutrients, essential nutrients and their classification. Food groups, proximate analysis of foods, chemical and biological analysis for nutrients.	**16**
3.1.2	Food as source of energy, methods of determining energy value of foods, calorimetry, physiological fuel values and daily requirement of energy, high and low	

	calorie diets. Basal metabolic rate (BMR), factors affecting BMR, specific dynamic action of foods.	
3.1.3	Carbohydrates–dietary sources, dietary fiber essentiality of carbohydrates.	
3.1.4	Proteins–Evaluation of nutritive value of dietary protein PER, BV, essential amino acids, nutritional classification of proteins, supplementary value of proteins, protein calorie malnutrition–Kwashiorkor and Marasmus.	
3.1.4	Fats–Sources, invisible fat, essential fatty acids, PUFA.	

Unit IV:		
4.1	**Vitamins and Minerals**	
4.1.1	Vitamins–Fat soluble and water soluble vitamins, provitamins, antivitamins, dietary sources, structure, daily requirements and functions.	**08**
4.1.2	Deficiency symptoms of B complex members and fat soluble vitamins, hypervitaminosis, vitamin like compounds.	
4.1.3	Minerals–Macro and micronutrients, sources, requirements, functions and deficiency symptoms.	
4.1.4	Water metabolism–distribution in body, function and factors affecting water balance.	
4.1.5	Recommended daily allowances, special nutrition for infants, children, during pregnancy, lactation and old age.	

References

[1] The Cell, Copper, Geoffery, M., Oxford University Press, (2001)
[2] Text Book f Biochemistry with Clinical correlations; Thomas Devlin [Ed.] (1997), Wiley –Liss.
[3] Lehninger- Principles of Biochemistry; DL Nelson and MM Cox [Eds), 6th Edn. Macmillan Publications (2012).
[4] Principles of Human Physiology; 4th Edn. Cindy L. Stanfield Pearson, (2010).
[5] Human Biochemistry, Orten and Neuhans , 10th Edn. Mosbey International, (1983).
[6] Human Physiology: The mechanisms of Body functions. A.J. Vander, et. Al.,(1985) McGraw-Hill.
[7] Molecular Cell Biology, Baltimore et. al. (1995) Scientific American Publication.
[8] Harper's Review of Biochemistry, Murray et. al., (1997) 24th Edn., Lange
[9] Molecular Biology of Cell; Albertis *et. al.* (2002) Garland Science.
[10] Biochemistry Ed. Donald Voet & Judith G. Voet, John Wiley & Sons, Inc. (2010).
[11] Mammalian Biochemistry; White, Handler and Smith, McGraw-Hill, (1986).
[12] Textbook of human Physiology by Guyton, 11th ed.Elesvier.
[13] Introduction to Human Nutrition, 2nd Edn. Michael J. Gibney, Susan A. Lanham-New, Aedin Cassidy, Hester H. Vorster, Wiley-Blackwell (2009).
[14] Nutrition: Everyday Choices, 1st Edition; Mary B. Grosvenor, Lori A. Smolin Wiley (2006).
[15] Bioactive Food as Dietary Interventions for Liver and Gastrointestinal Disease; Watson Elsevier (2012).
[16] Nutrition and Metabolism, 2nd Edn., Lanham S, Mac Donald I and Roche H. The Nutrition Society, London, UK, (2012).
[17] Introduction to Human Nutrition, 2nd Edn., Gibney M, Lanham S, Cassidy A and Vorster H. The Nutrition Society, London, UK, (2012).

Course Code	Title of the Course	Credits
BCB260	RESEARCH METHODOLOGY AND BIOSTATISTICS	4

COURSE OUTCOME(S):

CO1 Specify the classification and characteristics of research methodologies and the experimental designs

CO2 Identify in depth statistical analysis

CO3 Learn in details with application, if applicable, scientific write-up

CO4 Specify the details of Interpretation of data

		No. of Lectures
Unit I:		
1.1	**Research Methodology and Design**	
1.1.1	Research Methodology: Meaning of research, Objectives of research, Motivation in Research, Types of Research, and Research approaches.	
1.1.2	Research methods vs. Research Methodology, Research process–scientific method, Criteria for good research, Defining the research problem.	**12**
1.1.3	Research Design: Meaning and need for research design, features of good design. Preparation of Scientific report, presentation of a review.	

Unit II:		
2.1	**Scientific Writing**	
2.1.1	Mechanical and stylistic aspects of scientific writing-Precision and clarity of language, writing style, writing process, presentation of numerical data and scientific figures.	
2.1.2	Constraints on scientific writing–audience, format and mechanics (grammar, word choice, punctuation, tenses).	**12**
2.1.3	Objectives and design of experiment–experimental unit, identifying variables, replications & controls, power analysis in planning experiments, treatment structure and design structure.	
2.1.4	Graphical analysis of data and presentation of results.	

Unit III:		
3.1	**Statistical Significance Analysis**	
3.1.1	Significance and limitations of statistical calculations, Sampling techniques.	
3.1.2	Probability theory, random variables and distribution functions, Point and interval estimation, linear regression. Statistical evaluation of results–Hypothesis testing, interpretation of statistic for analysis of error.	**16**
3.1.3	Measures of central tendency and dispersion	

Unit IV:		**08**
4.1	**Testing Methods**	
4.1.1	ANOVA, F-test, t-test, z-test, chi-square, correlation coefficient.	

References

[1] Research Methodology: Methods & Techniques By CR Kothari. Publisher: New Age International

[2] From Research to Manuscript: A Guide to Scientific Writing (Paperback) By Michael Jay Katz. Publisher: Springer

[3] The Craft of Scientific Writing (3rd Edition) By Michael Alley. Publisher: Springer-Verlag.

[4] Writing Scientific Research Articles: Strategy and Steps (Hardcover) By Margaret Cargill and Patrick O.Connor. Publisher: WileyBlackewell.

[5] The Mayfield Handbook of Technical and Scientific Writing By Leslie Perelman and Edward Barrett. McGraw-Hill NY

[6] Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers(Hardcover) 6th Ed By Edward J. Huth. Publisher: Cambridge University Press.

[7] The Handbook of Technical Writing, Eighth Edition (Handbook of Technical Writing Practices) (Hardcover) By Gerald J. Alred, Charles T. Brusaw and Walter E. Oliu, St. Martin's Press.

[8] Science and Technical Writing: A Manual of Style (2nd Ed.) By Philip Rubens. Publisher: Routledge, London.

[9] The Elements of Technical Writing (Elements of Series) (Paperback) By Gary Blake and Robert W. Bly. Publisher: Longman.

[10] Technical Writing: Principles, strategies and readings (7th Edition) By Diana C. Reep. Publisher: Longman.

[11] Biostatistics By PN Arora and PK Malhan, Himalaya Publishing House.

[12] Experimental Design and Data Analysis for Biologists By Gerry P. Quinn and Michael J. Keough. Publisher: Cambridge University Press.

[13] Principles of Biostatistics (with CD-ROM) (Hardcover) By Marcello Pagano and Kimberlee Gauvreau. Publishers: Duxbury Press

[14] Biostatistics: Experimental Design and Statistical Inference (Hardcover) By James F. Zolman. Oxford University Press.

[15] Intuitive Biostatistics By Harvey Motulsky. Publisher: Oxford University Press

Course Code	Title of the Course	Credits
BCB260	**CLINICAL RESEARCH METHODS AND INDUSTRIAL BIOCHEMISTRY**	**4**

COURSE OUTCOME(S):

CO1 Specify the classification and characteristics of clinical practice and clinical research

CO2 Identify in depth fermentation technology and downstream processing

CO3 Learn in details with application, if applicable, clinical research methods

CO4 Specify the details of steps involved in drug discovery

		No. of Lectures
Unit I:		
1.1	**Introduction to Clinical Research**	
1.1.1	Introduction to Clinical Research, Terminologies and definition in Clinical Research, Origin and History of Clinical Research	
1.1.2	Difference between Clinical Research and Clinical Practice, Types of Clinical Research, Phases of clinical research	**10**
1.1.3	Clinical Trials in India–The National Perspective, Post marketing surveillance	
1.1.4	Pharmaceutical Industry–Global and Indian Perspective Clinical Trial market, Career in Clinical Research	

Unit II:		
2.1	**Clinical Research Methods**	
2.1.1	Design of experiments, factorial experiments, randomization, interaction among factors.	
2.1.2	Types of studies: Cohort studies, double blind, placebo control, cross over and double dummy.	
2.1.3	Introduction to Good Clinical Practices, Clinical Trial Development: Protocol Design and Development, Case Report Form Design and Development, Principals of Data Management, Clinical Trial Management: Maintaining and Managing Essential Documents, Recording and Reporting Non–Serious and Serious Adverse Events.	**14**

Unit III:		
3.1	**Drug Discovery Concepts and Biostatistics**	
3.1.1	Proof of concept, target identification and validation. Identifying the lead compound, optimization of lead compound, mechanism of action, drug target and validation of target.	**12**
3.1.2	Safety pharmacology, pharmaco–kinetics and	

	pharmaco–dynamics, acute and chronic toxicity Development of new drug/molecules and elucidation of their mechanisms of actions, formulations, factors affecting drug efficacy, drug resistance, traditional medicines; biotransformation.	
3.1.3	Statistical concept: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart.	
3.1.4	Measure of central tendency: Mean, median, mode,mean deviation, standard deviation, standard error	
3.1.4	Types of distribution of data: Normal, binomial, Poisson, Z-test, t-test and ANOVA. Correlation and regression.	
Unit IV:		
4.1	**Bioprocess Methods**	
4.1.1	Basics of chemical engineering, mass transfer, heat generation and removal, fluid dynamics:	**12**
4.1.2	Bernoulli's principle, viscosity, hydraulic conductivity, capillary flow, control and applications of industrial processes, process evaluation and development, over production of metabolites and methods;	
4.1.3	Fermentation–Submerged and solid state fermentation Fermentor design, Industrial use of microbes. Strain improvement, Inocula preparation, Downstream processing–Recovery and purification of intracellular and extra cellular products. Methods to maximize the yield.	

References

[1] Basic Test for Drugs, WHO-GENEVA 1998 edition
[2] Who Expert Committee on Specification for Pharmaceutical Preparation WHO-GENEVA, 2005 edition
[3] Who Expert Committee on Biological Standardization WHO-GENEVA 2003 edition
[4] Clinical Research Fundamental and Practice –Vishal Bansal Parar Medical Publisher, 2010 edition
[5] Introduction to Pharmacopoeia CBS Publishers and Distributors 1991 edition
[6] Essential of Clinical Research –Dr. Ravindra B. Ghooi and Sachin C. Itkar Nirali Prakashan 2010 edition
[7] Basic Principle of Clinical Research and Methodology, Jaypee Brothers Medical Publishers (P) Ltd. 2009 ed.
[8] A Comprehensive Clinical Research Manual-Samir Malhotra, Nusrat Shafiq, Promila Pandhi Jaypee Brothers Medical Publishers (P) Ltd, 2008 edition
[9] Industrial microbiology, A.H. Patel
[10] Principles of Fermentation technology, Stanburry. P. Whitaker and S.J. Hall, 1995
[11] Biotechnology–U. Sathyanarayana. YLL

Course Code	Title of the Course	Credits
BCC070	CELL BIOLOGY, ENDOCRINOLOGY AND CELL SIGNALING	4

COURSE OUTCOME(S):

CO1 Specify in details with examples cellular organization

CO2 Learn the characteristics of endocrinology

CO3 Learn in depth cell signaling

CO4 Write down the characteristics of membrane biology

		No. of Lectures
Unit I:		**12**
1.1	**Cellular Organization, Division and Cytoskeletons**	
1.1.1	Cell types–organization of prokaryotic and eukaryotic cells.	
1.1.2	Cell division–mitosis and meiosis, cell cycle–phases of cell cycle, cyclins and cdks. Regulation of cell growth and cell cycle.	
1.1.3	Cell motility–molecular motors, microtubules, structure and composition. Microtubular associated proteins–role in intracellular motility.	
1.1.4	Cellular organelles–Nucleus–internal organization, traffic between the nucleus the nucleolus, and cytoplasm. Endoplasmic reticulum–protein sorting and transport, golgi apparatus and lysosomes, morphology and function of mitochondria, chloroplasts and peroxisomes, glyoxysomes.	

Unit II:		**12**
2.1	**Membrane Biology**	
2.1.1	Organization of lipid monolayer, bilayer, Physicochemical properties of biological membranes - compositions, supra molecular organization - Singer and Nicolson's model.	
2.1.2	Membrane asymmetry-lipids proteins and carbohydrates, lateral diffusion, biogenesis of lipids and proteins. Polarized cells, membrane domains- caveolae, rafts, Membrane lipid and protein turnover, intracellular targeting of proteins. Factors influencing fluidity of membrane	
2.1.3	Membrane transport - Laws of diffusion across membranes, simple diffusion, facilitated diffusion and active transport - glucose transporter Na+ K+ ATPase (Structure and mechanism of action), bacterial phosphotransferase system. Endocytosis, receptor mediated endocytosis, exocytosis, ion channels, aquaporin channel, ionophores. Patch clamp technique.	

Unit III:		
3.1	**ENDOCRINOLOGY**	
3.1.1	Endocrine System–Endocrine organs in man. Hierarchy and regulation of hormone release.	
3.1.2	Structure and control of hypothalamus, GRH, somatostatin, TRH, CRH, GnRH. Pituitary-anatomy and structure.	
3.1.3	Hormones of anterior, posterior and median lobes. Pro-opiomelanocortin. Thyroid, parathyroid, adrenals, gonads–Testes and ovaries. Menstrual cycle. Hypothalamus–pituitary target organ axis and regulation by feedback mechanism, Pineal gland, melatonin and circadian rhythm	**12**
3.1.4	Classification of hormones based on solubility and structure, mechanism of action of water soluble and lipid soluble hormones.	
Unit IV:		
4.1	**Cell Signaling**	
4.1.1	Nerve transmission–Central and peripheral nervous systems. Structure of neuron, axon, dendrites, synapse neuromuscular junction. Neurotransmitters- mechanisms of nerve conduction. α and β adrenergic neurons, nicotinic and muscarinic neurons.	
4.1.2	Muscle contraction–Skeletal muscle and smooth muscle contraction, muscle proteins–actin, myosin, tropomyosine, troponins, mechanisms of muscle contraction, role of calcium and calmodulin Biochemistry of vision	**12**
4.1.3	Cellular signaling: Extra cellular signaling–G Protein linked receptors ,Role of cyclic AMP, IP3, DAG, Ca2+ as a second messenger, receptos tyrosine kinases , MAP kinase pathway, NFkB pathway, apoptosis, Cell survival pathway, Jak/Stat pathway, TGF β Signaling. Multiple signaling path ways–Insulin receptor (regulation of blood glucose)	
4.1.4	Steroid hormone receptors, structural organization of receptor protein, hormone binding domain, antigenic domain and DNA binding domain.	

References

[1] The World of the cell by Becker, Kleinsmith and Harden Academic Internet Publishers; 5th edition (2006)

[2] The Cell: A Molecular Approach, Fourth Edition by Geoffrey M. Cooper and Robert E. Hausman.

[3] Cell and Molecular Biology by concepts and experiments by Gerald Karp (2005) John Wiley sons & Inc.

[4] Molecular cell Biology by Harvey Lodish. W. H. Freeman; 6th edition (2007)

[5] The Cell–Biochemistry, physiology and morphology by J. Brachet and A. E. Mirsky, Academic Press (1963)

Course Code	Title of the Course	Credits
BCC050	CLINICAL BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1 Identify in details with application, if applicable, specimen collection and analysis

CO2 Specify in details with application, if applicable, metabolic disorders

CO3 Write down the characteristics of hormonal disorders

CO4 Write down in details with application, if applicable, hematology

		No. of Lectures
Unit I:		
1.1	**Specimen Collection and Analysis**	
1.1.1	Concepts of accuracy, precision, reproducibility, reliability, and other factors in quality control.	
1.1.2	Normal values. Specimen collection and Processing: Collection of blood–venipuncture, skin puncture, arterial puncture. Anticoagulants. Collection and analysis of normal and abnormal urine–timed urine specimens, preservatives.	**10**
1.1.3	Clinical significance of sugars, proteins, ketone bodies, bilirubin and porphyrins. CSF–collection, composition and analysis. Amniotic fluid–Origin, collection, composition.	

Unit II:		
2.1	**Disorders**	
2.1.1	Disorders of carbohydrate metabolism: Diabetes mellitus, glycohemoglobins, hypoglycemias, galactosemia and ketone bodies.	
2.1.2	Various types of glucose tolerance tests. Glycogen storage diseases.	
2.1.3	Lipid profile, lipidosis and multiple sclerosis. Causes and diagnosis of the disorders of HDL–cholesterol, LDL–cholesterol and triglycerides.	**14**
2.1.4	Cancer: Etiology, diagnosis, treatment and prognosis. Carcinogens, oncogens, mechanism.	
2.1.5	Biochemistry of ageing: Cellular senescence, Role of Telomerase in aging, Alzheimer's disease, Parkinson's disease.	

Unit III:		
3.1	**Enzymes and Hormonal Disorders**	
3.1.1	Evaluation of organ function tests: Clinical assessment of renal, hepatic, pancreatic, gastric, intestinal and thyroid functions. Clinical importance of bilirubin.	**12**
3.1.2	Diagnostic enzymes: Principles of diagnostic enzymology. Clinical significance of aspartate aminotransferase, alanine aminotransferase, creatine	

	kinase, aldolase and lactate dehydrogenase.	
3.1.3	Enzyme tests in determination of myocardial infarction. Enzymes of pancreatic origin and biliary tract.	
3.1.4	Hormonal disorders: Protein hormones (anterior pituitary hormones, posterior pituitary hormones), steroid hormones, adrenocorticosteroids, and reproductive endocrinology. Disorders of thyroid hormones.	

Unit IV:		
4.1	**Hematology**	
4.1.1	Biochemical aspects of hematology: Total cell count, differential count, hematocrit.	**12**
4.1.2	Disorders of erythrocyte metabolism, hemoglobinopathies, thalassemias, thrombosis, porphyrias and anemias. Laboratory tests to measure coagulation and thrombolysis.	
4.1.3	Doping	
4.1.4	Detoxification in the body: Enzymes of detoxification, polymorphism in drug metabolizing enzymes. Mechanism of drug action and channels of its excretion.	
4.1.5	Test for lung function: Chest X-ray, Spirometry. Test for Brain function: EEG, MRI, CT.	

References

[1] Textbook of Medical Biochemistry by MN Chatterjea and Rana Shinde, Jaypee Brothers.

[2] Lehninger Principles of Biochemistry 5th Ed by David L. Nelson and Michael M. Cox, WH Freeman and Company.

[3] Davidson's Principles and Practice of Medicine: A Textbook for Students and Doctors (Hardcover) 15th Ed by LSP Davidson, J MacLeod and CRW Edwards. Publisher: Churchill Livingstone.

[4] Medical Biochemistry (Paperback) by John W. Baynes and Marek Dominiczak. Publisher: Mosby.

[5] Clinical Biochemistry: An Illustrated Colour Text (Paperback) 3rd Ed By Allan Gaw, Michael Murphy, Robert Cowan, Denis O'Reilly, Michael Stewart and James Shepherd. Publisher: Churchill Livingstone.

[6] Review of Medical Physiology (Lange Basic Science) (Paperback) By William F. Ganong. Publisher: McGraw-Hill Medical

[7] Harper's Biochemistry (Lange Medical Books) (Paperback) By Robert K. Murray, Daryl K. Granner, Peter A. Mayes and Victor W. Rodwell. Publisher: Appelton and Lange.

[8] Clinical Biochemistry by Richard Luxton. Scion Publishing Ltd.

[9] Principles of Medical Biochemistry: With STUDENT CONSULT Online Access (Paperback) by Gerhard Meisenberg and William H. Simmons. Publisher: Mosby.

Course Code	Title of the Course	Credits
BCC060	EXPERIMENTS IN CLINICAL BIOCHEMISTRY AND MOLECULAR BIOLOGY	4

COURSE OUTCOME(S):

CO1 Specify the details of urine and blood analysis

CO2 Specify the characteristics of determination of enzyme activity

CO3 Identify the classification and characteristics of DNA quantification and analysis

CO4 Deliberate the details of isolation of nucleic acids from plant, animal and microbial sources

Group I:	**Urine analysis** 1. Qualitative analysis of urine for normal organic and inorganic constituents 2. Qualitative analysis of urine for abnormal constituents- Glucose, albumin, Ketone bodies. 3. Quantitative estimation of Creatine and Creatinine, Urea Uric acid Sulphate Chloride 4. Titrable acidity **Blood analysis** 5. Quantitative estimation of Urea Uric acid Creatine Cholesterol HDL–C and LDL–C 6. Blood glucose and GTT	
Group II:	**Determination of Enzyme activity of** 7. Alkaline phosphatase 8. SGOT 9. SGPT 10. LDH 11. Electrophoresis of lipoproteins: Serum proteins. 12. Albumin/Globulin Ratio. 13. Fractionation of serum proteins-Ammonium sulphate precipitation. 14. Isolation of DNA and RNA from biological sources. 15. Quantitative determination of DNA and RNA.	
Group III:	16. Determination of melting temperature of DNA (Tm) 17. Sub-cellular fractionation of rat liver by differential centrifugation and marker analysis 18. Determination of activities of marker enzymes 19. Preparation of erythrocyte ghosts 20. Kinetics of uptake of glucose by erythrocytes 21. Viability of cells by trypan blue dye exclusion 22. Study of morphology of *Drosophila melanogaster*	

	23. Study of mutants of *Drosophila melanogaster* 24. Study of polytene chromosomes of *Drosophila melanogaster*	

Group Study	Isolation of plasmid DNA, Restriction digestion of plasmid DNA, ligation of DNA fragment into a plasmid vector, preparation of competent cells, *E.Coli* transformation and amplification of DNA by PCR.	

References

[1] Practical Clinical Biochemistry, ed. Harold Varley, 4th edn. CBS Publishers (1988).
[2] Practical Clinical Biochemistry: Methods and Interpretation, ed. Ranjna Chawla, Jaypee Brothers Medical Publishers (1996).
[3] Practical and Clinical Biochemistry for Medical Students, ed. T.N. Pattabhiraman, Gajana Publishers (1994).
[4] Hawk's Physiological Chemistry, ed. Oser, 14th Edn.(1976), Tata-McGrawHill.
[5] Biochemistry, ed. Plummer Tata-McGraw Hill, (1971).
[6] Molecular Biology Techniques; Sue Carson, Heather Miller and D. Scott Witherow, Academic Press (2011).
[7] Principles and Techniques of Biochemistry and Molecular Biology; 7th Edn. Keith Wilson and John Walker (2012).
[8] Principles of Gene Manipulations; 6th Edn. S.B. Primrose, R.M. Twyman, and R.W. Old, Blackwell Science (2012).
[9] Gene Cloning and DNA analysis- An Introduction; T. A. Brown, 5th Edition, Wiley-Blackwell (2006).
[10] Laboratory methods in Enzymology; Part-A; Jon Lorsch, Academic Press (2014).
[11] Gene Cloning Laboratory Manual 4th Edn. Michael R. Green and Joseph Sambrook, CSHL Press (2014).
[12] Current Protocols in Molecular Biology; S Gallaghar, Wiley Interscience (2008).

Course Code	Title of the Course	Credits
BCC220	GENOMICS, PROTEOMICS AND BIOINFORMATICS	4

COURSE OUTCOME(S):

CO1 Specify the details of DNA sequencing methods

CO2 Specify the characteristics of determination of Proteins

CO3 Identify the classification and characteristics of microarray data

CO4 Deliberate the details of bioinformatics in biological databases and sequencing analysis

		No. of Lectures
Unit I:		**12**
1.1	**Structural Organization of Genome and Sequencing**	
1.1.1	Structural organization of genome in Prokaryotes and Eukaryotes, Organelle DNA–mitochondrial, chloroplast,	
1.1.2	DNA sequencing–principles and translation to large scale projects, Recognition of coding and non–coding sequences and gene annotation. Tools for genome analysis–RFLP, DNA fingerprinting, RAPD, PCR, Linkage and Pedigree analysis–physical and genetic mapping.	
1.1.3	Microbes, plants and animals, Accessing and retrieving genome project information from web, Comparative genomics, ESTs and SNPs.	

Unit II:		**12**
2.1	**Proteomics**	
2.1.1	Protein analysis (includes measurement of concentration, amino-acid composition, N-terminal sequencing),	
2.1.2	2–D electrophoresis of proteins, Microscale solution isoelectricfocusing, Peptide fingerprinting,	
2.1.3	LC/MS-MS for identification of proteins and modified proteins, MALDI-TOF	
2.1.4	SAGE and Differential display proteomics, Protein-protein interactions, Yeast two hybrid systems.	

Unit III:		**08**
3.1	**Functional Genomics, Proteomics and Metabolomics**	
3.1.1	Analysis of microarray data, Protein and peptide microarray–based technology; PCR–directed protein *in situ* arrays	
3.1.2	Structural proteomics	
3.1.3	Metabolomics	

Unit IV:		
4.1	**Biological Databases and Sequence Analysis**	
4.1.1	Introduction biological databases: Types (relational & object–oriented). Primary, secondary & specialized databases.	**16**
4.1.2	Types of databases–Nucleotide sequence database, EMBL, Genebank, Unigene, Genome biology, Protein dBase (Swiss–prot & Trembl and Motif) and 3D structure databases (PDB, SCOP, Cath, Genecards, SRS & Entrez).	
4.1.3	Computational approaches for gene identification, ORF and Human Genome Project.	
4.1.4	Basics of sequence analysis: Alignments using BLAST and FASTA, Multiple Sequence Alignment (CLUSTAL–X and CLUSTAL–W), Application of multiple sequence alignment	
4.1.5	Protein Structure Prediction in Bioinformatics–*Ab initio* based methods, Homology based methods, secondary structure prediction.	
4.1.6	Protein structure comparison–intermolecular and intramolecular methods. Phylogenetic construction by distance based methods	

References

[1] Voet D, Voet JG & Pratt CW, Fundamentals of Biochemistry, 2nd Edition. Wiley 2006
[2] Brown TA, Genomes, 3rd Edition. Garland Science 2006
[3] Campbell AM & Heyer LJ, Discovering Genomics, Proteomics and Bioinformatics, 2nd Edition. Benjamin Cummings 2007
[4] Primrose S & Twyman R, Principles of Gene Manipulation and Genomics, 7th Edition, Blackwell, 2006.
[5] Glick BR & Pasternak JJ, Molecular Biotechnology, 3rd Edition, ASM Press, 1998.
[6] Essential Bioinformatics (Paperback) byJin Xiong. Cambridge University Press.
[7] Bioinformatics: Methods & Protocols by Stephen Misener and Stephen A. Krawetz,
[8] Humana Press.
[9] Essentials of Bioinformatics by Irfan Ali khan and Atiya Khanum. Publisher: Ukaaz Publications.
[10] Bioinformatics: Sequence and Genome Analysis (Hardcover) by David W. Mount. Cold Spring Harbor Laboratory Press
[11] Introduction to Bioinformatics (Paperback) by Arthur M. Lesk. Oxford Univ Press.
[12] Introduction to Bioinformatics: A Theoretical and Practical Approach (Paperback) by David Womble, Stephen A. Krawetz and David D. Womble. Humana Press Inc., U.S.
[13] Applied Bioinformatics: An Introduction (Paperback) y Paul M. Selzer, Richard
[14] Marhofer and Andreas Rohwer. Publisher: Springer-Verlag Berlin and Heidelberg GmbH & Co. K.

Course Code	Title of the Course	Credits
BCC220	BIOTECHNOLOGY	4

COURSE OUTCOME(S):

CO1 Write down the characteristics of tools of genetic engineering

CO2 Learn in depth DNA Cloning

CO3 Write down the characteristics of Industrial biotechnology and gene therapy

CO4 Identify in depth biosafety and bioethics

		No. of Lectures
Unit I:		**12**
1.1	**Tools of Genetic Engineering**	
1.1.1	Basic principles–mechanism of natural gene transfer by Agrobacterium, generation of foreign DNA molecules.	
1.1.2	Restriction enzymes, their types and target sites, cutting and joining DNA molecules, linkers, adapters, homopolymers, enzymes used in genetic engineering.	
1.1.3	Cloning vehicles and their properties, natural plasmids, in vitro vectors, cosmids and T-DNA based hybrid vectors.	
1.1.4	Cloning strategies–cloning with single strand DNA vectors, cDNA cloning and gene libraries, recombinant selection and screening methods, expression of cloned genes–problems and solutions, shuffle vectors.	
1.1.5	DNA sequencing strategies–Sanger's and Maxam–Gilbert's methods, applications of PCR and DNA hybridization, Southern, Northern and Western blotting.	

Unit II:		**12**
2.1	**DNA Cloning and Sequencing**	
2.1.1	Techniques of tissue culture–culturing explants and haploids, protoplasts fusion and embryoids.	
2.1.2	Methods of gene transfer to plants, animals and bacteria-Ca transfection, electroporation, shotgun and others.	
2.1.3	Transgenic plants, GM foods and Biopesticides, gene knockouts and transgenic animals.	
2.1.4	Biodegradation and its applications, bioleaching.	

Unit III:		
3.1	**Industrial Biotechnology and Gene Therapy**	
3.1.1	Applications of biotechnology–industrial biotechnology–Fermentors, principle, types product recovery and purification of ethanol, citric acid, vitamin B12, streptomycin.	**16**
3.1.2	Enzyme biotechnology–production and uses of industrially important enzymes such as protease, immobilization of enzymes and their applications	
3.1.3	Waste treatment, bioenergy and biogas production.	
3.1.4	Gene therapy (somatic)-the principle and approaches.	

Unit IV:		
4.1	**Biosafety and Bioethics**	
4.1.1	Biotechnology–potential hazards, biological weapons, biosafety of GM foods and GMOs–substantial equivalence and safety testing, gene drain, the tangled genes	**08**
4.1.2	Human genome research–the objectives and approaches, genomics and genome prospecting–the controversies, issues of biotechnology-social and scientific, technology protecting systems and the terminator.	
4.1.3	IPR, its concepts and conditions–patenting of genes, cells and life forms, evaluation of life patenting.	

References

[1] Fermentation Biotechnology O.P. Ward. 1989 Prentice Hall.
[2] Biotechnology J.E. Smith Cambridge University Press 1996.
[3] Introduction to Biotechnology Brown, Campbell and Priest Blackwell Science 1987.
[4] A Textbook on Biotechnology H.D. Kumar 2nd edition East West Press 1998.
[5] Molecular Biotechnology Glick and Pasternak, Panima Publ.
[6] From Genes to clones Winnaecker VCH Publication.
[7] Elements of Biotechnology P.K. Gupta, Rastogi Publication, 1998.
[8] Molecular Biology and Biotechnology. Walker and Gingold. 3rd ed. Panima Publ. 1999.
[9] Plant Biotechnology. Ignacimuthu, Oxford, IBH.
[10] Recombinant DNA Technology, Watson, Scientific American Publ.
[11] Principles of Genome analysis, Primrose, Oxford University Press, 1998.

Course Code	Title of the Course	Credits
BCC220	PHARMACEUTICAL BIOCHEMISTRY	4

COURSE OUTCOME(S):

CO1 Identify the details of ADME mechanism of drugs

CO2 Learn in details with application, if applicable, Drug receptor interactions

CO3 Deliberate in details with application, if applicable, Mode of action of anti cancer drugs

CO4 Write down in depth Drug tolerance and abuse

		No. of Lectures
Unit I:		**10**
1.1	**Drugs**	
1.1.1	Drugs: History of Drugs Classification of drugs, routes of drug administration, absorption and distribution of drugs.	
1.1.2	Factors influencing drug absorption and elimination of drugs.	

Unit II:		**14**
2.1	**Drug Receptor and Metabolism**	
2.1.1	Drug-Receptor interactions involvements of binding forces in drug receptor interaction, drug action not mediated by receptors.	
2.1.2	Drug metabolism: Mechanism of phase I and II enzyme reactions, biochemical importance of xenobiotic metabolism.	

Unit III:		**12**
3.1	**Anticancer Drugs**	
3.1.1	Cancer: Cancer and principles of cancer chemotherapy, mode of action of anti cancer drugs.	
3.1.2	Antimetabolites, antibiotics, alkylating agents and other agents,	

Unit IV:		**12**
4.1	**Adverse Drug Reactions**	
4.1.1	Adverse drug reactions and drug induced side effects.	
4.1.2	Biological effects of drug abuse and drug dependence.	
4.1.3	Drug tolerance and intolerance.	

References

[1] The Pharmacology volume I and II –Goodman and Gillman
[2] Basic Pharmacology –Foxter Cox
[3] Oxford text book of Clinical Pharmacology and Drug Theraphy ,D.G Grahme Smith and J.K.Aronson
[4] Pharmacology and Pharmatherapeutics – R.S.Satoskar,S.D.Bhandhakarand
[5] Essentials of Pharmacotherapeutics ,Barav.F.S.K
[6] Lippincotts illustrated review Pharmacology, Mary.J.Mycek,Richards ,Pamela

Course Code	Title of the Course (Open Elective)	Credits
BCC630	NUTRITION AND HEALTH	4

COURSE OUTCOME(S):

CO1 Identify the details of basic concepts of nutrition

CO2 Learn in details with application, if applicable, nutrients

CO3 Deliberate in details with application, if applicable, nutrition associated problems

CO4 Write down in depth social health problems

		No. of Lectures
Unit I:		**10**
1.1	**Basic Concepts in Nutrition**	
1.1.1	Understanding relationship between food, nutrition, health and food pyramid.	
1.1.2	Functions of food: Physiological, psychological and social Basic food groups and concept of balanced diet	
1.1.3	Energy: Functions, sources and concept of energy balance.	
1.1.4	Nutritional requirements: Physiological considerations and nutritional concerns for the following life stages: Adult man / woman Preschool children Adolescent children Pregnant woman, Nursing woman and infant Geriatrics	

Unit II:		**14**
2.1	**Nutrients**	
2.1.1	Functions, Recommended Dietary Allowances, dietary sources, effects of deficiency and/ or excess consumption on health of the following nutrients: Carbohydrates and dietary fibre Lipids Proteins Fat soluble vitamins: A, D, E and K Water soluble vitamins: Thiamin, Riboflavin, Niacin, Pyridoxine, Folate, Vitamin B12 and Vitamin C Minerals: Calcium, Iron, Zinc and Iodine	
2.1.2	Gut Microbiome	

Unit III:		
3.1	**Nutritional problems, their implications and related nutrition programmes**	
3.1.1	Etiology, prevalence, clinical features and preventive strategies of Undernutrition: Protein energy malnutrition, nutritional anemia's, vitamin A deficiency and iodine deficiency disorders Overnutrition: Obesity, Coronary Heart Disease and Diabetes	**14**
3.1.2	National Nutrition Policy and Programmes: Integrated Child Development Services (ICDS) Scheme Mid day Meal Programme (MDMP) National programmes for prevention of Anemia Vitamin A deficiency and Iodine Deficiency Disorders	

Unit IV:		
4.1	**Social health problems**	
4.1.1	Smoking Alcoholism AIDS including AIDS Control Programme	
4.1.2	Nutrition for special conditions: Nutrition for physical fitness and sport, BMI Feeding problems in children with special needs Considerations during natural and man-made disasters e.g. floods, war. Basic guidelines in disaster management	**10**

References

[1] Text Book f Biochemistry with Clinical correlations; Thomas Devlin [Ed.] (1997), Wiley –Liss.

[2] Harper's Review of Biochemistry, Murray et. al., (1997) 24th Edn., Lange

[3] Bryan Derrickson, Gerard J Tortora Principles of Anatomy and Physiology , twelfth Ed, 2011, Wiley & Sons Limited.

[4] Bamji MS, Krishnaswamy K and Brahmam GNV (Eds) (2009). Textbook of Human Nutrition, 3rd edition. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

[5] Mudambi, SR and Rajagopal, MV. Fundamentals of Foods, Nutrition and Diet Therapy; 2012; New Age International Publishers

[6] Wardlaw GM, Hampl JS. Perspectives in Nutrition; Seventh Ed; 2007; McGraw Hill.

[7] Swaminathan M. Handbook of Foods and Nutrition; Fifth Ed; 1986; BAPPCO.

[8] Suri S. and Malhotra A. Food Science, Nutrition & Food Safety Pearson India Ltd. 2014.

[9] Edelstein S, Sharlin J (ed). Life Cycle Nutrition- An Evidence Based Approach; 2009; Jones and Barlett Publishers.

[10] ICMR (1989) Nutritive Value of Indian Foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad.

[11] ICMR (2011) Dietary Guidelines for Indians – A Manual. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad

[12] World Health Organization (2006). WHO Child Growth Standards: Methods and development: Length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age (d).

[13] Lakra P, Singh MD. Textbook of Nutrition and Health; First Ed; 2008; Academic 14 Excellence

Course Code	Title of the Course	Credits
BCD010	MOLECULAR BIOLOGY AND GENE REGULATION	4

COURSE OUTCOME(S):

CO1 Write down the characteristics of DNA characteristics and replication

CO2 Write down in depth Transcription and regulation

CO3 Learn in depth translation

CO4 Identify in depth translational regulation

		No. of Lectures
Unit I:		**14**
1.1	**DNA Replication and Gene Expression**	
1.1.1	Introduction: Historical perspective, types of RNA, Central dogma of molecular biology.	
1.1.2	DNA Replication: Nearest neighbor base frequency analysis. Replication of DNA semiconservative model-Meselson and Stahl experiment. Direction of replication of *E.coli*, discontinuous replication–Okazaki fragments.	
1.1.3	Composition and properties of DNA polymerase I, II and III. of *E.coli* DNA ligase, fidelity of replication. DNA topoisomerases and gyrases.	
1.1.4	Replication in viruses single stranded DNA virus, ϕX174, rolling circle model. Replication of mitochondrial DNA.	
1.1.5	Organization of prokaryotic and eukaryotic gene–promoters, introns, exons, other regulatory sequences, enhancers, silencers, function of introns.	
1.1.6	Regulation of Gene expression in prokaryotes: Operon model–Lac operon–structure and regulation; Galactose operon–role of two promoters; Arabinose operon–positive control; tryptophan operon–attenuation control.	
1.1.7	Regulation of gene expression at the level of DNA structure: Super coiling, DNA methylation, role of nucleosome structure of eukaryotic DNA in gene expression–eg. glucocorticoid gene, chromatin remodeling	

Unit II:		
2.1	**Transcription and Regulation**	
2.1.1	Transcription: RNA biosynthesis in prokaryotes and eukaryotes- initiation, elongation and termination. RNA polymerase I, II and III. RNA dependent RNA synthesis - RNA replicase of QB virus.	
2.1.2	Processing of eukaryotic mRNA–cap addition, poly A tail addition, intron splicing, RNA editing. Processing of t–RNA.	**10**
2.1.3	Regulation at the level of transcription: Transcription factors, TF II. Formation of initiation complex. Role of enhancers	
2.1.4	Regulation at the level of RNA processing: RNA export and RNA stability. Factors affecting RNA stability. RNA degradation.	
Unit III:		
3.1	**Translation**	
3.1.1	Translation: Genetic code, triplet codon, Universality features of the genetic code, assignment of codons studies of Khorana, Nirenberg, triplet binding techniques, degeneracy of codons, wobble hypothesis, evolution of genetic code and codon usage, variation in the codon usage.	
3.1.2	3D structure of prokaryotic and eukaryotic ribosomes, Translation: initiation, elongation and termination. Role of m–RNA and t–RNA; aminoacyl t–RNA synthetase and its role in translation accuracy, signal sequence, translational proof-reading, translational inhibitors.	
3.1.3	Post translational modification of proteins–signal peptide cleavage, disulphide bond formation, O–and N–Glycosylation, folding of nascent protein, role of chaperones, attachment of glycosyl anchor, and other modifications.	**12**

Unit IV:		
4.1	**Translational Regulation**	
4.1.1	Regulation at the level of translation: Secondary structure in the 5' and 3' untranslated region–eg. Regulation of Ferritin and Transformation of m-RNA. Role of upstream AUG codons. (eg. GCN 4 gene regulation), transplicing and translational introns, protein splicing introns.	**12**
4.1.2	Role of ribosomes in the regulation of translation: Proof–reading mechanism. Ribosomal optimization of translation. Regulation at the level of ribosome assembly. Regulation at the level of post-translational modification, protein stability, N–end rule, PEST and other sequences	

References

[1] Molecular Biology of the Cell, Alberts et al., Garland Publications, (2012).
[2] Molecular Biology, David Freifelder, Narosa Publishers, (1997).
[3] Molecular Biology Robert F. Weaver, McGraw Hill (2012).
[4] Molecular Biology of Gene; Watson, J.D. et al., 5th Edn. Pearson Education; (2004).
[5] Principles of Virology; S.J. Flint et al., ASM Press (2000).
[6] Biochemistry and Molecular Biology; 5th Edn. D.Papachristodoulou, A. Snape, W.H. Elliott, and D. C. Elliott Oxford University Press (2014)
[7] Chromatin structure and Gene Expression; 2nd Edn. Sarah Elgin, Jerry Workman, Oxford University Press (2000)
[8] Molecular Cell Biology; Harvey Lodish 5th Edn. (2010)
[9] Biochemistry 5th Edn. Jeremy M. Berg, John L. Tymoczko, Lubert Stryer (2011).
[10] Genome Stability: DNA Repair and Recombination; James Haber, Garland Science (2013)

Course Code	Title of the Course	Credits
BCD070	GENETICS AND GENETIC ENGINEERING	4

COURSE OUTCOME(S):

CO1 Deliberate in details with examples gene organization

CO2 Understand the classification and characteristics of population genetics

CO3 Deliberate the details of cloning vectors

CO4 Understand the details of applications of genetic engineering

		No. of Lectures
Unit I:		**12**
1.1	**Mendelism and Gene Organization**	
1.1.1	Basic principles of Mendelism–Laws of inheritance, dominance, codominance, epistasis, (eg. Comb shape in chickens). Pleiotropism. Cytoplasmic inheritances (eg. Shell Coiling)	
1.1.2	Organisation of genes in chromosomes–Single copy gene, gene families, tandemly repeating genes, pseudo genes	
1.1.3	Chromosome number–Ploidy, karyotyping, sex chromosome and dosage compensation. Mobile genetic elements,	
1.1.4	Chromosomal basis of human diseases–Extra or missing chromosome, abnormality in chromosome structure–deletion duplication, inversion and translocation.	
1.1.5	Gene and development–Model systems for studying development in Drosophila, genetic control of development in Drosophila, anteroposterior axis, specification role of maternal genes, segmentation of larval body, gap genes, pair rule genes, homeotic genes, complex gene interaction in development, sequential gene action.	

Unit II:		**12**
2.1	**Population Genetics and Mutations**	
2.1.1	Population Genetics–Genetic variation, Hardy–Weinberg Law, genetic frequency, migration, genetic equilibrium	
2.1.2	Mutations- nature of mutations–spontaneous and induced mutation, conditional lethal (eg. Temperature sensitive) mutation. Biochemical basis of mutation. Point mutation, base substitution mutation, missense, nonsense and silent mutations. Mutation rates. Chemical mutagens, radiation induced mutation, reverse mutations and suppressor mutations–intergenic and intragenic suppression, reversion as a means of detecting mutagens - Ames test	
2.1.3	Repair Mechanism–DNA repair mechanisms. Reciprocal	

	recombination, site specific recombination, *E. coli* rec system. Holliday model of recombination, SOS repair.	

Unit III:		
3.1	**Cloning Vectors, Gene Transfer and Sequencing Methods**	
3.1.1 3.1.2 3.1.3 3.1.4	Introduction to genetic engineering: Basic steps of gene cloning, enzymes used in genetic engineering. Cloning vectors: Plasmids, Phages, Cosmids, Phagemids, Yeast vectors, Shuttle vectors, Ti Plasmids, Ri plasmids. Methods of gene transfer. Isolation and purification of cellular and plasmid DNA. Methods for labeling nucleic acids and probes. Methods of DNA sequencing. DNA Microarray	**08**

Unit IV:		
4.1	**Amplification & Applications of Genetic Engineering**	
4.1.1 4.1.2 4.1.3	Amplification of DNA by PCR technique and applications. *Insitu* hybridization, analysis of DNA,RNA and protein by blotting techniques. Marker and Reporter genes. Applications of genetic engineering: Transgenic plants and animals DNA vaccines Gene therapy	**16**

References

[1] Singh, J.S., Singh, S.P. and Gupta, S. (2006) Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi

[2] Wilkinson, D.M. (2007). Fundamental Processes in Ecology. An Earth System Approach. Oxford.

[3] Daubenmier, R.F. (1970). Plants and Environment: A text book of Plant Autoecology, Wiley Eastern Private Limited

[4] Daubenmier, R.F. (1970), Plant Communities, Wiley Eastern Private Limited

[5] Odum, E. (2008) Ecology. Oxford and IBH Publisher.

[6] Sharma, P.D. (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut.

[7] Tom Strachan & Andrew P.Read 1999. Human Molecular Genetics (2nd Edition), John Wiley & Sons.

[8] Ricki Lewis, 1998. Human Genetics-Concepts & Applications (3rd Edition), McGraw-Hill.

[9] T. A. Brown, 1999. Genomes, John Wiley & Sons (Asia) PTE Ltd.

[10] Scott Freeman & Jon C. Herron, 2001. Evolutionary Analysis (2nd Edition), Prentice Hall.

[11] Garner E.J, Simmons, M.J. & Snustad, D.P.1991. Principles of Genetics, John Wiley & Sons Inc, N.Y

[12] Watson, J.D., Hopkins, N. H., Roberts, J. W. Steitz & Weiner, A. M., 1987. Molecular Biology of the Genes, The Benjamin/Cummings Publishing Company Inc., Tokyo.

Course Code	Title of the Course	Credits
BCD060	PROJECT WORK OR DISSERTATION	8

COURSE OUTCOME(S):

CO1 Identify the classification and characteristics of literature survey

CO3 Learn in depth define of objective of project work

CO3 Write down the classification and characteristics of design of experimental methods

CO4 Understand the details of result analysis and interpretation

BLUE PRINT OF QUESTION PAPER FOR C1 & C2 COMPONENT

JSS Mahavidyapeetha

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous) B N Road, Mysuru - 25

M.Sc. Biochemistry

I/II/III/IV Semester First/Second Internal Assessment Test (Component 1/2)

Title of the Course & Code

Duration: 1hr **Max Marks: 20**

A) Answer any FOUR of the following **4X2=08**

1.
2.
3.
4.
5

B) Answer any ONE of the following **4X1=04**

1.
2.

C) Answer any ONE of the following **8X1=08**

1.
2.

BLUE PRINT OF QUESTION PAPER FOR C3 COMPONENT

JSS Mahavidyapeetha

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous), Ooty Road, Mysuru – 570025

M.Sc Degree

I/II/III/IV Semester Examination, _____

BIOCHEMISTRY

Course Title & QP Code

Time: 3 Hours Max. Marks: 70

Instructions to Candidates: **Answer any Five questions from Part – A**
Any Four questions from Part – B
Any Three questions from Part – C

Part – A 2X5=10

1.
2.
3.
4.
5.
6.
7.

Part – B 6X4=24

8.
9.
10.
11.
12.
13.

Part – C 12X3=36

14.
15.
16.
17.
18.

CHOICE BASED CREDIT SYSTEM AND
CONTINUOUS ASSESSMENT AND GRADING PATTERN

SYLLABUS FOR

MASTER'S DEGREE PROGRAM IN BIO-TECHNOLOGY

(2018-19 ONWARDS)

JSS COLLEGE OF ARTS COMMERCE AND SCIENCE
(An Autonomous College of University of Mysore; Re-Accredited by NAAC with 'A' Grade)

POSTGRADUATE DEPARTMENT OF STUDIES IN BIO-TECHNOLOGY
Ooty Road, Mysore – 570 025, India

POSTGRADUATE DEPARTMENT OF STUDIES IN BIOTECHNOLOGY

Choice Based Credit System and Continuous Assessment and Grading Pattern Syllabus

M.Sc., PROGRAM IN BIOTECHNOLOGY

Scheme of Study – 2018-19 onwards

Credit matrix for Master's Degree Program in Biotechnology

Credits to be earned	I Sem	II Sem	III Sem	IV Sem	Total Credits
Hard Core Course	12	12	12	16	52
Soft Core Course	08	08	04	–	20
Open Elective Course	–	–	04	–	04
Semester Total	**20**	**20**	**20**	**16**	**76**

I SEMESTER			
Course title	**Hard Core(HC)/ Soft Core(SC)**	**Credit pattern (L:T:P)**	**Credits**
Biomolecules and Bioenergetics	HC	3:1:0	4
Bioanalytical Techniques	HC	3:1:0	4
Lab – I	HC	0:0:4	4
Choose any TWO from the following 1. Molecular Genetics 2. Microbiology 3. Cancer Biology 4. Cell Biology	SC	3:1:0	4
	SC	3:1:0	4
NON CREDIT COURSES			
Communication Skills			
		Total credits	**20**

II SEMESTER			
Course title	**Hard Core(HC)/ Soft Core(SC)**	**Credit pattern (L:T:P)**	**Credits**
Molecular Biology	HC	3:1:0	4
Immunology and Immunotechnology	HC	3:1:0	4
Lab – II	HC	0:0:4	4
Choose any TWO from the following 1. Cell Signalling and communication 2. Metabolomics 3. Food and Environmental Biotechnology 4. Pharmaceutical Biotechnology	SC	3:1:0	4
	SC	3:1:0	4
NON CREDIT COURSE			
Employability Skills			
		Total credits	**20**

III SEMESTER			
Course title	**Hard Core(HC)/ Soft Core(SC)/ Open Elective(OE)**	**Credit pattern (L:T:P)**	**Credits**
Bioprocess Engineering and Technology	HC	3:1:0	4
Genetic Engineering	HC	3:1:0	4
Lab – III	HC	0:0:4	4
Choose any ONE from the following 1. Biostatistics, Bioinformatics and Bioentrepreneurship 2. Clinical and Advanced Techniques in Biotechnology	SC	4:0:0	4
Applied Biotechnology * **(For other discipline students)**	OE	4:0:0	4
		Total credits	20
IV SEMESTER			
Course title	**Hard Core(HC)**	**Credit pattern (L:T:P)**	**Credits**
Plant Biotechnology	HC	3:1:0	4
Animal Biotechnology	HC	3:1:0	4
Project Work/Dissertation	HC	0:4:4	8
		Total credits	**16**
		Total credits to be earned for M.Sc. Biotechnology	**76**

∗ Open Elective Course shall be from different discipline of study

1. A student opting I, II and III semester has to appear for at least 12 credits. (Soft core course may be studied any time).
2. Minimum number of students per Soft core course is 15.

L – Lecture – 1 credit = 1 hour

T – Tutorial – 1 credit = 2 hours

P – Practical – 1 credit = 2 hours

ASSESSMENT:

Continous Assessment: C1 – 15% & C2 – 15% (at the end of 8th and 16th week respectively)

Assessment	**IA Test (20 Marks)**	**Assignment (5M)**		**Total (25 Marks)**	**Total reduced to 15 Marks**
		a - Collection of material - 2.5 Marks	b - Prepartion of report - 2.5 Marks		
C1					
C2					

Semester End Assessment: C3 – 70% – By written exam.

Conversion of grades in to credits should be based on relative evaluation calculations.

Program: M.Sc. Biotechnology

Program outcomes (PO):

PO1: To make the students develop interpersonal skills, written and oral communication and also to improve their body language and eye contact during presentations.

PO2: To train the students in group discussions to develop leadership qualities and to respect the others idea and take the decisions for the welfare of society.

PO3: To teach the students not to demoralize the others ideas and not to differentiate the intelligent and the ignorant, poor and the rich and to uphold the moral values in the society.

PO4: Upon completion of course students will have the ability to design the experiments to solve the current problems in the society related to health, environment and industries.

PO5: To make the students competent enough to write the research papers, project proposals and application of mathematics in understanding biological science.

Program Specific Outcomes (PSO):

PSO1: To make the students understand the nature, bio-molecules, their analysis and application in day to day life, so that we are transforming knowledge from nature to lab and lab to beside.

PSO2: Higher studies like M.Phil and Ph.D can be pursued to attain research positions.

PSO3: Various examinations such as CSIR-NET, ARS-NET GATE, ICMR, DBT and many other opens channels for career development.

PSO4: Students have various opportunities in different industrial sector.

PSO5: Several career opportunities are available for students with biotechnology background abroad

PSO6: In practical we teach the students to follow the standard operating procedures of the equipment, troubleshooting the problems and analyse and interpretation of data.

PSO7: To train the students regarding bio-safety in handling corrosive, explosive and radioactive and bio-hazardous compounds.

I SEMESTER

BIOMOLECULES AND BIOENERGETICS (HARD CORE) - 48 Hrs

COURSE CODE: BTA040

Course Outcome

CO1-Study of different biomolecules

CO2-Metabolism and their regulation

CO3-Enzymes and their role in metabolism

CO4- Application of thermodynamics to understand the basic concepts of life.

Unit – I **12 Hrs**

Chemical basis of life; Composition of living matter; Water – properties, pH, ionization and hydrophobicity; Emergent properties of biomolecules in water; Biomolecular hierarchy; Macromolecules; Molecular assemblies; Structure-function relationships

Amino acids – structure and functional group properties; Peptides and covalent structure of proteins; Ramchandran's plot; Elucidation of primary and higher order structures; Evolution of protein structure; Structure-function relationships in model proteins like ribonuclease A, myoglobin, hemoglobin and chymotrypsin.

Unit – II **12 Hrs**

Enzyme catalysis – general principles of catalysis; Quantitation of enzyme activity and efficiency; Enzyme characterization and Michaelis-Menten kinetics; activation, inhibition (reversible & irreversible) and covalent modification; Single substrate enzymes; Bisubstrate reaction (ping-pong and sequential), Applications of enzymes (food& Pharmacy).

Unit – III **12 Hrs**

Sugars - mono, di, and polysaccharides; Suitability in the context of their different functions-cellular structure, energy storage, signaling; Glycosylation of other biomolecules - glycoproteins and glycolipids; Lipids - structure and properties of important members of storage and membrane lipids; lipoproteins

Unit – IV **12 Hrs**

Bioenergetics-basic principles; Equilibria and concept of free energy; Coupled processes; Glycolytic pathway; Kreb's cycle; Oxidative phosphorylation; Photophosphorylation; Elucidation of metabolic pathways; Logic and integration of central metabolism; entry/ exit of various biomolecules from central pathways; Principles of metabolic regulation; Regulatory steps;

Nucleosides, nucleotides, nucleic acids - structure, diversity and function

Texts/References

1. V.Voet and J.G.Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
2. A.L. Lehninger, Principles of Biochemistry, 4th edition, W.H Freeman and Company, 2004.
3. L. Stryer, Biochemistry, 5th edition, W.H. Freeman and Company, 2002.

BIOANALYTICAL TECHNIQUES (HARD CORE) - 48 HRS

COURSE CODE: BTA050

Course Outcome

CO1-To understand the separation of molecules by different chromatography, centrifugation and electrophorotic techniques

CO2-Analysis and characterization of molecules by spectroscopy techniques

CO3-Use of radioactive material in understanding metabolic pathways

Unit- I **12 Hrs**

Basic Techniques

Buffers; Methods of cell disintegration; Enzyme assays and controls; Detergents and membrane proteins; Dialysis, Ultrafiltration and other membrane techniques

Spectroscopy Techniques

UV, Visible and Raman Spectroscopy; Theory and application of Circular Dichroism; Fluorescence; MS, MALDI-TOF; NMR and Plasma Emission spectroscopy; Protein crystallization; Theory and methods; API-electrospray; Peptide Synthesis.

Imaging techniques: Compound microscope, fluorescent, phase contrast, TEM, SEM, cryo-electron microscope

Unit-II **12 Hrs**

Chromatography Techniques

TLC and Paper chromatography; Chromatographic methods for macromolecule separation - Gel permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography; HPLC and FPLC; Criteria of protein purity

Electrophorotic techniques

Theory and application of Polyacrylamide and Agarose gel electrophoresis; Capillary electrophoresis; 2DElectrophoresis; Gradient electrophoresis; Pulsed field gel electrophoresis

Unit- III **12 Hrs**

Centrifugation

Basic principles; (RCF, Sedimentation coefficient etc); Types of centrifuge -Microcentrifuge, High speed & Ultracentrifuges; Preparative centrifugation; Differential & density gradient centrifugation; Applications (Isolation of cell components); Analytical centrifugation; Determination of molecular weight by sedimentation velocity & sedimentation equilibrium methods

Unit- IV **12 Hrs**

Radioactivity

Radioactive & stable isotopes; Pattern and rate of radioactive decay; Units of radioactivity; Measurement of radioactivity; Geiger-Muller counter; Solid & Liquid scintillation counters (Basic principle, instrumentation & technique); Brief idea of radiation dosimetry; Cerenkov radiation; Autoradiography; Measurement of stable isotopes; Falling drop method; Applications of isotopes in biochemistry; Radiotracer techniques; Distribution studies; Isotope dilution technique; Metabolic studies; Clinical application; Radioimmunoassay

Texts/References

1. Freifelder D., Physical Biochemistry, Application to Biochemistry and Molecular Biology, 2nd Edition, W.H. Freeman & Company, San Fransisco, 1982.
2. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press, 2000.

3. D. Holme& H. Peck, Analytical Biochemistry, 3rd Edition, Longman, 1998.
4. R. Scopes, Protein Purification - Principles & Practices, 3rd Edition, Springer Verlag, 1994.
5. Selected readings from Methods in Enzymology, Academic Press.

LAB – I (HARD CORE)

COURSE CODE: BTA060

Course Outcome

CO1 - Course objective is to introduce the students to the fundamental experiments in the field of Biochemistry, Microbiology and Genetics.

CO2 - Students get the insight to operate simple equipments like colorimeter and spectrophotometer.

CO3 - Identification of microorganisms by morphology and staining techniques. Study of growth kinetics.

CO4 - In genetics students are exposed to know about culture and maintenance of *Drosophila melanogaster* (model organism), Study of mutants, salivary gland chromosome and karyotyping techniques.

Practicals/ Experiments

1. Good laboratory practices
2. Measurement of pH
3. Preparation buffers and solutions
4. Determination of pKavalues of amino acids
5. Estimation of reducing sugar by DNS method
6. Estimation of proteins by Lowry's method
7. Ascending, descending and circular paper chromatography for separation of amino acids (1D & 2D)
8. TLC of amino acids/lipids (1D & 2D)
9. HPLC
10. Estimation of ascorbic acid by DNPH method
11. Estimation of urea
12. Estimation of Phosphate
13. Gel electrophoresis- native and SDS-PAGE and determination of molecular weight of proteins
14. Salivary amylase assay, time kinetics, specific activity, determination of optimum temperature and pH; Effect chloride ions on salivary amylase activity
15. Determination of Km and Vmax. and activation energy for an acid phosphatase (from potato)
16. Effect of inhibitors on enzyme activity
17. Purification of amylase from sweet potatoes: Extraction, ammonium sulphate fractionation, gel filtration. Monitoring of enzyme activity, % activity and % recovery during purification
18. Preparation of liquid and solid media for growth of microorganisms
19. Isolation and maintenance of organisms by plating, streaking and serial dilution methods, slants and stab cultures, storage of microorganisms
20. Isolation of pure cultures from soil and water
21. Growth, growth curve; measurement of bacterial population by turbidometry and serial dilution methods. Effect of temperature, pH, carbon and nitrogen sources on growth.
22. Microscopic examination of bacteria, yeast and molds and study of organisms by gram stain, acid fast stain and staining for spores.
23. Assay of antibiotics and demonstration of antibiotic resistance.
24. Culture of Drosophila melanogaster and Observation of drosophila mutants
25. Isolation of salivary gland chromosomes
26. Biotech Industry and/ or R & D institution visit/s

MOLECULAR GENETICS (SOFT CORE) – 48 Hrs

COURSE CODE: BTA230

Course Outcome

CO1- To understand the molecular mechanism of inheritance

CO2-Mutation and DNA repair mechanism

CO3-Gene mapping and study of chromosomal abnormalities

CO4-Phylogenetics and micro-evolution

CO4-Development of an organism

Unit- I **12 Hrs**

Laws of inheritance in haploid organisms- *Chlamydomonas* and *Neurospora*, uniparental, maternal and cytoplasmic inheritance in yeast, *Neurospora*, paramecium and plants

Genomic organization: Prokaryotes, eukaryotes, viral genome, extrachromosomal genome-plasmids, mitochondria & chloroplast, repetitive elements- LINES and SINES, simple sequence repeats

Mobile genetic elements: discovery, insertion sequence in prokaryotes, complex transposons (Tn10, Tn5, Tn9 and Tn3 as examples), mechanisms, control, consequences and applications of transposition by simple and complex elements.

Unit – II **12 Hrs**

Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, Molecular basis of mutations,insertional mutagenesis

Recombination: Homologous and non-homologous recombination, Holliday model, site-specific recombination

DNA Repair: Mechanism of genetic repair- direct repair, photo reactivation, excision repair, mismatch repair, post-replicative recombination repair, SOS repair

Unit-III **12 Hrs**

Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.

Unit-IV **12 Hrs**

Genes and development: Model systems for studying development- *Drosophila, Caenorhabditis, Arabidopsis*.Genetic control of development in Drosophila: anterioposterior axis specification, role of maternal genes, segmentation of larval body, gap genes, pair rule genes, homeotic genes, complex gene interaction in development, sequential gene action. Floral meristems and floral development in *Arabidopsis.*

Human Genetics: Human chromosomes, karyotype – construction, characteristics, staining techniques and nomenclature; chromosomal abnormalities – sex chromosomal and autosomal, inherited disorders, genetic counselling, gene therapy; Human Genome Project, Human Genome Map.

Population Genetics: Genetic variation, Hardy-Weinberg Law, random mating, genetic frequency, natural selection, genetic drift, migration, genetic equilibrium.

Evolution:Molecular basis of evolution, Molecular clock, Molecular phylogenetics

Reference Books

1. Genetics. Strickberger, M. W., Prentice Hall of India Pvt. Ltd.
2. Genetics – A Molecular Approach. Brown, T. A. Chapman and Hall.
3. Genes VII. Lewin, B. Pearson Education International. 2003.
4. Genetics- A Conceptual Approach. Benjemin A Pierce.

CANCER BIOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1**-**Understanding the normal and cancerous cell

CO2-Protooncogens, tumor suppressor genes and apoptotic genes – regulation

CO3-Diagnosis and treatment of cancer

Unit-I

Cancer Biology: **12 Hrs**

Introduction, historical perspective, classification, Carcinogenesis, cancer initiation, promotion and progression, Cancer cell cycles, Genomic instability, Apoptosis, Genes and proteins as players in apoptosis, DNA viruses/ cell immortalization.

Unit-II **12 Hrs**

Cancer Genes I: Oncogenes and signal transduction

Cellular proto-oncogenes, oncogene activation, Growth factors, growth factor receptors, signal transduction , Transcription, Transcription factors and cancer, Retroviral oncogenes, Tumor suppressor, Tumor suppressor gene pathways, DNA methylation, epigenetic silencing of suppressor genes.

Unit-III **12 Hrs**

Understanding Cancer as a Disease: natural history of cancer development

Free radicals, antioxidants and metabolic oxidative stress and cancer, Epidemiology of selected cancers, Gene rearrangements, detecting oncogene abnormalities in clinical specimens, Cell: cell interactions, cell adhesion, angiogenesis, invasion and metastasis, Antiangiogenic therapy of cancer.

Unit-IV **12 Hrs**

Current concepts in cancer therapy

Strategies of anticancer chemotherapy, Strategies of anticancer gene therapy/translating therapies from the laboratory to the clinic, Gene discovery in cancer research, cancer genome anatomy project , Cancer immunity and strategies of anticancer immunotherapy, stem cells and their applications in cancer therapy.

Reference Books

1. Molecular Biology of the Cell. Bruce Alberts

MICROBIOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE: BTA240

Course Outcome

CO1- To understand the microbial taxonomy

CO2-Handling, preservation and sterilization of microbes

CO3-Microbial interactions with different hosts

CO4-Application of microorganisms in the field of agriculture, environment and health sciences

Unit-I **12 Hrs**

Microbial Diversity & Systematics

The beginning of microbiology: The discovery of the microbial world – Hook, Anton van Leeuwenhoek and Cohn; Contribution of Pasteur and Koch. Development of pure culture methods; the enrichment culture methods. Methods in Microbiology: Pure culture techniques; the theory and practice of sterilization.

Classical and modern methods and concepts; Domain and Kingdom concepts in classification of microorganisms; Criteria for classification; Classification of Bacteria according to Bergey's manual; Molecular methods such as Denaturing Gradient Gel Electrophoresis (DGGE), Temperature Gradient Gel Electrophoresis (TGGE), Amplified rDNA Restriction Analysis and Terminal Restriction Fragment Length Polymorphism (T-RFLP) in assessing microbial diversity; 16S rDNA sequencing and Ribosomal Database Project.

Unit-II **12 Hrs**

Microbial Growth & Physiology

Ultrastructure of Archaea (Methanococcus); Eubacteria (*E.coli*); Unicellular Eukaryotes (Yeast) and viruses (Bacterial, Plant, Animal and Tumor viruses); Microbial growth: Batch, fed-batch, continuous kinetics, synchronous growth, yield constants, methods of growth estimation, stringent response, death of a bacterial cell. Factors affecting growth like temperature, acidity, alkalinity, water availability and oxygen. Microbial physiology: Physiological adoption and life style of Prokaryotes; Unicellular Eukaryotes and the Extremophiles (with classical example from each group)

Unit-III **12 Hrs**

Microbial Interactions and Infection

Host–Pathogen interactions; Microbes infecting humans, veterinary animals and plants; Pathogenicity islands and their role in bacterial virulence. Chemotherapy/antibiotics: Types, mode of action, resistance to antibiotics.

Unit-IV **12 Hrs**

Microbes and Environment

Role of microorganisms in natural system and artificial system; Influence of Microbes on the Earth's Environment and Inhabitants; Ecological impacts of microbes; Symbiosis (Nitrogen fixation and ruminant symbiosis); Microbes and Nutrient cycles; Microbial communication system; Quorum sensing; Microbial fuel cells; Prebiotics and Probiotics.

Texts/References

1. Pelczar MJ Jr., Chan ECS and Kreig NR., Microbiology, 5th Edition, Tata McGraw Hill, 1993.
2. Maloy SR, Cronan JE Jr., and Freifelder D, Microbial Genetics, Jones Bartlett Publishers, Sudbury, Massachusetts, 2006.

3. Crueger and A Crueger, (English Ed., TDW Brock); Biotechnology: A textbook of Industrial Microbiology, Sinaeur Associates, 1990.
4. G Reed, Prescott and Dunn's, Industrial Microbiology, 4th Edition, CBS Publishers, 1987.
5. M.T. Madigan and J.M. Martinko, Biology of Microorganisms, 11th Edition, Pearson Prentice Hall, USA, 2006.

CELL BIOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-Understanding the structure and function of bacterial, plant and animal cell

CO2-Cell signalling and communication

CO3-Study of growth factors and their function

CO4-Tumor biology of a cell

Unit-I **12 Hrs**

Membrane and membrane phenomenon: Membrane structure and principles of organization, Membrane proteins, glycoproteins and glycolipids, specialization of plasma membrane, transport across cell membrane – types of transport, ion channels, active transport and ion pumps, symport, antiport, plant and prokaryotic membrane transport proteins. Cell organelle and membrane proteins: Mechanism and regulation of vesicular transport, Golgi and post golgi storing, receptor mediated endocytosis.

Unit-II **12 Hrs**

Microfilament, cell motility and cell shape: actin, actin architecture and assembly, myosin, muscle contraction, microtubules structure and dynamics, microtubule associated protein, cilia, flagella, intermediate filaments.

Multicellularity: Extracellular matrix, hyaluronan and proteoglycan, matrix proteins and their receptors, adhesive proteins, cell junctions, structure and function of plant cell wall.

Cellular signaling: Extra cellular signaling, G-protein linked receptors, role of cAMP, receptor tyrosine kinases, Ca^{2+} as a second messenger, multiplex signaling pathways, insulin receptor and regulation of blood glucose, regulation of cell surface receptors and transcription factors in signaling pathways, Chemical messenger – peptide and steroid hormones, mechanism of hormone action.

Unit-III **12 Hrs**

Growth factor: Growth factor structure (PDGF, VEGF), mechanism of action (PDGF, VEGF), receptors, signal transduction, plant growth factors and hormones – auxins, cytokinins and other

Cell Cycle: General strategy of cell cycle, discrete cell cycle events, cell cycle control, early embryonic cell cycle, yeast cell cycle, molecular genetics of cell cycle control, cyclins, cyclin dependent kinase, inhibitors, cell division control in multicellular organism, apoptosis.

Unit-IV **12 Hrs**

Tumor biology: Retroviruses, retro viral transformation of host, development and causes of cancer, proto-oncogene, conversion from proto-oncogene to oncogene, tumor suppressor gene, role of p53 in cancer, cell culture uses in research, molecular medicine and cancer.

Nerve cells: Action potential, voltage gated ion channels, nicotinic acetylcholine receptor, other neurotransmitters and their transporters, sensory transduction – the visual and olfactory system.

Reference Books

1. Molecular Biology of the Cell. Alberts, B., *et al.,* 4th Edition. Garland Publ. Inc.
2. Molecular Cell Biology. 5th Edn. Lodish, H., *et al.,* W H Freeman.
3. Genes VII. Lewin, B. Pearson Education International.
4. Cell and Molecular Biology. Karp, J. John Wiley and Sons Inc.

NON CREDIT COURSE

COURSE CODE:

Course Outcome

CO1-Interpersonal skills (body language, eye contact)
CO2-Presentation skills
CO3-Writing emails, research papers and proposals and business reports

Communication Skills Module

Business Etiquette – Video Conferencing (VC): Introduction to Video Conferencing; Concept & uses of VC; VC Etiquette

Business Communication: Seven Cs of communication: Complete, Courteous, Considerate, Clear, Concise, Concrete, Correct; Verbal/ Nonverbal Communication

Writing Process: Identifying objective; Categorizing Information; Organizational Patterns; Designing document; Memo writing; Revision checklist; Releasing document

Business Proposal & Report Writing: Types of Proposals; Top-Down & Bottom-Up Approach; Study of Technical Bid & Cost Bid; Transmittal Letters; Formal Reports (Short and Long); Types of graphics & illustrations; Business Report Templates; Study of Sample Proposals;

Project Report Writing: Project Charter; Project Plan; Gant Chart; Activities List; Resources List; Risks List, Project Status Report; Project Closure Report; Types of graphics & illustrations; Study of Project Report Templates

Email Writing: Problems resulting out of emails; Contents of email, Importance of a good subject line; Dos and Don'ts; Using your email software to its maximum; Setting up signatures; Setting up accounts; Creating HTML stationary; Creating email templates for common emails; Using short mails for internal communication; Importance of acknowledging emails; Creating folder structure for easily accessing emails; Care to be taken while deleting emails, Archiving emails; Comparison of emails and letters; Writing typical emails, sending point-wise reply to emails

Cross-Cultural Training: Cross-Cultural Sensitivity; American, European, Australian, Middle-east and South-East Asian countries culture training; Cultural Foundations; Cross Cultural Communication; Communication Styles; Comparative Values (American – Indian); Regional Dialects; Cross-Cultural Customer Attitude & Expectations

Interpersonal Skills: Introduction & Importance of Interpersonal Skills; Cost of Poor interpersonal skills; Standing up for self assertiveness; Strategies to achieve self-assertiveness; Managing conflicts, disputes; Dealing with Diversity Interpersonal Relationship and influence

II SEMESTER

MOLECULAR BIOLOGY (HARD CORE) – 48 Hrs

COURSE CODE: BTB020

Course Outcome

CO1- The student will get an idea about the genomic organization of prokaryotes and eukaryotes.

CO2-Obtain in depth knowledge of genetic code, DNA replication and transcription.

CO3-Understand principles, concepts of translation, post translation mechanism

CO4-Regulation of gene expression in prokaryotes and eukaryotes

CO5-Gain the insight into molecular mechanism of antisense molecules, inhibition of splicing and application of antisense and ribozyme technologies.

Unit-I **12 Hrs**

Genome organization:Organization of bacterial genome; Structure of eukaryotic chromosomes; Role ofnuclear matrixin chromosome organization and function; Matrix binding proteins; Heterochromatin and Euchromatin; DNA reassociation kinetics (Cot curve analysis); Repetitive and unique sequences; Satellite DNA;DNA melting and buoyant density; Nucleosome phasing; DNase I hypersensitive regions

DNA topology: Closed and super coiled DNA, DNA topoisomerases,

DNA replication: Enzymes in DNA replication, DNA Pol I, II III, replication in single stranded DNA viruses, replication in prokaryotes, eukaryotic DNA replication, eukaryotic polymerases, role of other proteins and enzymes in replication, fidelity of replication, replication of mitochondrial DNA, inhibitors of replication.

Unit- II **12 Hrs**

Genetic code: Elucidation, Contributions of Khorana and others, triple binding assay, Wobble hypothesis.

Transcription: Transcription unit, RNA polymerase in prokaryotes, mechanism of transcription-initiation, elongation and termination. Eukaryotic transcription - eukaryotic RNA polymerase, transcription factors, initiation, elongation and termination of transcription, inhibitors of transcription; post transcriptional modifications – capping, polyadenylation, splicing, introns and exons. Structural organization of mRNA, tRNA and rRNA, nuclear export of mRNA and mRNA stability

Unit-III **12 Hrs**

Translation: Molecular anatomy and biogenesis of ribosome, partial reconstitution experiments; Amino acid activation- amino acylation of tRNA; prokaryotic and eukaryotic translation– mechanism of initiation, elongation and termination, inhibitors of translation, post translational modifications, protein glycosylation.

Protein localization: Synthesis of secretory proteins and membrane proteins; import into nucleus, mitochondria, chloroplast and peroxisomes.

Regulation of gene expression in Prokaryotes: Basic control circuits, positive and negative regulation; Operon concept – *lac*, *ara* and *trp* operons- catabolite repression, regulatory elements in prokaryotes, attenuation, antitermination, regulation of gene expression in Bacteriophage.

Unit-IV **12 Hrs**

Regulation of gene expression in Eukaryotes: *cis* control elements – promoters, enhancers, *trans* acting factors, DNA binding motifs of transcription factors, mechanism of regulation by transcription factors, NFkB histone acetyl transferase and deacylase, hormonal regulation of gene expression, post transcriptional control.

Antisense RNA and ribozymes: Molecular mechanism of antisense molecules, inhibition of splicing, disruption of RNA structure, hammerhead, hairpin ribozymes, Application of antisense and ribozyme technologies. RNA interference, RNA induced gene silencing.

Reference Books

1. Molecular Biology. Freifelder, D. Narosa Pub House.
2. Advance Molecular Biology. Twyman, R. M. Viva Book Pvt. Ltd.
3. Molecular Biology. JD Watson
4. Molecular Biology of the Cell. Bruce Alberts.
5. Genes, Benjamin XII ,2017

IMMUNOLOGY AND IMMUNOTECHNOLOGY (HARD CORE) – 48 Hrs

COURSE CODE: BTB050

Course Outcome

CO1- Study basic concepts of immunology

CO2- MHC and their role in transplantion

CO3-Cytokines and their role in immune system

CO4-Tumor immunology

CO5-Autoimmune diseases

CO6-Hypersensitivity

CO7-Vaccine production.

Unit-I **12 Hrs**

Immune system: Structure, functions and organization of cells and organs involved in immune systems – T cells, B-cells, macrophages, Eosinophils, Neutrophils, Mast cells; bone marrow, spleen, thymus, lymph node, peyer's patch; Infections and immune responses – Innate immunity, acquired immunity; clonal nature of immune response; Immunohaematology – blood groups antigens, blood transfusion and Rh incompatibilities.

Antigens: Types, haptens, adjuvants, antigenic specificity.

Antibodies:Structure of immunoglobulins, heterogeneity, sub-types – iso-, allo- and idio- types and their properties

Unit-II **12 Hrs**

Complements: Structure, components, properties and functions of complement pathways, biological consequences of complement activation; Immunological diversity;

Effector mechanism: T-cell cloning, mechanism of antigen recognition by T-cells and B-lymphocytes and their properties, receptors and related diseases.

Role of class II MHC molecules in T-cell cloning, antigen specific and alloreactive T-cell cloning, applications of T-cell cloning in understanding relevant antigens and T-cell subtypes; T-cell cloning in vaccine development

MHC and Tumor immunology: Structure and function of MHC and the HLA system; regulation of Ir-genes; Tumor immunology– Tumor specific antigens, Immune response to tumors, theory of surveillance, immune diagnosis of tumor; Tumor markers – Alpha fetofoetal proteins, carcinoembryonic antigen

Unit-III **12 Hrs**

Immune responses and Transplantation: HLA and tissue transplantation; Tissue typing methods for organ and tissue transplantation in humans; Graft versus host rejection, Host versus graft rejection; Xenotransplantation; Immunosuppression theory; Autoimmune diseases – Hashimoto's disease, Systemic lupus erythematosis, Multiple sclerosis, Myasthenia gravis, Rheumatoid arthritis and the remedies.

Allergy: Type I – Antibody mediated – Anaphylaxis, Type II – antibody dependent – Cytolytic and Cytotoxic, Type III – Immune complex mediated reactions**–** Arthus reaction, serum sickness, Type IV– Cell mediated hypersensitivity reaction– Tuberculin type.

Unit-IV **12 Hrs**

Lymphokines and Cytokines– assay methods, related diseases; Immunological tolerance; production of interleukins and interferons– applications.

Immunizations: Conventional vaccines, sub-unit vaccines, DNA vaccines, toxoids, antisera; common immunization – small pox, DPT, hepatitis, polio, measles

Reference Books

1. Immunology. Roitt, Gower Medical Publisher.
2. Fundamental Immunology. Paul W E Raven Press.
3. Immunology. Kuby
4. Immunology, JanewasTraves, Walpart, SHlomehik. Churchill Livingstone.
5. An introduction to Immunology. Rao, C. V. Nasora pub house.
6. Immunology – A short course. Coico, R., Sunshine, G. and Benjamini, E. John Wiley and sons.
7. Cellular Interactions and Immunobiology. BIOTOL series. Butterworth-Heinemann.

LAB – II (HARD CORE)

COURSE CODE: BTB060

Course Outcome

CO1-Students are trained to get the skills in the field of Molecular biology and Genetic engineering

CO2- , Isolation and purification of nucleic acids and their quantification

CO3-Study of antigen and antibody interactions.

CO4 -Preparation of wine and analysis of food samples

Practicals/ Experiments

1. Identification of normal and abnormal human karyotype
2. Localization of Barr bodies
3. Estimation of free fatty acids by titrametric method
4. Saponification value for commercial oil samples
5. Determination of iodine value of an oil
6. Determination of total carbohydrates by phenol-sulphuric acid method
7. Estimation of cholesterol
8. *In vitro* transcription
9. Total RNA extraction
10. Estimation of DNA by Diphenylamine (DPA) method
11. Estimation of RNA by orcinol method
12. Isolation of DNA different samples: plant leaves, coconut endosperm, yeast, animal tissues
13. Determination of purity and concentration of isolated DNA using spectrophotometer
14. Agarose gel electrophoresis of DNA
15. Analysis of microbial quality of foods – Litmus test, catalase test and dye reductase test in milk, estimation of lactic acid in milk
16. Preparation of wine
17. Estimation of percentage of alcohol in wine
18. Chemical method to differentiate between ethanol from methanol
19. Estimation of total acids in wine
20. Conjugation
21. Phage titration
22. Preparation of antigen and antibody production
23. Purification of IgG/IgY
24. Slide agglutination test/blood grouping
25. Antibody labeling
26. Immunoprecipitation test- ODD
27. ELISA for quantification of an antigen
28. Lymphocyte preparation
29. Rossette assay
30. Rocket immunoelectrophoresis

Biotech Industry and/ or R & D institution visit

CELL SIGNALLING AND COMMUNICATION (SOFT CORE) – 48 Hrs

COURSE CODE: BTB220

Course Outcome

CO1- Understanding the multi-cellularity of organisms

CO2-role of extracellular matrix in signalling

CO3-various signalling pathways from the cell surface to the nucleus

CO4-cell signalling in plants

CO5-microbe-plant and insect-plant interaction.

Unit-I **12 Hrs**

Multicellularity: Role of Extracellular matrix - hyaluronan and proteoglycan. Matrix proteins and their receptors, adhesive proteins and cell junctions in multicellularity. Structure and function of plant cell wall

The importance of the matrix in signal transduction: Cell surface receptors as reception of extra-cellular signals, Amplification of signal during transmission - a quantitative study,Tyrosine kinase and tyrosine phosphatase, Cell membrane components and adapter proteins required for signal transmission, Upstream and downstream signal transduction without cell surface receptor activation, G-protein coupled signaling; the secondary messengers in signal transduction pathways cAMP, Ca^{2+}, Reactive Oxygen Species and Hypoxia Signalling, Apoptosis Signaling Transduction Pathway, PI3K/AKT Cell Survival Pathway.

Unit-II **12 Hrs**

Various signal transduction pathways from cell surface to nucleus: MAP kinase pathway, SAP/JNK pathway, p38 pathway, ERK pathway, NFkB pathway, Cell survival pathway, Wnt signaling pathway, Jak/Stat pathway, Smad pathway,TGF β Signaling, EGFR, VEGF And their Signalling, Cytoskeleton And Cell Signalling, Carbohydrate Recognition Signaling, MMPs And Cell Signalling, Cross talk among cell surface receptors, Cross talks among cytoplasmic components, Translocation of signal components during signal transmission, From cytoplasm to cell membrane, NF-κB Signaling from cytoplasm to nucleus, Cell cycle and its Signalling.

The end point of signal transduction--- gene transcription: Nuclear receptors and transcription factors in signalling, Signalling from single gene expression to multiple gene expression: Super array as a tool for the study of multiple gene transcription, Practical application of the signal transduction research, RNA Interference And Cell Signalling, Senescence and Its Signaling Pathways.

Unit-III **12 Hrs**

Signal transduction in plants: Cross-talk with the environment- wound and mechanical signalling - fatty acid signalling, peptide signalling, oligosaccharide signalling; protein kinases and signal transduction. Abiotic stresses - Dehydration-stress, salt-stress, cold acclimation, heat-stress

Role of active oxygen species (AOS) in plant signal transduction: AOS in plants, AOS as signal molecules, AOS-part of a signalling network.

Action of phytohormones: Multiple signals regulating growth and development of plant organs and their adaption to environmental stresses.

Unit-IV **12 Hrs**

Symbiotic plant-microbe interaction: Rhizospheric signals (PGPR) and early molecular events in the ectomycorrhizal symbiosis; Lipo-chito-oligosaccharides (LCO) signalling in the interaction between rhizobia and legumes; endophytes.

Recognition and defencesignalling in plant-microbe interaction: Resistance genes - gene-for-gene resistance; co-evolution and specificity of R genes; the TIR domain, the NBS domain; genetic organization of resistance genes; quorum sensing.
Plant-insect interaction: Induction of direct and indirect defence

Reference Books

1. Animal Cell Biotechnology – Methods and Protocols. Nigel Tenkins.
2. Molecular biology of the Cell –Alberts et al.
3. Molecular Cell Biology. 5th Edn. Lodish, H, et al., W H Freeman
4. Cell and Molecular Biology. Karp, J.JohnWiey and Sons In.
5. The Cell-Molecular approach. 4th Ed. Geoffrey M Cooper and Robert E Hausman.
6. Cell Biology- A Laboratory Handbook. 3rd Ed, 4th Vol, Julio E Celis

METABOLOMICS (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-Understanding the basic metabolism of plants

CO2-Different pathways involved in secondary metabolite production

CO3-Altering the metabolic pathways by changing the precussors

CO4-Purification of useful secondary metabolites and their kinetics and dynamics

CO5-Applications in food and pharmaceutical industries

Unit-I **12 Hrs**

Plant Metabolomics: Developments and history of plant metabolomics, Nature and prospecting of metabolism-related secondary plant products, tools and techniques, production in culture: optimization; selection, hormonal kinetics for secondary metabolites, production, mechanism and control.

Unit-II **12 Hrs**

Production of secondary metabolites: Induction, Alkaloids, antitumor compounds, food additives, steroids and saponins, detoxification of secondary metabolites, production of secondary metabolites by bioconversion, genetic transformation for production of secondary metabolites, large-scale production in bioreactors, Metabolomics-assisted breeding.

Unit-III **12 Hrs**

Microbial metabolomics: Systems biology of microbial metabolism; microbe sensors, *In silico* metabolomes, Food and Applied metabolomics, Biomarker discovery. Experimental Approaches-Genome sequencing, Gene expression arrays, Nuclear Magnetic Resonance, Mass spectroscopy, Capillary electrophoresis, Two dimensional gel electrophoresis, Gene expression arrays, Pathway analysis, HPLC, Protein sequencing, Bench-scale fermentation, AFLP/RLFP analysis.

Unit-IV **12 Hrs**

Pharmacometabolomics: personalized medicine and future of health system, Pathways discovery and disease pathophysiology, Bioinformatics analysis of targeted metabolomics; Environmental metabolomics, Bioactive compounds and Pharmacognosy, Clinical Applications of Metabolomics, Nutrigenomics and Metabolomics, Novel Technologies for Metabolomics, Data Handling for Metabolomics.

Reference Books

1. V.Voet and J.G.Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
2. A.L. Lehninger, Principles of Biochemistry, 4th edition, W.H Freeman and Company, 2004.

FOOD AND ENVIRONMENTAL BIOTECHNOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE: BTB210

Course Outcome

CO1-Comprehensive insight into the fermented foods and enzymes in food industry

CO2-Obtain knowledge of functional foods, genetically modified foods and nutraceuticals.

CO3-Students will be able to understand current status of biotechnology in environment protection.

CO4-Understand the principles of bioremediation and significance of GMO to the environment.

Unit-I **12 Hrs**

Fermented foods, milk-based products, fermented vegetables, fermented meats, fish, beverages, vinegar, mould fermentation - tempeh, soysauce, rice wine.

Enzymes in dairy industry, cheese making and whey processing, impact of enzyme technology (protein hydrolysates, bioactive peptides), Enzymatic processing of fruit juices; role of enzymes in baking, meat and meat processing, phytase in animal feeds, DNA-based methods for food authentication, comparative methods of toxicity testing in (novel) foods, biological approach to tailor-made foods, application of generic technologies in food and nutritional sciences; anti-cancer components in foods.

Unit-II **12 Hrs**

Functional foods and Biotechnology: applying molecular, biochemical, cellular and bioprocessing concepts, use of specific phenolic metabolites from botanical species. Pre- and Pro-biotics, single cell protein, single cell lipids. Manipulation of fruit ripening process.

Food processing, principles and practices, food ingredients and processing aids from biotechnological processes, corn sweeteners, bacterial starter cultures, Food spoilage, preservation, mycotoxins in food commodities. Genetically modified foods, designer foods, Nutraceuticals, detection of GM foods.

Unit-III **12 Hrs**

Renewable and non-renewable resources, current status of biotechnology in environment protection. Characterization of waste. Waste water management: Bioreactors for waste-water treatment, Aerobic biological treatments, anaerobic biological treatments, treatment of industrial effluents-dairy, distillery, paper and sugar industries. Membrane-based waste water treatment.

Oil pollution – treatment with microorganisms.

Unit-IV **12 Hrs**

Bioremediation: Concepts and principles, bioremediation using microbes, in situ and ex situ bioremediation, biosorption and bioaccumulation of heavy metals.

Xenobiotics: Degradation capabilities of microorganisms with reference to toxicology, pesticides, herbicides, polyaromatic hydrocarbons.

Renewable energy: Relevance of GMO to the environment.

Solid waste management: Waste as a source of energy, biotechnology in paper and pulp industry, production of oil and fuels from wood waste, anaerobic and aerobic composting, vermiculture, biofuels.

Reference Books

1. Food Microbiology. Frazier, W. C. and Westhoff, D. C. Tata McGraw Hill.
2. Agriculture Bio-technology. Purohit. Agrobios India.
3. Food Bio-technology. Knorr, D. Marcel Dekker Inc.
4. Environmental Bio-technology. Jogand, S. N. Himalaya Publishing House, New Delhi.

PHARMACEUTICAL BIOTECHNOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-Rules and regulation regarding development of drugs

CO2- Study of Pharmacodynamics and pharmacokinetics of drugs

CO3-Different phases of clinical trials and drug toxicity studies.

CO4-GMP and GLP in production management and quality control and assessment

Unit- 1 **12 Hrs**

Introduction to pharmaceuticals and Drug development process: Introduction to pharma industry, history of the pharmaceutical industry, traditional pharmaceuticals of biological origin (animal, plant and microbial)biopharmaceuticals and pharmaceutical biotechnology, age of biopharmaceuticals, biopharmaceuticals: current status and future prospects.

Steps involved in drug development process, drug delivery systems, preclinical studies and principles practices, phases of clinical trials. Regulatory authorities in India, USA and Europe and Japan, prescription, non- prescription drugs and orphan drugs.-

Unit-II **12 Hrs**

Drug Receptors, Pharmacodynamics and pharmacokinetics.: Different types of drug receptors, second messengers (cAMP, Ca2+ and phosphoinositides) and their signalling mechanism, relation between drug concentration and respose, concentration effect curves, concentration- effect curves, relation between drug dose and clinical responses.Volume of distribution of drug, clearance, drug accumulation, bioavailability, alternative routes of administration and the first pass effect, therapeutic drug monitoring

Unit-III **12 Hrs**

Drug biotransformation and drug toxicity:The role of biotransformation in drug disposition, phase I metabolism (microsomal oxidation, hydroxylation, dealkylation), phase II metabolism (Drug conjugation pathway) CYP families, clinical relevance of drug metabolism, drug-drug interaction.

Mechanisms of toxicity, production of toxic metabolites, harmful immune response, idiosyncratic toxicity, contexts of drug toxicity, drug overdose, drug- drug interactions, pathology of drug toxicity. Cellular toxicity, organ and tissue toxicity.

Unit-IV **12 Hrs**

The drug manufacturing process and drugs of biopharmaceutical origin: Guides to good manufacturing practice, manufacturing facility. Clean rooms, cleaning, decontamination and sanitations (CDS), CDS of the general manufacturing area, CDS of the Process equipment, generation of purified water, water for injection, documentation, specifications, Concept and testing of pre- formulations & their parameters. Tablets: Compressed, granulation, coatings, pills and capsules, parenteral preparations, herbal extracts, oral liquids, Ointments. Processing and packing instructions.

Therapeutic enzymes: asparginase, DNAse, Glucocerebrosidase, galactosidase and urate oxidase, superoxide dismutase, Lactase.

Reference Books

1. Textbook of Pharmaceutical Biotechnology. Chandrakant Kokate, Pramod H.J, SS Jalalpure. Elsevier Health Sciences, 2012
2. Pharmaceutical Biotechnology: Concepts and Applications. Gary Walsh. John Wiley & Sons, 2013
3. Pharmaceutical Biotechnology, Second Edition. Michael J. Groves. Taylor & Francis, 2005

NON CREDIT COURSE

EMPLOYABILITY SKILLS MODULE

COURSE CODE:

Course Outcome

CO1- Concepts of corporate communication
CO2- English grammar skills
CO3- Develop strategies for negotiation and marketing
CO4- Personality development and interview skills
CO5- This course will enable students to learn about the project management, entrepreneurship.

Campus to Corporate: Transition from College to Corporate world; Perceptions v/s Real Corporate life; Working in Teams; Basics of corporate communication

Corporate & Office Etiquette: Elements of a good handshake; Visiting cards exchange & How to manage business cards; Small Talk & Networking; Basics dining etiquette

English Grammar: A quick round up: Nouns, Pronouns, Adjectives, Verbs, Adverbs, Tenses, Prepositions, Clauses, Subject and Predicate, Punctuations, Subject- verb agreement, Confusing prepositions, Missing Articles, Editing paragraphs

Negotiation Skills: Introduction to Bargaining and Negotiation; The Negotiation Process: Four Stages; An Analytical framework of Negotiation; Bargaining Approaches; Strategy for Value Added Negotiation

Selection & Interviewing Skills: Current market for talent & methods for attracting & sourcing; Best practices for different hiring situations - Campus, Market, Head hunter agencies; Selection process design & assessment centers; Effective interview

Personality Development: Self assessment: SWOT; Understanding Personality - Identifying different personalities; Levels of Human Learning; Change v/s Transformation; Sensitivity - Sharpen your senses; Creativity and Lateral thinking; Developing Positive Mental Attitude; Emotional Quotient; Handling Criticism; Positive Health; Food habits and Meditation; Goal setting - Creative Visualization - Law of Attraction; Living a created life - Personal Leadership

III Semester

BIOPROCESS ENGINEERING AND TECHNOLOGY (HARD CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1-To have the **c**omprehensive insight into the different type of fermenter
CO2-To obtain knowledge of media design and industrial culture
CO3-Students will be able to understand different type of fermenter and bioreactor.
CO4-Understand the principles of downstream processing
CO5- To understand the enzyme technology and their applications in industry.

Unit-I **12 Hrs**

Basic principle of Biochemical engineering and Microbial Growth Kinetics:

General Introduction to metabolic pathways involved in microbial products, concepts of over production, primary and secondary metabolites, estimation of biomass. Isolation, screening and maintenance of industrially important microbes; Microbial growth kinetics, Strain improvement for increased yield and other desirable characteristics.

Batch culture, continuous culture, fed batch culture, the growth cycle, effect of nutrients, growth rate and cell cycle.

Unit II **10 Hrs**

Media design and industrial cultures: Introduction, typical media, Oxygen requirement, antifoams, media formulation, energy sources, carbon and nitrogen source, other components, media optimization , Media sterilization, Batch process (thermal death kinetics), continuous sterilization process. Sterilization of fermenter and other ancillaries, filter sterilization of air and media. Rheological properties of medium. Screening for industrial useful metabolites, maintenance of stock cultures

Unit III **10 Hrs**

Types of fermenters and bioreactors: design, control system, operation, optimization, control and monitoring of variables such as temperature, agitation, pressure, pH, online measurements and control, Scale up of bioreactors. Bubble column, airlift reactor, packed bed, fluidized bed, trickle bed, Membrane reactor, Photobioreactor, Solid state fermenter, Animal and plant cell bioreactors. Scale up and Scale down studies of bioreactors. Biosensor

Unit IV **16 Hrs**

Downstream processing (Recovery and purification of products) of biologicals: Separation of cells, foam separation, disintegration of micro organism, mechanical and non mechanical methods,flocculation, filtration, plate filters, rotary vacuum filters, centrifugation, Stoke's law, continuous centrifugation, basket centrifuge, bowl centrifuge, , membrane filtration, ultra filtration and reverse osmosis, chromatographic techniques, absorption, spray drying, drum drying, freeze drying.

Enzyme Technology: production, recovery, stability and formulation of bacterial and fungal enzymes-amylase, protease, penicillin acylase, glucose isomerase; Immobilised Enzyme and Cell based biotransformation steroids, antibiotics, alkaloids.

Texts/ References

1. Jackson AT., Bioprocess Engineering in Biotechnology, Prentice Hall, Engelwood Cliffs, 1991.
2. Shuler ML and Kargi F., Bioprocess Engineering: Basic concepts, 2nd Edition, Prentice Hall, Engelwood, Cliffs, 2002.

3. Stanbury RF and Whitaker A., Principles of Fermentation Technology, Pergamon press, Oxford, 1997.
4. Baily JE and Ollis DF., Biochemical Engineering fundamentals, 2nd Edition, McGraw-Hill Book Co., New York, 1986.
5. Aiba S, Humphrey AE and Millis NF, Biochemical Engineering, 2nd Edition, University of Tokyo press, Tokyo, 1973.
6. Comprehensive Biotechnology: The Principles, Applications and Regulations of Biotechnology in Industry, Agriculture and Medicine, Vol 1, 2, 3 and 4. Young M.M., Reed Elsevier India Private Ltd, India, 2004.
7. Mansi EMTEL, Bryle CFA. Fermentation Microbiology and Biotechnology, 2nd Edition, Taylor & Francis Ltd, UK, 2007.

GENETIC ENGINEERING (HARD CORE) - 48 Hrs

COURSE CODE:

Course Outcome

CO1-To have the **c**omprehensive insight into the different enzymes used in Genetic engineering lab

CO2-To obtain knowledge of construction of vectors

CO3-Students will be able to understand different type ofcloning methods.

CO4-Understand the principles of PCR& types

CO5- To know the different sequence methods

Unit I **10 Hrs**

Basics Concepts: DNA Structure and properties; Restriction Enzymes; DNA ligase, Klenow enzyme, T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase; CRISPR- cas9, Cohesive and blunt end ligation; Linkers; Adaptors; Homopolymeric tailing; Labeling of DNA: Nick translation, Random priming, Radioactive and non-radioactive probes, Hybridization techniques: Northern, Southern and Colony hybridization, Fluorescence in situ hybridization; Chromatin Immunoprecipitation; DNA-Protein Interactions-Electromobility shift assay; DNaseI footprinting; Methyl interference assay

Unit II **10 Hrs**

Cloning Vectors: Plasmids; Bacteriophages; M13 mp vectors; PUC19 and Bluescript vectors, Phagemids; Lambda vectors; Insertion and Replacement vectors; Cosmids; Artificial chromosome vectors (YACs; BACs); Animal Virus derived vectors-SV-40; vaccinia/bacculo & retroviral vectors; Expression vectors; pMal; GST; pET-based vectors; Protein purification; His-tag; GST-tag; MBP-tag etc.; Intein-based vectors; Inclusion bodies; Methodologies to reduce formation of inclusion bodies; Baculovirus and pichia vectors system, Plant based vectors, Ti and Ri as vectors, Yeast vectors, Shuttle vectors

Unit III **6 Hrs**

Cloning Methodologies: Insertion of Foreign DNA into Host Cells; Transformation; Construction of libraries; Isolation of mRNA and total RNA; cDNA and genomic libraries; cDNA and genomic cloning; Expression cloning; Jumping and hopping libraries; Southwestern and Far-western cloning; Protein-protein interactive cloning and Yeast two hybrid system; Phage display; Principles in maximizing gene expression

Unit IV **22 Hrs**

PCR and Its Applications: Primer design; Fidelity of thermostable enzymes; DNA polymerases; Types of PCR – multiplex, nested, reverse transcriptase, real time PCR, touchdown PCR, hot start PCR, colony PCR, cloning of PCR products; Tvectors; Proof reading enzymes; PCR in gene recombination; Deletion; addition; Overlap extension; and SOEing; Site specific mutagenesis; PCR in molecular diagnostics; Viral and bacterial detection; PCR based mutagenesis, Mutation detection: SSCP, DGGE, RFLP, Oligo Ligation Assay (OLA), MCC (Mismatch Chemical Cleavage, ASA (Allele-Specific Amplification), PTT (Protein Truncation Test)

Sequencing methods: Enzymatic DNA sequencing; Chemical sequencing of DNA; Automated DNA sequencing; RNA sequencing; Chemical Synthesis of oligonucleotides; Introduction of DNA into mammalian cells; Transfection techniques; Gene silencing techniques; Introduction to siRNA; siRNA technology; Micro RNA; Construction of siRNA vectors; Principle and application of gene silencing; Gene knockouts and Gene Therapy; Creation of knock out mice; Disease model; Somatic and germ-line therapy- in vivo and ex-vivo; Suicide gene therapy; Gene replacement; Gene targeting; Transgenics; cDNA and intragenic arrays; Differential gene expression and protein array.

Text/References

1. S.B. Primrose, R.M. Twyman and R.W.Old; Principles of Gene Manipulation. 6th Edition, S.B.University Press, 2001.
2. J. Sambrook and D.W. Russel; Molecular Cloning: A Laboratory Manual, Vols 1-3, CSHL, 2001.
3. Brown TA, Genomes, 3rd ed. Garland Science 2006
4. Selected papers from scientific journals.
5. Technical Literature from Stratagene, Promega, Novagen, New England Biolab etc.
6. Genes, Benjamin XII , 2017

LAB-III (HARD CORE)

COURSE CODE:
Course Outcome
CO1 -
CO2 -
CO3 -
CO4 -
CO5 -

Practicals/ Experiments

1. Animal cell culture: preparation of media, culture and maintenance of cell lines, trypsinization
2. Culture of transformed cells
3. MTT assay for cytotoxicity
4. Western blotting and detection
5. Study of fermenter (demo)
6. Immobilization of yeast by calcium alginate, gel entrapment and assay for enzyme *invertase*
7. Assay of catalase.
8. Study of alcohol fermentation – alcohol from different substrates – estimation of alcohol content
9. Solid state fermentation
10. Determination of the activity of enzyme protease
11. Determination of the activity of enzyme amylase
12. Estimation of Vitamin E
13. Estimation of Vitamin C
14. Estimation of aminoacid by ninhydrin method
15. Preparation of MS media
16. Induction of callus
17. Micropropagation
18. Suspension culture- production of secondary metabolites
19. Preparation of synthetic seeds
20. Database search for nucleotide and aminoacid sequences using BLAST
21. Study of sequence alignment
22. Construction of trees/dendrogram using sequence analysis
23. Structure prediction using homology searches
24. RAPD
25. Transformation
26. Bacterial gene expression
27. RFLP mapping
28. Isolation of plasmid DNA from *E.coli*
29. Restriction digestion of DNA
30. DNA ligation
31. production of citric acid by *A.niger* by submerged fermentation.
32. Estimation of citric acid by titrametric method
33. PCR
34. Isolation of antibiotic producing actinomycetes from soil sample

CLINICAL AND ADVANCED TECHNIQUE IN BIOTECHNOLOGY (SOFT CORE) – 48 Hrs

COURSE CODE:

Course Outcome

CO1**-**Diagnosis of diseases using enzymes as markers
CO2-analysis of blood and urine sample to interpret the diseases
CO3-Study of metabolic disorders and their diagnosis
CO4- Clinical trails of designed drugs/ biomolecules
CO5-Tools of Histopathalogy, Immunotechnology, microarray and DNA chips in understanding the diseases

Unit I **16 Hrs**

Diagnostic Enzymology: Mechanisms of elevated enzyme activities. Some important enzymes – alkaline phosphates, creatine kinase, LDH, AST, ALT – isozyme changes

Blood: Composition, cells, functions of plasma proteins and lipo proteins in diseases. Disorders of hemoglobin – Thalassemia, sickle cell anemia. Anemias – Microcytic, normocytic and macrocytic.

Advanced methods in clinical analysis: Blood, urine and quantitative determination of metal ions in body fluids

Liver: Biochemical indices of hepatobiliary diseases. Bile pigments – formation of bilirubin, urobilinogen bile acids, jaundice – pre-hepatic, hepatic and post-hepatic; liver function tests, diseases of the liver – hepatitis, cholestasis, cirrhosis, Gallstones.

Unit II **8 Hrs**

Kidney: Assessment of renal function – creatine clearance, renal calculi, uremia, laboratory investigation of kidney disorders.

Cardiovascular Disorders: major cardio vascular system – Atherosclerosis – risk factors, pathogenesis. Diagnosis and prognosis

Disorders of Amino Acid and nucleotide metabolism: Gout Lesch – Nyhan syndrome, orotic acid urea phenyl ketonuria, alkaptonuria, maple-syrup urine.

Clinical trails of designed drugs/biomolecules.

Molecular detection of diseases, Amniocentesis

Unit III **12 Hrs**

Microscopy: Phase Contrast Microscopy, Fluorescence Microscopy, Confocal and Inverted Microscopy), Electron Microscopy (Transmission Electron Microscopy, Scanning Electron Microscopy)

Diagnostics and immunological techniques: applications of immunological and molecular diagnostic methods (RIA, ELISA, PCR, DNA finger printing) in forensic science and disease diagnosis. *In vitro* antigen-antibody reactions, Coombs' test, complement titration test (Direct and indirect), Immunoflourescence, Immuno-enzymatic and ferritin technique, Immuno-electromicroscopy. Immuno-electrophoresis, Western blot analysis. Hybridoma technology – Monoclonal and polyclonal antibodies and their application

Unit IV **12 Hrs**

Nanobio-technology: Introduction, types and synthesis of nanomaterial, protein – based nano structures, DNA-based nano structures. Applications of nanomaterials, nano biosensors, drug and gene diversity, disease diagnostics, cancer therapy, risk potential of nanomaterials.

DNA chip technology and micro arrays: Types of DNA chips and their production, hybridization, application of micro arrays on DNA chips.

Genomic research: Methods for whole genome sequencing, genome sequence data, e-PCR, genome sequence to annotation- methods for annotation of genome sequence.

Reference Books

1. Biochemistry – With Clinical Correlations. Devlin.
2. Clinical Biochemistry. Latner.
3. Principles of Instrumental Analysis. 5th Ed. Douglas A Skoog, James Holler and Timothy A Nieman.
4. Analytical and Preparative Separation Methods of Biomacromolecules. Hassan Y Aboul – Enein.
5. Microbiology – Principles and Explorations. 5th Ed. Jacquelyn G Black.
6. Genetic Engineering: Primose, S. B.
7. An introduction to molecular Bio-technology (Ed.) Wink.
8. Principles of gene manipulation and genomics. Primose, S. B. and Twyman, R. M.
9. Gene cloning and DNA analysis an Introduction. Brown, T. A. Blackwell Science Company.
10. Molecular Biology and Biotechnology. Walker, J. M. and Rapley, R. Panima Publishing Corporation.
11. Molecular Biotechnology – Principles and application of Recombinant DNA. Glicks, R. Bernard and Pasternak, J. Jack. Panima Publishing Corporation.
12. Molecular Biomethods Hand Book. Rapley, R and Walker, M. Jhon. Humana Press.
13. Genes (VIII edition) Benjamin Lewin, Pearson Education International

BIOSTATISTICS, BIOINFORMATICS AND BIOENTREPRENEURSHIP (SOFT CORE) – 48 HRS

COURSE CODE:

Course Outcome

CO1-Application of statistics to understand and analyse the experimental results of biological sciences
CO2-retrival of biological data
CO3-phylogenetic analysis
CO4-primer designing
CO5-drug discovery and molecular docking

Unit I **12 Hrs**

Statistical concept: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart.

Measure of central frequency: **Mean, median, mode, mean deviation, standard deviation, standard error**

Types of distribution of data: Normal, binomial, Poisson, Z-test, t-test and ANOVA.

Correlation and regression

Unit II **18 Hrs**

Bioinformatics: Introduction, history, internet and bioinformatics, knowledge, discovery and data mining, problems faced in bioinformatics area, opportunities in bioinformatics, human genome project.

Biological databases and their management: database concept, introduction, history of databases, databases management systems, types of database, Codd rules, data normalization biological databases – introduction, application and its importance, biological database and their functioning, types of biological database, microbiological database, primary sequence database, carbohydrate database, RNA database, genome database, organism database, biodiversity.

Sequence database: Introduction, nucleotide sequence database, protein sequence database, the EMBL nucleotide sequence database, structure databases.

Bioinformatics software: Clustal V Multiple sequence alignment, Clustal W Version 1.7, Ras Mol, Oligo, Mol script, TREEVIEW, ALSCRIPT, genetic analysis software, Phylip.

Computational biology: Introduction, data mining and sequence analysis, database similarities searches, practical aspects of multiple sequence alignment, phylogentic analysis, predictive methods using nucleic acid and protein sequences, submitting DNA sequences to the databases.

Unit III **10 Hrs**

Innovation: Idea to enter into business, Designing and development of new products as per market demands and their future prospective. Needs of customer, branding, distribution, promotion and advertising.

Types of bio-industries and IPR: biopharma, bioagri and bioservices. IP protection & commercialization strategies- freedom to operate.

Accounting and Finance : Business plan preparation, contracts, partnerships, business feasibility analysis by SWOT, socio-economic costs benefit analysis; funds/support from Government agencies like MSME/banks and private agencies like venture capitalists:/angel investors for bio entrepreneurship; business plan proposal for virtual start up company. statutory and legal requirements for starting a company/venture; basics in accounting practices: concepts of balance

sheet, profit and loss statement, Valuation, Cash flow, double entry. Information technology for business administration and expansion. Technology transfer.

Incubation centres: Govt. (C-CAMP, KBITS, CFTRI) and Private incubation centres for start-ups.

Unit IV **8 Hrs**

Marketing : Market conditions, segments, prediction of market changes; identifying needs of customers; Market linkages, branding issues; developing distribution channels - franchising; policies, promotion, advertising; branding and market linkages for virtual start-up company.

Business Strategy & HR: Entry and exit strategy; pricing strategy; negotiations with financiers, bankers, government and law enforcement authorities; dispute resolution skills; external environment/ changes; avoiding/managing crisis; broader vision–global thinking; mergers & acquisitions.

Regulatory understanding:- GLP, GMP, GCP, PCB, IBSC, ISO

Bioentrepreneurship and case study: Importance of entrepreneurship; advantages of being entrepreneur - freedom to operate; introduction to bioentrepreneurship – biotechnology in a global scale; Scope in bioentrepreneurship; innovation – types, out of box thinking; skills for successful entrepreneur – creativity, leadership, managerial, team building, decision making, Risk assessment, opportunities for bioentrepreneurship- development programs of public and private agencies (MSME, DBT, BIRAC, Start-up & Make in India).

References:

1. Singh Narendra, Project management and control, (Himalaya publishing house)
2. Prasanna Chandra, Projects: Planning, Analysis, selection, implementation& review (Tata McGrow Hill)
3. P. GopalaKrishna& V.E. Rama Moorthy, Project management (Mac Millan India)
4. Chandra prasanna, proect preparation, Appraisal and Implementation (Tata Mcgrow Hill)
5. A. N. Desai, The dynamics of Entrepreneurial development and management (Himalaya publishing house)
6. Biostatistical Analysis. Zar J. H. Printice-Hall International.
7. Methods in Biostatistics. Mahajan, B. K. Smt. Hindu Mahajan
8. Bioinformatics. David W. Mount.
9. Bioinformatics A Practical Guide to the Analysis of Genes and Proteins Andreas D. Baxevanis and B. F. Francis Ouellette. A John Wiley & Sons, Inc., Publication.
10. Biostatistics. Daniel.
11. Handbook of Biostatistics A Review and Text. Christopher and Carvounis.

APPLIED BIOTECHNOLOGY (OPEN ELECTIVE) – 48 Hrs

Unit I **12 Hrs**

Scope of Biotechnology in India and Karnataka.

Structure of plant,animal and bacterial cells. Biomolecules and their importance.

Enzyme Biotechnology

Introduction to application of enzymes in industry: Food & beverage, detergent, textile pharmaceutical and leather.

Unit II **14 Hrs**

Applications of Plant Cell and tissue culture technology

Improvement of hybrids, encapsulated seeds, production of disease resistant, stress resistant plants, secondary metabolites from cell cultures

Transgenic plants for crop improvement, molecular farming from transgenic plants, edible vaccines. Bioethics in plant genetic engineering**.**

Unit III **10 Hrs**

Animal Cell Culture Techniques

Manipulation of reproduction in animals: Artificial insemination,embryo transfer, embryo splitting, embryo sexing

In vitro fertilization technology(IVF): Embryo cloning, embryonic stem cells Invitro-fertilization and embryo transfer in humans. Transgenic animals

Valuables products from animal cell culture (Tissue plasminogen activator, Blood factor VIII, erythropoietin.)

Hybridoma technology: Production of monoclonal and polyclonal antibodies and their applications. Bioethics in animal genetic engineeringcryopreservation, quantitation of cells, cytotoxicity assays.

Unit IV **12 Hrs**

Industrial and microbial biotechnology

Growth media, sources of nutrition, sterilization, design of fermenter, batch, fed batch and continuous culture.

Production of primary metabolites (vitamins, organic acids, alcohols and aminoacids). Production of secondary metabolites (antibiotics)

Biopesticides (Biological control of plant pathogens, pests and weeds.).

Biofertilizers (microbial inoculants)

Food Biotechnology – Genetically modified foods, Nutraceuticals, detection of genetically modified foods. Production of single cell proteins and mycoproteins.

Reference Books

1. Biotechnology. B. D. Singh
2. Biotechnology. R. C. Dubey

OPEN ELECTIVE –FUNDAMENTALS OF BIOINFORMATICS

Contact Hours/ Week	:	4	Credits	:	4
Total Lecture Hours	:	48			

Course Outcomes:

- Ability to use popular bioinformatics tools to generate biologically meaningful results
- Ability to interpret biological results generated by a bioinformatics tool
- Application of some basic models and algorithms
- The students will gain an understanding of the computational challenges (and their solutions) in the analysis of large biological data sets; they will understand how some of the commonly used bioinformatics tools work, how to use these tools effectively

Unit I **12 Hrs**

Introduction to Bioinformatics and Biological Database:

Introduction to bioinformatics, Review of Central Dogma, Genome organization -Prokaryotic and Eukaryotic. Overview of Genome Projects – Human genome project. Introduction to DNA and protein databases and their classification, file formats, information retrieval tools – Entrez, SRS, ARSA. Nucleotide and Protein sequence and structure databases (NCBI, EMBL, DDBJ and PDB). Focus on GenBank, UniProt, and Gene Ontology.

Unit II **12 Hrs**

Sequence Alignment and Database Similarity Searching:

Pairwise alignment: Alignment algorithm: Pairwise: Dot matrix method, Dynamic programming Method (Needleman-Wunsch & Smith Waterman), Scoring Matrices – PAM and BLOSUM, Database Similarity Searching: FASTA and BLAST. BLAST variants, Statistical parameters for BLAST output – e value, p value and Bit Score.

Unit III **12 Hrs**

Multiple sequence alignment:

Iterative, Progressive alignment. Application of MSA – 1. Phylogenetics – Phylogenetics Basics, Terminologies, Gene versus species phylogeny, Forms of tree representation: Maximum Parsimony and Distance methods 2. Gene prediction: Gene prediction in prokaryotes and eukaryotic 3. Protein Motif and Domain Prediction: Identification of Motif and Domains in MSA – PSSM and Profile HMMs.

Unit IV **12 Hrs**

Protein sequence analysis:

Analysis of Scalar parameters: Protparam and pepstats: Hydropathy analysis (Membrane protein prediction): Kyte-Doolittle plot, Helical Wheel representation. Secondary structure prediction, Protein structure building-Homology modelling (Comparative modelling only) – SWISS MODEL server and MODELLER, Protein Structure Visualization: Rasmol, Pymol, CN3D, Swiss PDB viewer, Chimera and Discovery studio visualizer

Applications of Bioinformatics: Bioinformatics in pharmacy: overview of drug discovery process, structure based and ligand-based drug design (CADD). Pharmacokinetics: absorption, distribution, metabolism, excretion and toxicity of drugs.

REFERENCE BOOKS:

1	David W Mount	"Bioinformatics sequence and Genome analysis", Cold Spring Harbor Laboratory Press, 2nd Edition, 2013, 9989332257358
2	Jin Xiong	Essentials Bioinformatics, Cambridge university press,3rd Edition, 2006, 9789335657325
3	Neil C. Jones and Pavel A. Pevzner	An Introduction to Bioinformatics Algorithms, MIT Press,5th Edition, 2005, 8789432449328
4	Steffen Schulze-Kremer	Molecular Bioinformatics: Algorithms and Applications, Walter de Gruyter, 4th Edition, 1996, 9789432449327
5	Attwood T K, D J Parry-Smith	Introduction to Bioinformatics, Pearson Education, 3rd Edition, 2005, 9789332447329
6	Michael R Barnes and Ian C grey	Bioinformatics for Geneticists, John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England
7	Rui Jiang, Xuegong Zhang. Michael Q. Zhang	Basics of Bioinformatics, Springer Heidelberg New York Dordrecht London,
8	Supratim Choudhuri	Bioinformatics for Beginners, Academic Press.
9	Peter Lake and Paul Crowther	Concise Guide to Databases. Springer London Heidelberg New York Dordrecht
10	Arthur M. Lesk	Introduction to Bioinformatics, Oxford University Press Inc., New York
11	Mahmood A. Mahdavi	Bioinformatics –Trends and Methodologies, InTech Janeza Trdine 9, 51000 Rijeka, Croatia
12	Catherine Hack and Gary Kendal	Bioinformatics: Current Practice and Future Challenges for Life Science Education: Biochemistry and Molecular Biology Education Vol. 33, No. 2, pp. 82–85, 2005
13	Teresa K. Attwood	The Babel of Bioinformatics, SCIENCE, Volume 290, Number 5491, Issue of 27 Oct 2000, pp. 471-473.

IV SEMESTER

PLANT BIOTECHNOLOGY (HARD CORE) – 48 Hrs

Unit I **10 Hrs**

Plant tissue culture-General: Historical background: Requirements for in-vitro culture- Tissue culture laboratory, Preparation of media, sterilization. Conventional plant breeding and plant tissue culture.

Cell and Tissue Culture Technology: **Role of hormones in growth and development of plants, tissue-specific hormones. Callus Induction, Organogenesis, Somatic embryogenesis, cell suspension culture and synthetic seeds**

Somaclonal variations: Isolation of somoclonal variants, Factors affecting somoclonal variants – applications

Micropropagation: Propagation from pre-existing meristem, shoot apical meristem, shoot and node culture, micropropagation stages and applications

Unit II **15 Hrs**

Germplasm preservation: cryopreservation, cryoprotectant, warming rate and recovery, gene banks, applications.

Seed Health Technology

Introduction: Importance of Seed health, important seed-borne diseases; Seed Health diagnostics; Management of seed-borne diseases.

Haploid Technology: Methods of haploid culture, Factors affecting anther and microspore cultures, applications. Cytoplasmic male sterility in Indian Mustard.

Protoplast Technology: Isolation, purification and culture of protoplasts, protoplast fusion and somatic hybridization, applications of somatic hybrids/ cybrids.

Secondary metabolite production: Induction of secondary metabolites by plant cell culture, technology of plant cell culture for production of chemicals, biotransformation using plant cell culture. Bioreactor systems and models for mass cultivation of plant cells.

Unit III **7 Hrs**

Plant transformation techniques: Methods of gene transfer in plants, *Agrobacterium* mediated transfer- mechanism of DNA transfer, general features of Ti and Ri plasmids, role of *vir* genes, design of expression vectors, use of promoters and reporter genes; viral vectors, direct gene transfer methods- electroporation, microinjection, particle bombardment, selection of transformants, screening and field trials.

Unit IV **16 Hrs**

Transgenic plants: Herbicide resistance, resistance against biotic stress- bacterial, viral, fungal and insect resistance, abiotic stress, improved crop productivity, improved nutritional quality, transgenic plants for floriculture, Qualitative trait loci and marker studies.

Growth- promoting bacteria in plants: Biological nitrogen fixation, genetic manipulation for nitrogen fixation. Biocontrol of phytopathogens.

Molecular farming: Transgenic plants as production systems-production of alkaloids, steroids, colouring agents, flavoring agents, biodegradable plastics, industrial enzymes, therapeutic proteins, biopharmaceuticals, edible vaccines, plantibodies.

Intellectual Property Rights (IPR): IPRs and agricultural technology- implications for India, WTO, WIPO, GATT, TRIPS. Plant Breeder's Rights, legal implications, commercial exploitation of traditional knowledge, protection. Ethical issues associated with consumption of GM food, labelling of GM crops and foods.

Reference Books

1. Plant Signal Transduction. Scheel D and Wasterpack C. Oxford University Press.
2. Introduction to Plant Pathology. Strange R N. John Wiley and Sons Ltd.
3. Applied plant virology. Walkey. Chapman and Hall London.
4. Molecular Plant Pathology by Agrios.
5. Plant Tissue Culture Concepts and Laboratory Exercise. Trigiano R. N. and Gray, D. L. CRC Press.
6. Plant Tissue culture – Supplement-7. Lindsey, K. Springer International Edition.
7. Introduction to Plant Tissue Culture. Razdon, M. K. Oxford and IBH Publishing Co. Pvt Ltd.
8. Introductory to plant physiology. Noggle, R., Fritz, J. G. Prentice Hall of India Pvt. Ltd.
9. Plant Molecular Biology – A Practical Approach. Shaw, C. H. Panima Publishing Corporation.
10. A Laboratory Manual of Plant Biotechnology. Purohit. Publisher Agrobios.
11. Introduction to Plant Biotechnology. Chawla, H. S.
12. Practical Application of Plant Molecular Biology. Henry, R. J. Chapman and Hall.
13. Plant Biotechnology – Laboratory manual. Chawla, H. S. Oxford and IBH publishing Co. Pvt. Ltd.
14. Biotechnology. Gupta, P. K. Rastogi Publications.
15. Biochemistry and Molecular Biology of Plants. Buchanan, Gmissem and Jones.
16. Genetic Engineering of Crop Plants. Lyrett, G. W., Grierson, D.
17. Plant Molecular Biology. Grierson and S. N. Covey.

ANIMAL BIOTECHNOLOGY (HARD CORE) – 48 Hrs

Unit I **10 Hrs**

Culture of animal cells: Advantages and limitations of tissue culture, aseptic handling, facilities required, media and cell lines. Primary culture: Isolation of mouse and chick embryos, human biopsies, methods for primary culture, nomenclature of cell lines, sub culture and propagation, immoretalization of cell lines, cell line designation, selection of cell line and routine maintenance.

Cloning and Selection: Cloning protocol, stimulation of plating efficiency, suspension cloning, isolation of clones, isolation of genetic variants, interaction with substrate, selective inhibitors.

Unit II **16 Hrs**

Cell separation and characterization: Density based, antibody based, magnetic and fluorescence based cell sorting. Characterization of cells based in morphology, chromosome analysis, DNA content, RNA and protein, enzyme activity, antigenic markers, cytotoxicity assays, cell quantitation, cell culture contamination: monitoring and eradication, cryopreservation.

Culturing of specialized cells: Epithelial, mesenchymal, neuro ectodermal, hematopoietic gonad and tumor cells, Lymphocyte preparation, culture of amniocytes, fish cells, confocal microscopy. Stem cell culture and its applications

Organic and embryo culture: Choice of models, organ culture, histotypic culture, filter-well inserts, neuronal aggregates whole embryo culture eggs, chick and mammalian embryos.

Unit III **16 Hrs**

Cell and Tissue engineering: Growth factors for *in situ* tissue regeneration, biomaterials in tissue engineering, approaches for tissue engineering of skin, bone grafts, nerve grafts. Hemoglobin based blood substitutes, bio antificial or biohybrid organs. Limitations and possibilities of tissue engineering.

In vitro **fertilization and Embryo transfer:** *In vitro* fertilization in Humans, Embryo transfer in Humans, Super ovulation and embryo transfer in farm animals e.g: Cow.

Cloning of Animals: Methods and uses. Introduction, nuclear transfer for cloning, cloning from-embryonic cells, adult and fetal cells. Cloning from short term cultured cells: cloning of sheep, monkeys, mice, pets, goats and pigs. Cloning from long term cultured cells: Cloning of cows from aged animals. Cloning efficiency, Cloning for production of transgenic animals, gene targeting for cloned transgenic animals, cloning for conservation, human cloning: ethical issues and risks.

Unit IV **6 Hrs**

Transfection methods and transgenic animals: Gene transfer or transfection, transfection of fertilized eggs or embryos, unfertilized eggs, cultured mammalian cells, targeted gene transfer. Transgenic animals and applications: mice and other animals, sheep, pigs, goats, cows and fish.

The legal and socio-economic impact of biotechnology at national and international levels, public awareness. Biosafety regulations- guidelines for research in transgenic animals, public awareness of the processes of producing transgenic organisms

Reference Books

1. Anthony Atala, Robert P Lanza. 2002, Methods of tissue engineering, Academic press
2. Ian Freshney R. 2005, Culture of animal cells–A manual of basic techniques, John Wiley and Sons Inc. Hoboken, New Jersey
3. Animal Cell Culture – A Laboratory Manual. Frushney.
4. Animal Biotechnology. Ballinic, C. A., Philip, J. P and Moo Young, M. Pergamon Press.
5. Genetic Engineering of Animals. Puhler, A. VCH Publisher.
6. Methods of Tissue Engineering. Anthony Atala, Robert P. Lanza.
7. Animal Cell Biotechnology – Methods and Protocols. Nigel Tenkins.

PROJECT WORK/DISSERTATION (HARD CORE)

COURSE CODE:

Course Outcome

CO1-Review of recent research articles published in high impact journals and presentation by students.

CO2-Students do conduct review of literature followed by hands on training to do piece of research work.

CO3-They would be skill full to understand the experiment and interpret the result.

CO4-They get an idea to compile the data and present in the form of dissertation.

- Includes exhaustive review of literature on the topic selected, design of work, standardization of techniques and execution of work
- Compiling of the data generated in the form of thesis. Interpretation of the result correlating with the advanced information available in the literature.
- Research Paper presentation.

JSS COLLEGE OF ARTS COMMERCE AND SCIENCE

(An Autonomous College of University of Mysore; Re-Accredited by NAAC with 'A' Grade)

OOTY ROAD, MYSURU- 25

PG DEPARTMENT OF BOTANY

Choice - Based Credit System (CBCS)

BOTANY

M.Sc. DEGREE SYLLABUS

2018-19 ONWARDS

(MODIFIED ON 2022)

JSS MAHAVIDYAPEETHA
JSS COLLEGE FOR ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS) OOTY ROAD, MYSURU- 25

POST GRADUATE DEPARTMENT OF BOTANY

M.Sc., Botany Choice - Based Credit System (CBCS) Syllabus
(CBCS-CGPA-Modified (2018-19)
CORE SUBJECT: BOTANY – [POST GRADUATE]

DEGREE: M.Sc., BOTANY

1st and 3rd semester Changes made at BOS meeting held on 13.01.2022 (in %)
HC 1.3 Systematics of Angiosperms (5.17%)
HC 3.3 Plant Biotechnology (40.22%)
SC 3.3 Plant Propagation and Plant Breeding (1.7%)
OE 3.1 Plant Propagation Techniques (1.35%)
(CHANGES MADE ARE HIGHLIGHTED IN THE TEXT)

FIRST SEMESTER				**Credits: 22**
No.	**Course/Paper Code**	**Title of the Course/ Paper**	**Hrs/Week L:T:P**	**Credits**
1	**HARD CORE 1.1**	**Virology, Bacteriology, Mycology and Plant Pathology**	**2:2:2**	2:1:1
2	**HARD CORE 1.2**	**Phycology, Bryophytes, Pteridophytes and Gymnosperms**	**2:2:2**	2:1:1
3	**HARD CORE 1.3**	**Systematics of Angiosperms**	**2:2:2**	2:1:1+ (2 credits for submission of tour report) 2:1:3
4	**SOFT CORE 1.1****	**Fungal Biology and Biotechnology**	**2:2:2**	2:1:1
5	**SOFT CORE 1.2****	**Algal Biology and Biotechnology**	**2:2:2**	2:1:1
6	**SOFT CORE 1.3****	**Lichenology and Mycorrhizal Technology**	**2:2:2**	2:1:1
7	**SOFT CORE 1.4****	**Phytopathology**	**2:2:2**	2:1:1

*Field Study/Tour: The student shall undertake a field trip for a minimum of 2-3 days and shall submit the herbaria and tour report for evaluation-2 credits.
**Any two soft core papers shall be studied.

SECOND SEMESTER			Credits: 18	
No.	**Course/Paper Code**	**Title of the Course / Paper**	**Hrs/Week L:T:P**	**Credits**
1	**HARD CORE 2.1**	**Reproductive Biology of Angiosperms and Plant Morphogenesis**	**2:2:2**	2:1:1
2	**HARD CORE 2.2**	**Cell Biology and Genetics**	**2:2:2**	2:1:1
3	**HARD CORE 2.3**	**Plant Breeding and Evolutionary Biology**	**2:2:2**	2:1:1
4	**SOFT CORE 2.1***	**Plant Anatomy and Histochemistry**	**2:0:2**	2:0:1
5	**SOFT CORE 2.2***	**Ethno-Botany and Intellectual Property Rights (IPR)**	**2:0:2**	2:0:1
6	**SOFT CORE 2.3***	**Economic Botany**	**2:0:2**	2:0:1
7	**OPEN ELECTIVE 2.1**	**Medicinal Plants**	**2:2:0**	2:1:0
	** Any two soft core papers shall be studied.			

THIRD SEMESTER			Credits: 16	
No.	**Course/Paper Code**	**Title of the Course /Paper**	**Hrs/Week L:T:P**	**Credits**
1	**HARD CORE 3.1**	**Biochemistry and Plant Physiology**	**2:2:2**	2:1:1
2	**HARD CORE 3.2**	**Molecular Biology**	**2:2:2**	2:1:1
3	**HARD CORE 3.3**	**Plant Biotechnology**	**2:2:2**	2:1:1
4	**SOFT CORE 3.1***	**Molecular Genetics of Plants**	**2:2:2**	2:1:1
5	**SOFT CORE 3.2***	**Molecular Plant Pathology**	**2:2:2**	2:1:1
6	**SOFT CORE 3.3***	**Plant Propagation and Plant Breeding**	**2:2:2**	2:1:1
7	**SOFT CORE 3.4***	**Phyto-chemistry and Herbal Technology**	**2:2:2**	2:1:1
8	**OPEN ELECTIVE 3.1**	**Plant Propagation Techniques**	**2:2:0**	2:1:0
	* Any one soft core courses/papers shall be studied.			

FOURTH SEMESTER				Credits: 16
No.	**Course/Paper Code**	**Title of the Course /Paper**	**Hrs/Wk L:T:P**	**Credits**
1	**HARD CORE 4.1**	**Ecology, Conservation Biology and Phytogeography**	**2:2:2**	2:1:1
2	**HARD CORE 4.2**	**Project Work ***	**4:2:2**	8
3	**SOFT CORE 4.1***	**Seed Technology**	**2:2:2**	2:1:1
4	**SOFT CORE 4.2***	**Seed Pathology**	**2:2:2**	2:1:1
5	**SOFT CORE 4.3***	**Bio -Analytical Techniques**	**2:2:2**	2:1:1
6	**OPEN ELECTIVE 4.1**	**Plant Diversity and Human Welfare**	**2:2:0**	2:1:1
	***Project Work:** The student shall undertake a Project Work in the Department or in any other University or Institute under the guidance of a Research Supervisor and shall submit a Project Report duly signed by Student and Research Supervisor for Evaluation.			

Semester- Wise Credit Pattern:
I Semester= 22 [HC- 12+2=14 + 08 (SC)]
II Semester= 24 [HC- 12 + 08 (SC) + 04 (OE)]
III Semester= 18 (HC- 08 + 06 (SC) + 04 (OE)]
IV Semester= 20 (HC-12 +04 (SC) + 04 (OE)]

In total= 46 HC + 26 (SC) + 12 (OE)= The Department is offering 84 Credits of B.Sc. Honors/ M.Sc. Botany (CBCS) Course including three Open Elective Course to the outside Department Students/

Important Note:
Student is required to earn the credit for qualifying B.Sc. Honors/ M.Sc. Botany from Department of Botany as follows:

Hard Core offered by the Department= 46 (Against maximum of 56)
Soft Core offered by the Department = 26 (Against minimum of 16)
Minimum Open Elective to be earned by the Student (Outside the Department) = 04
A total of 76 Credit is required for qualifying B.Sc. Honors/ M.Sc. Botany Course.

SCHEME OF EXAMINATION/ASSESSMENT
MODEL QUESTION PAPER (THEORY)
JSS COLLEGE FOR ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS) OOTY ROAD, MYSURU- 25
POST GRADUATE DEPARTMENT OF BOTANY
M.Sc., Degree ------Semester Examination May/June-20--
BOTANY
Course/Paper: ……
Course/Paper Code……..

Time: 3 Hrs **Max Marks: 70**

Instructions: 1) Answer all questions.
2) Draw neat and labelled diagrams wherever necessary.

I. Answer the following; (10MCQs of 1 Marks each) **10 X 1 = 10**
2 from Unit I
3 from Unit II
2 from Unit III
3 from Unit IV

II. Answer the following; **4 X 5 = 20**
2 from Unit I with internal choice
2 from Unit II with internal choice
2 from Unit III with internal choice
2 from Unit IV with internal choice

III. Answer the following; **4 X10 = 40**
2 from Unit I with internal choice
2 from Unit II with internal choice
2 from Unit III with internal choice
2 from Unit IV with internal choice

SCHEME OF PRACTICAL EXAMINATION/ASSESSMENT
MODEL QUESTION PAPER (PRACTICALS)

JSS COLLEGE FOR ARTS, COMMERCE AND SCIENCE
(AUTONOMOUS) OOTY ROAD, MYSURU- 25
POST GRADUATE DEPARTMENT OF BOTANY
M.Sc., Degree I Semester Examination May/June-2018
BOTANY
Course/Paper: ……
Course/Paper Code……..

Time: 3 Hrs **Max Marks: 70**

Q I. Conducting Experiment/Micro-preparation /Plant identification 15
Q II. Minor experiment/ Demonstrations/ Procedure Writing 10
Q III. Critically comments (3x5 Marks) 15
Q IV. Identification 5x2 Marks) 10
Q V. Viva-voce examination 10
Q VI. Class Records/ Submissions 10

PO M.SC. BOTANY

Sl. No.	PO
1.	Conduct investigations of complex problems by the use of research-based knowledge on an independent term project.
2.	Transfer of appropriate knowledge and methods from one topic to another within the subject.
3.	Carry out practical work, in the field and in the laboratory, with minimal risk.
4.	Able to think logically and organize tasks into a structured form and assimilate knowledge and ideas based on wide reading of text books and through the internet.
5.	Apply the scientific knowledge of basic science, life sciences and fundamental process of plants to study and analyse any plant form.
6.	Knowledge and understanding of the range of plant biology in terms of structure, function and environmental relationships.
7.	Apply reasoning informed by the contextual knowledge to assess plant diversity, and the consequent responsibilities relevant to the biodiversity conservation practice.

PSO M.SC. BOTANY

Sl. No.	COURSE	PSO
1.	Algal Biology and Biotechnology	Phylogeny, thallus organisation, economic and ecological importance of alagal community
2.	Biochemistry and Plant Physiology	Biomolecules, metabolic pathways and stress physiology in plants
3.	Cell Biology and Genetics	Cell originals and Mendelian principles
4.	Ecology, Conservation Biology and Phytogeography	Diversity of vegetation, distribution and its conservation
5.	Economic Botany	Economic values of different crop plants and their applications
6.	Major Project	Hands on experience in various fields of plant science
7.	Molecular Biology	Molecular level organisation in prokaryotes and eukaryotes with respect to various mechanisms involved
8.	Plant Anatomy and Histochemistry	Anatomical features and organisation of cells in plants
9.	Plant Breeding and Evolutionary Biology	Plant breeding methods, procedures and their application for crop improvement
10.	Plant Biotechnology	Tissue culture techniques and its application in development of resistant varieties
11.	Plant Propagation and Plant Breeding	Propagation methods and plant breeding procedures and their application in different fields
12.	Plant Propagation Techniques	Propagation methods and procedures and their application in different fields
13.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Distribution, classification and phylogeny of lower plant communities
14.	Phytopathology	Concepts of plant diseases defence mechanisms in plants and study of plant diseases
15.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Embryological study of growth and development using plant models
16.	Seed Technology	Industrial scale processing of seeds up to marketing

17.	Systematics of Angiosperms	Angiospermic plant family study with their phylogeny
18.	Virology, Bacteriology, Mycology and Plant Pathology	Diversity, distribution of microorganism with respect to their economic aspects

CO M.SC. BOTANY

Sl. No.	COURSE	CO
1.	Algal Biology and Biotechnology	Specify in depth of thallus organization and phylogeny in algae
2.	Algal Biology and Biotechnology	Understand the details of toxins, blooms and distributions of algae
3.	Algal Biology and Biotechnology	Deliberate in depth about cultivation and marketing algae
4.	Algal Biology and Biotechnology	Specify the details of Algal products and uses
5.	Biochemistry and Plant Physiology	Learn in details with biomolecules and their function
6.	Biochemistry and Plant Physiology	Understand in depth about solute transport and photosynthesis in plants
7.	Biochemistry and Plant Physiology	Specify the details of metabolism of nitrogen, lipids and plant hormones
8.	Biochemistry and Plant Physiology	Understand in depth about Stress physiology
9.	Cell Biology and Genetics	Learn in detail about cell membranes transport and proteins
10.	Cell Biology and Genetics	Deliberate the Functions of cell organelles, programed cell death
11.	Cell Biology and Genetics	Specify the extensions of Mendelian principles
12.	Cell Biology and Genetics	Learn about Sex determination and dosage compensation
13.	Ecology, Conservation Biology and Phytogeography	Understand the diversity of ecosystem and types of ecosystems
14.	Ecology, Conservation Biology and Phytogeography	Learn the in details of pollution and environmental biology
15.	Ecology, Conservation Biology and Phytogeography	Study the importance of biodiversity and conservation biology
16.	Ecology, Conservation Biology and Phytogeography	Detailed study of phytogeography and crop distribution
17.	Economic Botany	Specify the details of cereals, millets, pulses, oil yielding plants and study of horticultural plants and floriculture
18.	Economic Botany	Deliberate the characteristics of sugar yielding plants, spices and condiments
19.	Economic Botany	Understand the importance of fibre, timber and gum yielding plant
20.	Economic Botany	Deliberate on the medicinal plants and their applications
21.	Major Project	Learn the details of literature survey and methodology in research
22.	Molecular Biology	Identify the characteristics of genetic materials and its replication
23.	Molecular Biology	Learn the details of molecular basis of mutation, repair and recombination
24.	Molecular Biology	Deliberate the details of RNA formation, processing of RNA and post-RNA
25.	Molecular Biology	Understand in depth of gene regulation in prokaryotes and eukaryotes
26.	Plant Anatomy and Histochemistry	Learn in details of primary vegetative body of the plants
27.	Plant Anatomy and Histochemistry	Deliberate in details of differentiation in vascular tissues and study of apical meristems in shoot and root
28.	Plant Anatomy and Histochemistry	Deliberate the characteristics of secondary growth
29.	Plant Anatomy and	Understand the details of plant histochemistry

	Histochemistry	
30.	Plant Breeding and Evolutionary Biology	Learn in depth about plant breeding methods and techniques
31.	Plant Breeding and Evolutionary Biology	Understand the details of breeding for specific purposes
32.	Plant Breeding and Evolutionary Biology	Learn the details of Nature of evolution
33.	Plant Breeding and Evolutionary Biology	Identify the characteristics of variation and speciation
34.	Plant Biotechnology	Understand in depth about plant tissue culture and its techniques
35.	Plant Biotechnology	Specify the genetic engineering and tools used in it
36.	Plant Biotechnology	Understand the details of genetic manipulation, transgenic approaches to produce resistant plants
37.	Plant Biotechnology	Learn the details of engineering of crop plants for production of secondary metabolites
38.	Plant Propagation and Plant Breeding	Learn the details of importance of plant propagation, vegetative propagation and micro propagation
39.	Plant Propagation and Plant Breeding	Understanding of basic concepts of plant breeding and genetics
40.	Plant Propagation and Plant Breeding	Study types, purposes of plant breeding
41.	Plant Propagation and Plant Breeding	Deliberate study of advanced breeding aspects
42.	Plant Propagation Techniques	Learn the details of importance of plant propagation
43.	Plant Propagation Techniques	Understand in depth about types of vegetative propagation
44.	Plant Propagation Techniques	Learn the techniques of budding and layering
45.	Plant Propagation Techniques	Deliberate in details with examples of micro propagation in forestry and horticulture plants
46.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Understand the details of diversity, distribution, pigmentation and life cycle of algae
47.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Deliberate in depth of Bryophytes life cycle, classification, phylogeny and Economic importance
48.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Understand the details of Pteridophytes life cycle, phylogeny, classification, economic importance and anatomy
49.	Phycology, Bryophytes, Pteridophytes and Gymnosperms	Write down in details with examples Gymnosperms history, reproduction, edconomic importance and interrelationship
50.	Phytopathology	Learn the details of the concept, causative agents and disease cycle of plant pathogens
51.	Phytopathology	Deliberate the details of defense mechanisms in plants and its genetics
52.	Phytopathology	Study of Management of plant diseases
53.	Phytopathology	Identify in details with examples of diseases in crop plants
54.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Understanding the microsporogenesis and historical overview
55.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Specify in details with examples about megasporogeneis, fertilization, endosperm and embryo
56.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Specify the details of models and concepts of plant morphogenesis
57.	Reproductive Biology of Angiosperms and Plant Morphogenesis	Understand in details with examples of plant growth and development, photomorphogenesis
58.	Seed Technology	Understand the seed science and concepts
59.	Seed Technology	Study the seed production and processing methods

60.	Seed Technology	Learn about seed quality parameters and tests
61.	Seed Technology	Deliberate the procedure of seed certification
62.	Systematics of Angiosperms	Understand the principles and applications of Taxonomy of angiosperms
63.	Systematics of Angiosperms	Specify the details of taxonomic literature
64.	Systematics of Angiosperms	Deliberate in details with examples Dicot and monocot family and features of classification systems
65.	Systematics of Angiosperms	Specify in details molecular systematics with examples of softwares and databases
66.	Virology, Bacteriology, Mycology and Plant Pathology	Learn the classification and characteristics of viruses, viroids, prions and diseases of it
67.	Virology, Bacteriology, Mycology and Plant Pathology	Deliberate in details with examples of Bacteria, archeabacteria, actinomycetes and mycoplasma and its economic importance
68.	Virology, Bacteriology, Mycology and Plant Pathology	Specify the Fungal diversity, life cycle and economic importance of fungi
69.	Virology, Bacteriology, Mycology and Plant Pathology	Understand in details of etiology, distribution and management of plant disease

BOTANY: I SEMESTER- HARD CORE 1.1

VIROLOGY, BACTERIOLOGY, MYCOLOGY AND PLANT PATHOLOGY

Theory-32 Hrs

Unit-1: Virology: Origin and evolution of viruses; Classification of viruses-ICTV and Baltimore Systems; Genome diversity in viruses; Methods of cultivation of viruses; Purification and detection of viruses; Transmission of viruses; Mechanism of replication of DNA and RNA viruses; Viroids - Structure and multiplication; Prions - structure and multiplication; Prion diseases.

Unit-2: Bacteriology: Introduction and classification of Bacteria by Bergey's Manual of Determinative and Sytematic Bacteriology; C. R. Woese- Three domain classification of Bacteria; Archaebacteria and Eubacteria - diversity and evolution; Nutritional types of bacteria; Bacterial growth; Recombination in bacteria (conjugation transformation, and transduction); Brief account on actinomycetes; Structure and multiplication of Mycoplasma and Phytoplasmas; Economic importance of bacteria.

Unit -3: Mycology: Present status of fungi; Outline classification of fungi (Ainsworth-1973). Vegetative organization in fungi; Nutrition in fungi (saprotrophs, biotrophs, necrotrophs; symbiotrophs); Methods of reproduction in fungi - Asexual and sexual methods; Spore liberation in fungi; Evolution of sex in fungi; Heterothallism and parasexuality; Life cycle pattern and phylogeny of Myxomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina; Fungi and their economic importance.

Unit-4: Plant Pathology: Concepts and scope of plant pathology; Plant diseases and crop losses; Classification of plant diseases; Parasitism and disease development; Effect on physiology of host; Host range of pathogens; Defence Mechanisms in Plants; Plant Disease epidemics and plant disease forecasting; Methods of plant disease management; Study of plant diseases- Sandal Spike, Citrus Canker, Bacterial Blight of Paddy, Late Blight of Potato, Downy Mildew of Bajra, Tikka Disease of Ground nut, Grain Smut of Sorghum. Phloem Necrosis of Coffee, Root Knot Disease of Mulberry.

Practicals-32 Hrs

1) Laboratory guidelines, design, tools, equipments and other requirements for studying microorganisms.
2) Measuring the dimensions of microorganisms using Micrometry.
3) Determining total count of microbes using Haemocytometer.
4) Gram and special staining of bacteria.
5) Preparation of NA, PDA, sterilization, pouring, inoculation and culturing of bacteria/fungi.
6) Staining of fungi including VAM fungi.
7) Identification of fungi.
8) Measurement of bacterial growth by Spectrophotometer.
9) Recording environmental factors (Temperature, RH, and Rainfall and wind velocity).
10) Splash liberation of spores from diseased tissue.
11) Estimation of total phenols in diseased and healthy plant tissues.
12) Study of the following diseases: Sandal Spike, Citrus canker, Bacterial Blight of paddy, Late Blight of Potato. Downy Mildew of Bajra, Tikka disease of ground nut, Grain smut of Sorghum, Phloem Necrosis of Coffee, Root Knot disease of Mulberry.

References

1) Madigan, M .T. 2012. Brock Biology of Microorgasms, 13t edn. Benjamin Cummings.
2) Willey, J, Sherwood, L. and Woolverton, C.J. 2013. Prescott`s Microbilogy 9th edn. Mc Graw- Hill Educations.
3) Wagner, E.K, and Hewlett, M.J. 2009. Basic Virology. Blackwell Science Ltd. 2nd edn. USA.
4) Kodo, C.I. and Agarwal, H.O. 1972. Principles and Techniques in Plant Virology, Van Nostrand, Reinhold Company, New York.
5) Conrat, F.H., Kimball, P.C. and Jay, L. 1988.V irology. Prentice Hall, Englewood Chiff, New Jercy.
6) Jawaid, A. Khan and Jeanne Dijkstra. 2002. Plant Viruses as Molecular Pathogens. Food Products Press, NY
7) Alexopoulos, C.J. Mims, C.W. and Blackwell, M. 2013. Introductory Mycology 4th edn. Wiley.
8) Singh, R. S. 2009. Plant Disease. 9th edn. Oxford and IBH Pub.Co., New Delhi.
9) Agrios, G. N. 2005. Plant Pathology 5th edn. Academic Press, San Diego.
10) Rangaswamy, G. and Mahadevan, A. 2002. Diseases of crop plants in India, Prentice Hall of India Pvt.Ltd. New Delhi.
11) Mehrotra, R. S. 2003. Plant Pathology. 2nd edn. Tata Mc Graw-Hill Pub. Co. Ltd., New Delhi.
12) Cann, A.J. 2012. Principles of Molecular Virology 5th edn. Elsevier Ltd, USA.
13) Flint, S.J. Enaquist, L.W., Rancnicllo, V. R. and Skalka, A.M. 2009. Principles of Virology pathogenesis and control. 3rd edn. APS Press, USA.
14) Hall, R. 2014. Plant Virology, 5th edn. Elsevier, USA.
15) Aneja, K.R. 2003. Experiments in Microbiology plant Pathology and Biotechnology, 4th edn. New Age International Publishers, New Delhi.
16) Holt, J.G., Krige, N.R., Sneath., P.H.A. Stuley, J.T. and Williams, S.T. 2010. Bergey`s Manual of Determinative Bacteriology, 9th edn. Williams and Wilkins, USA.

BOTANY: I SEMESTER - HARD CORE 1.2

PHYCOLOGY, BRYOPHYTES, PTERIDOPHYTES AND GYMNOSPERMS

Theory-32 Hrs

Unit-1: Phycology: Diversity and distribution of algae; Unicellular, colonial, filamentous, heterotrichous, parenchymatous, pseudoparenchymatous, siphonous forms; General characteristics, classification and phylogeny of algae; Pigmentation in algal groups; Role of photosynthetic and accessory pigments; Life cycles in algae - haplontic, diplontic, isomorphic, heteromorphic; Economic importance of algae.

Unit -2: Bryophytes: Introduction, general characteristics, classification and phylogeny of Bryophytes; Distribution, habitat, external and internal morphology and reproduction; Comparative account on gametophytes and sporophytes of bryophytes; Economic and ecological importance.

Unit -3: Pteridophytes: Introduction, classification and phylogeny; Morphology, anatomy reproductive biology and phylogeny; Psilophytes, Lycophytes, Sphenophytes, Filicophyta; Evolution of sorus; evolution of sporangium; Gemetophyte development - homosporous and heterosporous ferns; Heterospory and seed habit; Stelar evolution in Pteridophytes; Ecology of Pteridophytes; Economic importance.

Unit- 4: Gymnosperms: Distribution, general characteristics, classification and phylogeny of Gymnosperms; Range in morphology, anatomy, reproduction and interrelationships of - Cycadales, Ginkgoales, Coniferales, Gnetales; Pteridosperms; Economic importance of Gymnosperms.

Practicals-32 Hrs

1-4) Algae: Study of Cyanophyceae: *Anabaena, Oscillatoria*; Study of Chlorophyceae: *Oedogonium*, *Pediastrum;* Study of Phaeophyceae: *Turbinaria, Ectocarpus*; Study of Rhodophyceae: *Gracilaria*, *Batrachospermum*; Economic products of algae.

5-7) **Bryophytes:** Study of morphology, anatomy and reproductive morphology - Hepaticopsida- *Marchantia, Dumortiera*; Anthocerotopsida- *Anthoceros, Notothylas*; Bryopsida- *Bryum* and *Polytrichum*.

8-10) **Pteridophytes:** Study of vegetative habit, anatomy and reproductive morphology of *Psilotum, Lycopodium, Isoetes, Ophioglossum, Botrychium, Angiopteris, Pteris, Hymenophyllum, Marselia, Salvinia, Azolla;* **Paleobotany**- Study of Lepidodendrales, Calamitales, Sphenophyllales and Coenopteridales (Fossil Pteriodophytes).

11-12) **Gymnosperms:** Study of morphology, anatomy and reproductive morphology of *Zamia, Pinus* and *Ephedra, Ginkgo, Auracaria, Podocarpus, Gnetum, Agathis, Cupressus*, *Thuja*; Economic importance of Gymnosperms.

References:

1) Bower, F.O. 1935. Primitive land plants, Macmillan, London.
2) Campbell, D. H. 1972. Evolution of land plants (Embryophytes), Central Book Department Allahabad.

3) Watson, E.V. 1971. The structure and life of Bryophytes Hutchinson and Co. Ltd. London.
4) Parihar, N.S. 1970 An Introduction to Embryophyta Vol. 1. Bryophyta. Central Book Department, Allahabad.
5) Prempuri, 1981. Bryophytes, Morphology, Growth and Differentiation. Atmaram and sons, New Delhi.
6) Nayar, M.C., Rajesh, K.P. and Madhusoodanan, P.V. 2005. Bryophytes of Wyanad.
7) Murthy, A.V.S.S. 2005. A text book of algae. IK International Pvt., Ltd., New Delhi.
8) Bold, H. C. and Wynne, M.J. 1978. Introduction to the algae. Structure and reproduction. Prentice Hall.
9) Chapman and Chapman. 1973. The Algae. Macmillan Co., New York.
10) Fritsch, F. E. 1935. Structure and Reproduction of Algae Vol. I & II. Cambridge Univ. Press, London.
11) Odum, E.P. Fundamentals of Ecology. 3rd edn. Toppan Co., Ltd., Japan.
12) Round, F. E. 1973. Biology of the algae. Edward Arnold Ltd., London.
13) Smith, G.M. 1951. Manual of Phycology. Pub. Co. Waltham., Mass.
14) Venkataraman, G.S. 1974. Algae form and function. Today & Tomorrow's Pub., New Delhi.
15) South, G. R. And Whittick, A. 1987. Introduction to Phycology. Blackwell Scientific Publication, UK.
16) Hoek, V., Mann, D. G. And Jahns, H. M. 1995. An introduction to Phycology. Cambridge University Press, UK.
17) Biswas, C. and Johri, B. M. 1997. The Gymnosperms. New Age Publishers, New Delhi.
18) Rashid A. 1986. An Introduction to Pteridophytes. Vikas, New Delhi.
19) Sporne K. R. 1969. Morphology of Gymnosperms. Hutchinson University Library, London.
20) Sporne, K. R. 1969. Morphology of Pteridophytes. Hutchinson University Library, London.
21) Chase, M.W. and Reveal, J.L. 2009. A phylogenetic classification of the land plants to accompany APG III. Botanical Journal of the Linnean Society, 161: 122-127.
22) Sundararajan, S. 2007. Introduction to Pteridophyta. New Age International Publishers, New Delhi.
23) Vashishta, P.C. (2008). Botany for Degree Students: Pteridophyta. S. Chand & Co. Ltd., New Delhi.

BOTANY: I SEMESTER - HARD CORE 1.3
SYSTEMATICS OF ANGIOSPERMS

Theory-32 Hrs

Unit-1: Introduction to plant systematics; Plant classification systems-artificial, natural and phylogenetic systems; Contributions of Carolus Linnaeus, Michel Adanson, de Jussieu, de Candolle to plant classification; Concepts of taxonomic hierarchy; Taxonomic Categories-Genus concept; Species concept; Intraspecific categories; subspecies; varieties and forms; History of botanical nomenclature; ICBN and ICN aims and principles; Rules and recommendations; Rule of priority; Typification; Author citation, Legitimate and illegitimate names; Name changes and synonyms; Effective and valid publication; Herbarium and its significance; Botanical gardens.

Unit-2: **Taxonomic Literature:** General taxonomic indices, world floras and manuals; Monographs and revisions; Bibliographies, catalogues and reviews; Periodicals, glossaries and dictionaries; Hortus Malabaricus; Taxonomic websites-IPNI, Plant List, Tropicos, Botanico-Periodicum-Huntianum (BPH); Biodiversity Heritage Library (BHL); Botanicus, Index Herbariorum; Taxonomic Keys- bracketed keys, indented keys, numbered keys, edge punched and body punched keys.

Unit-3: Study of plant classification Systems; Broad outlines of Bentham and Hooker's system, Engler and Prantl's system, Hutchinson's system, Takhtajan's system, and Cronquist's system; Numerical Taxonomy-principles, selection of characters, merits and demerits; Angiosperm Phylogeny Group (APG) III & IV classification; Study of angiosperm families-Magnoliaceae, Nympheaceae, Urticaceae, Papaveraceae, Euphorbiaceae, Acanthaceae, Rubiaceae, Alismataceae, Cyperaceae, Commelinaceae, Zingiberaceae, Liliaceae, Dioscoreaceae and Orchidaceae.

Unit-4: Molecular Systematics: Nuclear, mitochondrial and chloroplast genes. Gene sequencing, analysis of molecular data, alignment of sequences; Phylogenetic tree construction-Maximum Likelihood and Neighbour Joining Methods; Phylogenetic analysisrooted and unrooted trees; Data analysis- alignment, substitution, model building; Phylogentic softwares-CLUSTAL W, MEGA, Mesquite, PAUP, PHYLIP, Treefinder, TreeBase.

Practicals-32 Hrs

1) Methods of preparation and maintenance of Herbaria.
2-4) A field trip of three days to a floristically rich area to study plants belonging to different families (Every student shall submit a report for evaluation for two credits).
5-10) Identification of the flowering plants in and around Mysore using keys, floras and monographs.
11-12) Construction of phylogenetic tree based on molecular data of plant species retrieved from GenBank.

References:

1. Cronquist, A. 1981. An Integrated system of classification of flowering plants. Columbia University Press, New York.
2. Simpson, M.G. 2006. Plant Systematics. Elsevier, Amsterdam.

3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.A. and Donoghue, M.J. 2002. Plant Systematics: A phylogenetic Approach. Sinauer Associates, Inc., Massachusetts.
4. Gurucharan Singh. 2004. Plant Systematics: Theory and Practice, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Jeffrey, C. 1982. An introduction to Plant Taxonomy. II Edn., Cambridge Uni. Press.
6. Mondal, A.K. 2009. Advanced Plant Taxonomy. New Central Book Agency Pvt. Ltd., Kolkata, WB.
7. Pullaiah, T. 1998. Taxonomy of Angiosperms. Regency Publications, New Delhi.
8. Johri, B.M. and Bhatacharjee, S.P. 1994. Taxonomy of Angiosperms. Narosa Publishers, New Delhi.
9. Lawrence, G.H.M. 191. Taxonomy of Vascular Plants. MacMillan, London.
10. Chase, M.W. and Reveal, J.L. 2009. A phylogenetic classification of the land plants to accompany APG III. Botanical Journal of Linnaean Society, 161: 122-127.
11. Nei, M. and Kumar, S. 2000. Molecular Evolution and Phylogenetics. Oxford Univ. Press, New York
12. APG-IV. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants APG-IV. Botanical Journal of Linnaean Society, 181: 1-20.

BOTANY: I SEMESTER - SOFT CORE 1.1
FUNGAL BIOLOGY AND BIOTECHNOLOGY

Theory-32 Hrs

Unit-1: Introduction and historical overview of mycology; General characteristics and importance of fungi in human life; Fungi –Taxonomy and Systematics; Fungi in genetic and applied research; Estimation of Fungal diversity; Quantitative Indices- species richness, species evenness and species abundance; Molecular methods used for fungal diversity estimation-nuclear genome, messenger RNA transcripts, Ribosomal/DNA sequence comparisons and mitochondrial genome.

Unit-2: Macro fungi and micro fungi living on plant substrata; Lignicolous macrofungi; Lichenized fungi; Sequestrate fungi; Endophytic fungi; Saprobic soil fungi; Fungi in stressful environment; Mutualistic, arbuscular, and endomycorrhizal fungi; Yeasts; Fungicolous fungi; Fungi in fresh and marine water habitats; Fungi associated with aquatic animals; Fungi as parasites of humans and plants; Fungi associated with animals, insect, arthropod and nematodes; Coprophilous fungi.

Unit-3: Fungal Fermentation and Food Products: Food and Beverages; Single cell proteins-Myco-proteins; Food processing by fungi-bread, soybean products, cheese and fermented milk; Fungal secondary metabolites-antibiotics, immunosuppressive agents, anti-tumour agents, fungal toxins as medicines; Fungal pigments; Steroid transformation; Fungal enzymes; Bio-control agents; Application of molecular biology in fungal biotechnology.

Unit-4: Mushrooms and fungi in medicine; Toxic macromycetes; Mushroom cultivation; Model organisms- *Saccharomyces cerevisiae*/*Neurospora crassa*; Bio-deterioration of food grains and mycotoxins; Fungal communities of herbivore dung; The fungal communities of composts; Fungal interactions and practical exploitation; Heavy metals in fungi-accumulation and sorption; Biotechnology of wood rotting fungi.

Practicals-32 Hrs

1) Study of Myxomycetes and Chytridiomycetes
2) Study of Plasmodiophoromycetes and Oomycetes
3) Study of Zygomycetes
4) Study of Ascomycetes
5) Study of Basidiomycetes
6) Study of Deuteromycetes 7)Study of Lichens
8) Study of VAM fungi
9) Detection of aflatoxin B1
10) Cultivation of Oyster mushroom.
11) Alcoholic fermentation of grape juice by *Saccharomyces*.
12) Cultivation of *Penicillium* and testing antibiotic principle.
13) Study of edible and poisonous mushrooms.
14) Study of fungal model organisms - *Saccharomyces cerevisiae*/*Neurospora crassa*

References:

1) Alexopoulos, C. J., Mims, C. W. and Blakwell, M. 2007. Introductory Mycology 4th edn. Wiley India, New Delhi.
2) Deacon, J. W. 1997. Modern Mycology 3rd edn. Blackwell Science publishers, London.

3) Mehrotra, R.S. and Aneja, K.R. 1990. An Introduction to Mycology, New Age International (P) Limited, New Delhi.
4) Mueller, G M; Bills, GF and Foster, M.S. 2004. Biodiversity of Fungi, Elsevier Academic Press, New York.
5) Rai, M. and Bridge, P.D. 2009. Applied Mycology, CABI International, UK.
6) Carlile, M.J. Watkinson,S.C. and Gooday, G.W. 2001.The Fungi, 2nd edn. Academic Press, USA.
7) Webster, J. and Weber, R.W.S. 2007. Introduction to Fungi. 3rd edn. Cambridge University Press, Cambridge.

BOTANY: I SEMESTER - SOFT CORE 1.2
ALGAL BIOLOGY AND BIOTECHNOLOGY

Theory-32 Hrs

Unit-1:Algal Biology: Historical development of Phycology and contributions of Phycologists; Thallus organization in algae-Cyanophyceae, Chlorophyceae, Charophyceae, Euglenophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae and Rhodophyceae; General characteristics, algal classification, affinities and phylogeny- polyphasic approach; Molecular markers for phylogenetic study; Algal physiology- ultra-structure of cells; Photosynthesis and respiration.

Unit-2: Algal blooms and Toxins: Blooms produced by algal groups; Toxins produced by cyanobacteria, diatoms, dinoflagellates, prymnesiophytes and eugleoids; bioaccumulation and biomagnification; effects of toxins on aquatic life and humans; Scenario in coastal waters of India- monitoring and safety measures; Algal communities of extreme environments- Thermal hot springs, cold springs, snow and ice; **Fresh water algae**-Ecological classification of fresh water organisms; Lentic communities of algae (pond, lake, bog, swamp); Lotic communities (streams, rivers, rapids; **Marine algae-** Marine biota; zonation; quantitative study of phytoplanktons, marine communities of algae.

Unit-3: Algal Biotechnology: Algal culture techniques; general principles; physical parameters; culture media; strain improvement; **Algal cultivation methods-**conventional, advanced; **Cultivation of microalgae-*Spirulina*** and ***Dunaliella***; Media, seeding, cultivation systems, harvesting; processing, drying methods, packaging, marketing; Algal cultivation and production in India; **Cultivation of macroalgae- *Porphyra;*** Nutritional value; importance of life cycle; methods of cultivation in advanced countries; Pillar, semi raft floating and open sea cultivation.

Unit-4: Applications of algae/products: Pollution indicators, treatment of waste water plants, heavy metal toxicity and phyco-remediation; Bio-fouling and biofuel production; Algal products as sources of nutraceuticals; Food colorants; Aquaculture feed; Therapeutics and cosmetics; Medicines; Dietary fibres from algae and uses; Biotechnological applications of algal silica and oils.

Practicals-32 Hrs

1) Study of fresh water planktonic forms in the lake samples.
2) Study of fresh water diatoms.
3) Chlorophyceae: *Ulva, Caulerpa, Halimeda, Acetabularia.*
4) Xanthophyceae: Mounting of *Botrydium* from soils.
5) Phaeophyceae: *Dictyota, Sargassum, Cystophyllum.*
6) Rhodophyceae: *Gracilaria, Gelidium.*
7) Cyanophyceae: *Microcystis*, *Nostoc, Spirulina.*
8) Estimation of carotene content in algal cells .
9) Culturing of microalgae: *Spirulina/ Chlorella/Scenedesmus/Dunaliella.*
10) Applications of algal products: Agar, spirulina tablets/powder, beta-carotene, phycobiliproteins, triglycerides, Mycosporine like amino acids (MAA), diatom silica as nanoparticles.
11) Visit to National Institute of Oceanography, Goa.
12) Study of algal herbaria.

References

1) Bold, H. C. and Wynne, M. J. 1978. Introduction to the algae. Structure and reproduction. Prentice Hall, New York.
2) Chapman and Chapman, V.J. 1973. The Algae. Macmillan Co., New York.
3) Fritsch, F. E. 1935. Structure and reproduction of Algae Vol. I and II. Cambridge University Press, London.
4) Hoek, V., Mann, D. G. and Jahns, H. M. 1995. An introduction to Phycology, Cambridge University Press, UK.
5) Murthy, A.V.S.S. 2005. A text book of algae. I.K. International Pvt., Ltd., New Delhi.
6) Odum, E. P. Fundamentals of Ecology. 3rd edn. Toppan Co., Ltd., Japan.
7) Round , F. E. 1973. Biology of the algae. Edward Arnold Ltd., London.
8) Southcott, G. R. and Whittick, A. 1987. Introduction to Phycology. Blackwell Scientific Publication, UK.
9)Venkataraman, G.S.1974. Algae form and function. Today and Tomorrow's Pub., New Delhi.
10) Bux *et al.* (eds.). 2016. Algae Biotechnology: Products and Processes, Springer, ISBN 9783319123332 (P), 9783319123349 (Online).
11) Chu, W. 2012. Biotechnological Applications of Microalgae. IeJSME 6(1): S24-S37.

BOTANY: I SEMESTER - SOFT CORE 1.3
LICHENOLOGY AND MYCORRHIZAL TECHNOLOGY

Theory-32 Hrs

Unit-1: Introduction: Photobionts- identification, reproduction, and taxonomy of photobionts; Occurrence within lichens; Mycobionts- Lichenized versus nonlichenized fungi; Bryophilous and folicolous lichens; Thallus morphology and anatomy; Growth forms - crustose lichens, foliose lichens, fruticose lichens; Vegetative structures- Homoiomerous thallus, stratified thallus, cortex, epicortex, and epinecral layer, photobiont layer and medulla, lower cortex, Attachment organs and appendages; Cyphellae and pseudocyphellae; Cephalodia (Photosymbiodemes); Reproductive structures- sexual reproduction in lichen-forming ascomycetes; Mating systems, dikaryon formation, Ascomal ontogeny, Ascosporogenesis; Ascus structure and function; Generative reproduction: ascoma, perithecia, apothecia, Thallinocarpia, Pycnoascocarpia, Hysterothecia, Asci, Basidioma; Vegetative reproduction- aposymbiotic propagules, symbiotic propagules; Systematics of lichenized fungi- History, classification and phylogeny.

Unit-2: Morphogenesis- Acquisition of a compatible photobiont; Recognition and specificity; Structural and functional aspects of the mycobiont–photobiont interface; Genotypes and phenotypes, growth patterns; Biochemistry and secondary metabolites- intracellular and extracellular products; The fungal origin of the secondary metabolites; Major categories of lichen products; Application to pharmacology and medicine; Harmful properties of lichen substances, lichens in perfume, lichens in dyeing; Stress physiology and the symbiosis- stress tolerance, limits to stress tolerance; harmful effects of stress, constitutive and inducible stress tolerance, evolution of stress tolerance in lichens; Modes of water uptake, light, temperature, carbon dioxide; The carbon economy of lichens.

Unit-3: Nitrogen, its metabolism and potential contribution to ecosystems, Methods of determination of nitrogen fixation; Nutrients- chemical and physical properties of nutrients and metals; Nutrient requirements, sources of nutrients, accumulation mechanisms, compartmentalization of elements within lichens; Metal toxicity, metal tolerance; Environmental role of lichens- dispersal, establishment, pedogenesis and biodeterioration; Community structure, succession, ecosystem dynamics; Animal and lichen interactions; Forest management, conservation, environmental monitoring; Lichen sensitivity to air pollution- lichens in relation to sulfur dioxide, oxidants and lichens, hydrogen fluoride and organopollutants.

Unit-IV: Mycorrhizal fungi: Introduction and classification; Types of mycorrhizas- Arbutoid mycorrhizas, ectomycorrhizas, vesicular arbuscular mycorrhizas or arbuscular mycorrhizas, ectendomycorrhizas, ericoid mycorrhizas, monotropoid mycorrhizas and orchid mycorrhizas; Phoshate solubilisation; Ecological significance of AM fungi; Importance of mycorrhiza in evolution of land plants; Role of mycorrhiza in agriculture, horticulture and forestry.

Practicals-32 Hrs

1-3) Survey of lichen vegetation in the study area: Frequency, density and abundance.
4) Determination of species richness and species diversity.
5) Isolation and maintenance of cyanobionts and phycobionts
6) Isolation and maintenance of mycobionts

7) Analysis of secondary metabolites of lichens.
8) Biological activity of secondary metabolites of the lichens.
9) Culture methods for lichens and lichen symbionts.
10) Root clearing and staining technique to study arbuscular mycorrhizal fungi.
11) Assessment of % root colonization of arbuscular mycorrhizal fungi.
12) Isolation and identification of arbuscular mycorrhizal fungi.

References:

1) Thomas H. Nash , 2008. Lichen Biology, 3rd edn. Cambridge University Press, The Edinburgh Building, Cambridge CB2 8RU, UK
2) Awasthi D.D. 2000. Lichenology in Indian subcontinent: A supplement to "A hand book of lichens". Publisher: M/s Bishen Singh Mahendra Pal Singh, Dehra Dun.
3) Awasthi D. D. 2013). A hand book of lichens , Publisher: M/s Bishen Singh Mahendra Pal Singh, Dehra Dun.
4) Sally E. Smith and David J. Read (2008). Mycorrhizal Symbiosis. 3rd edn. Academic Press, New York.
5) Larry Peterson R., Hugues B. Massicotte, Lewis H. Melville, 2004. Mycorrhizas: Anatomy and Cell Biology, CAB International, UK.

BOTANY: I- SEMESTER - SOFT CORE 1.4
PHYTOPATHOLOGY

Theory-32 Hrs

Unit-1: Concept of plant disease, Economic aspects of plant diseases; Types of plant diseases- Infectious diseases and non-infectious diseases; Causative agents of plant diseases; Angiospermic parasites; Development of plant pathology; Plant pathology in practice- Plant Clinic and Plant Doctor Concept; Parasitism and pathogenicity; Disease triangle; Infections and colonization; Weapons of plant pathogens; Effect of pathogen on physiology of host plant (photosynthesis, translocation and transpiration, respiration, permeability, transcription and translation).

Unit-2: Defence mechanisms in Plants- Pre-existing structural and chemical defences, induced structural and biochemical defences; Plant disease epidemiology- Elements of an epidemic and development of epidemics; Plant Disease forecasting; Genes and Diseases, Gene for gene concept, non-host resistance; Types of plant resistance to pathogens (Horizontal and Vertical Resistance); 'R' Genes and 'avr' genes; Genetics of virulence in pathogens and resistance in host plants; Breeding for disease resistance.

.

Unit-3: Management of Plant Diseases: Exclusion, eradication, cross protection, direct protection, integrated disease management, chemical methods of plant disease control; Biotechnological approaches to plant disease management; Gene silencing and disease control; Mechanism of gene silencing and control of viral diseases; Engineered resistance to viral, bacterial, fungal and insect diseases of crop plants.

Unit-4:Study of diseases of crop plants: Potato Spindle Tuber Disease, Tobacco Mosaic Disease, Sandal Spike Disease, Bacterial blight of Paddy, Citrus Canker, Late Blight of Potato, Downy Mildew of Maize, Blight of Paddy, Angular leaf spot of Cotton, Tikka disease of ground nut, Rust of coffee, Grain and Head smut of Sorghum. Leaf blight of Paddy, Blast of Paddy, Powdery mildew of cucurbits, Wilt of Tomato, Phloem Necrosis of Coffee, Root Knot of Disease of Mulberry and Vegetables; Non-parasitic diseases of plants; Seed-borne diseases.

Practicals-32 Hrs

1) Isolation of bacterial, fungal, and nematode plant pathogens of crop plants.
2) Study of mineral deficiency diseases of Tomato and French bean.
3) Estimation of foliar infection by Stover's method.
4) Study of spore germination.
5) Estimation of total phenols in diseased and healthy plant tissues.
6) Mycoflora analysis by Standard Blotter Method SBM/agar plating method.
7)-9) Study of Tobacco mosaic, Bacterial blight; Downy mildew of Maize; Powdery mildew of cucurbits; Grain smut of sorghum; Leaf rust of Coffee; Root Knot of Mulberry. Bunchy top of banana, Grassy shoot of sugar cane, Little leaf of Brinjal; Potao Spindle Tuber Disease (PSTVd)
10) Study of effect of pathogens on seed germination and vigour index.
11) Study of effect of fungicide on seed-borne pathogens.
12) Study of Fungal bio-control agents.

References:

1) Agrios, G. N. 2005. Plant Pathology 5th edn. Academic Press, San Diego.
2) Dickinson, M. 2003. Molecular Plant Pathology, Garland Publishing Inc, CT.
3) Ingram,D.S. and Robertson, N.F. 1999. Plant Diseases, Collins Publishers, London.

4) Johnston, A and Both, C. 1983. Plant Pathologists Pocket-book. 2nd edn. Commonwealth Mycological Institute, Oxford and IBH Pub. Co. Calcutta.
5) Lane, C.R., Beales P.A. and Hughes, K.J.D. 2012. Fungal Plant Pathogens, CABI Publishing, Wallingford.
6) Mehrotra, R. S., 2003. Plant Pathology, 2nd edn. Tata Mc. Graw Hill Pub. Co. Ltd., NewDelhi.
7) Rangaswamy, G. and Mahadevan, A. 2002. Diseases of crop plants in India, Prentice Hall of India Pvt.Ltd. New Delhi.
8) Schumann, G. L. and D'Arcy, C. J. 2012. Hungry Planet: Stories of Plant Diseases, APS Press, USA.
9) Singh, R. S., 2009. Plant Diseases. 9th edn. Oxford and IBH Pub.Co. New Delhi.
10) Vidhyasekaran, P. 2004. Encylopedia of Plant Pathology.Viva Books Pvt. Ltd. New Delhi.

BOTANY: II- SEMESTER- HARDCORE 2.1

REPRODUCTIVE BIOLOGY OF ANGIOSPERMS AND PLANT MORPHOGENESIS

Theory-32 Hrs

Unit-1: Reproductive Biology of Angiosperms: Historical overview; Contributions of P. Maheshwari; BM Johri; BGL Swamy to the development of embryology in India; Microsporogenesis and Microgametogenesis- wall layers and functions; Tapetum- types, concept of male germ unit and its significance; Pollen morphological features; Unusual features-pollen development in Cyperaceae, pollen embryosac; Concept and scope of palynology.

Unit-2: Megasporogenesis and Megagametogenesis; Ovular structure and types; Development of monosporic, bisporic, tetrasporic and special types of embryo sacs; Ultra structure and nutrition of female gametophyte, concept of female germ unit and its significance; Fertilization- a general account, double fertilization, single fertilization, heterofertilization and polyspermy; Pollen recognition and rejection reactions - types, structures, methods to overcome incompatibility reactions; Endosperm- types, haustorial variations, ruminate and composite endosperm; Embryo- structure, development of monocot, dicot and grass embryo; Significance of embryonal suspensor; Experimental Embryology- scope and applications.

Unit-3: Plant Morphogenesis: Models of morphogenesis- comparison of plant v/s animal morphogenetic pathways: Embryo, *Arabidopsis thaliana*; Concepts- cell fate/ fate maps, gradients, stem cells in plants and their significance in development, polarity, symmetry, totipotency of cell types, pleuripotency, plasticity, differentiation, redifferentiation, dedifferentiation and regeneration in *Acetabularia* and *Arabidopsis thaliana.*

Unit-4: Plant Growth and Development: Types, shoot apical meristems, root meristems; control of cell division in meristems; Quiescent center and meresteme de attente; *Arabidopsis*- vascular patterning and leaf development, abnormal growth; Cellular basis of growth- maintenance of cell shape; Cytoskeletal elements; Photomorphogenesis- definition, history, Hartmann's technique; Photoreceptors and photo morphogenesis, localization and properties; Effect of blue light-mediated photomorphogenesis with suitable examples.

Practicals-32 Hrs

Reproductive Biology of Angiosperms:

1) Study of microsporangium- slides: wall layers, tapetal types, two-celled and three-celled pollen; pollen tetrads.

2) Study of pollen germination: *Balsam, Delonix, Hibiscus* and *Peltaphorum*

3) Study of megasporangium-slides: female gametophyte development in *Penstemon, Xyris pauciflora,* 2, 4, 8-nucleate stages, mature embryo sac.

4) Endosperm mounting- *Cucumis sativus, Grevellia robusta* and *Croton sparsiflorus*

5) Embryo: Slides-monocot, dicot and grass embryo.

6) Embryo mounting : *Crotalaria.*

Plant Morphogenesis:

7) Study of stem cells in plants: SAM, RM.

8) Regeneration abilities of shoot apical meristems of dicots on media with combinations of growth regulators.

9) Study of totipotency in cell types: stomata, epidermal cells, stem and leaf explants on a tissue culture media.

10) Polarity in stem cuttings: *Pothos* spp.

11) Study of regeneration in succulents *Kalanchoe*, *Byrophyllum.*

12) Study of leaf galls of plants: *Pongamia pinnata and Achyranthes aspera*: Morphological observations and histology.
13) Study of *Arabidopsis thaliana* as a model plant.

References:

1) Johri, B. M. 1984. The embryology of Angiosperms. Springer Verlag.
2) Johri, B. M. 1982. The experimental embryology of vascular plants. Springer Verlag, New York.
3) Swamy, B.G.L. & Krishnamurthy, K. V. 1982. From flower to fruit: The embryology of angiosperms. Tata McGraw Hill Co. New Delhi.
4) Eames, 1961. Morphology of Angiosperms. McGraw Hill book Co., Inc., New York.
5) Maheshwari, P. 1950. An introduction to the embryology of Angiosperms. McGraw Hill book Co., Inc., New York.
6) Maheshwari, P. 1963. Recent advances in the embryology of angiosperms. ed. New Delhi
7) Bhojwani, S. S.and Bhatnagar, S. P. 1978. The embryology of Angiosperms. Vikas Publishing House, New Delhi.
8) Turing, A. M. 1952. The chemical basis of morphogenesis. Phil. Trans. R. Soc. Lond. B. 237: 37- 72.
9) Sinnot, E. W. 1960. Plant Morphogenesis. Mc Graw- Hill Book Co. Inc. New York, USA.
10) Steeves, T.A. and Sussex, I. M. 1989. Patterns in Plant development. 2nd edn. Cambridge University Press. UK.
Chasan, R. 1994. Tracing tracheary element development. The Plant Cell 6:917-919.
11) Lyndon, R. F. 1990. Plant Development : The Cellular basis. Unwin Hyman, London.
12) Aloni, R. 1987. Differentiation of vascular tissues. Annu. Rev. Plant Physiol. 38:179- 219.
13) Raman, A. 2007. Insect induced plant galls of India; unresolved questions. Curr. Sci. 92 (6): 748-757.
14) Smith, H. 1975. Phytochrome and Photomorphogenesis- an introduction to the photocontrol of plant development. Mc Graw- Hill Book Co. (UK), Ltd.
15) Mohr, H. 1972. Lectures in photomorphogenesis. Springler- Vohrleg, Berlin, Germany.

BOTANY: II- SEMESTER - HARD CORE 2.2
CELL BIOLOGY AND GENETICS

Theory-32 Hrs

Unit-1: Bio Molecules and Membranes: Structure, composition of bio-molecules and their stabilizing interactions (carbohydrates, lipids, proteins and nucleic acids); Unit membrane structure and functions; Membrane proteins, membrane transport and the electrical properties; Intra-cellular compartments and protein sorting; Intracellular membrane traffic; Cytoskeletons.

Unit-2: Functions of Organelles: Cell wall, membranes, nucleus, mitochondria, Golgi bodies, lysosomes, spherosomes, peroxisomes, ribosomes, endoplasmic reticulum, Plastids, chloroplast, vacuoles and cytoskeleton; Cell cycle and mechanism of cell cycle regulations; A brief account of cell signalling, receptors, second messengers; General mechanism of signal transduction pathway; Programmed cell death in life cycles of plants.

Unit-3: Extensions of Mendelian Principles co-dominance, incomplete dominance, gene interactions, multiple alleles, lethal alleles, pleiotropy, penetrance and expressivity, polygenic inheritance, linkage and crossing over, sex linked inheritance, sex limited and influenced traits, genome imprinting, extra nuclear inheritance; C**oncept of the gene**-classical-alleles, multiple alleles, pseudo-alleles, complementation test, experiments on rII locus and lozenge locus, modern- jumping genes, overlapping and genes within genes, split genes, nested genes, fusion genes; **Gene mapping methods-** linkage maps, tetrad analysis; Recombination in bacteria mapping genes in bacteria by interrupted mating technique, fine structure mapping, transduction and transformation mapping, mapping genes in Bacteriophages**,**

Unit-4: Sex Determination and Dosage Compensation: Chromosomal and genetic basis of sex determination; Mechanism of sex determination in *Melandrium*, *C. elegans*, Drosophila and humans, dosage compensation mechanisms in humans, Drosophila and *C. elegans*. **Transposable elements**- discovery in maize and bacteria, transposal elements in bacteria and bacteriophage, types and functions; Transposable elements in eukaryotes- Plants, *Drosophila* and Humans, mechanisms of transpositions;Transposable elements in research.

Practicals-32 Hrs

1) Determination of reducing sugars by Nelson-Somogyim's method.
2) Estimation of total soluble sugars by volumetric method.
3) Quantitative determination of free Amino acid content in germinating seeds.
4) Estimation of ascorbic acid in plant tissues.
5) Estimation of Phospholipids by TLC.
6) Slides/Charts/photos NP (Cytology Genetics and Embryology).
7) Study of mitosis in normal and induced root tips cells of Onion.
8) Study of meiosis in onion flower buds , translocation in Rhoeo.
9) Study of special chromosomes- B chromosomes, and sex chromosomes.
10) Determination of chiasma frequency in onion.
11) -12)To solve genetic problems on linkage, ordered and unordered tetrads.

References:

1) Atherly, A.G. Girton, J.R. Donald, J.R. 1999. The Science of Genetics. Saunders College Publishers. Fortworth .
2) Griffith, A.J.F. Gelbart, W.M. Muller, J.H. and Lewintin, R.C. 1999. Modern Genetic Analysis. W.H. Freeman and Co. New York.

3) Hartl. D. 1991. Basic Genetics. 2edn., Jones and Barlett Publishers Inc. Boston.
4) Fairbanks, D.J. and Anderson, W.R. 1999. Genetics the continuity of Life. Brooks's/Cole publishing Company, California.
5) Brooker. R.J. 1999. Genetics –analysis and principles. Addison Wesley Longman Inc.California.
6) Snustad, D.P., Simmons, M.J. and Jenkins, J.R. 1997. Principles of Genetics. Hohn Wiley & son's inc. New York.
7) Brown, T.A. 1989. Genetics a molecular approach. Van Nostrand Reinhold (intn) Co., Ltd. London.
8) Winchester, A.M. 1969. Genetics. 3rd edn. Oxford and IBH, New Delhi.
9) Strickberger, Monroe W. 2000. Evolution. 3rd Edn. Jones & Bartlett Publishers, Inc. 40 Tall PineDrive Sudbury, MA 01776, USA.
10) Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Rafi, Keith Roberts, and Peter Walter. 2008. Molecular biology of the cell, 5th ed., Garland science, Taylor & Francis Group, LLC, 270 Madison Avenue, NewYork NY f 0016, USA.
11) Alberts, B., Bray, D., Lewis, J , Raff, M., Roberts, K and Watson, J.D. 1999 . Molecular biology of the cell. Garland Publishing, Inc., New York.
12) Kleinsmith, L.J. and Kish, V.M. 1995 .Principles of Cell and Molecular Biology 2nd edn. Harper Collins College Publishers, New York, USA.
13) Lodish, H. Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular Cell Biology, 4th edn.W.H. Freeman and Co. New York, USA.
14) Buchanan, B.B. W.Gruissem and Jones, R.L. (2000). Biochemistry and Molecular Biology of Plants. ed. ASPP Press.USA.

BOTANY: II SEMESTER HARD CORE 2.3
PLANT BREEDING AND EVOLUTIONARY BIOLOGY

Theory-32 Hrs

Unit-1: Introduction: Objective and role of plant breeding; Evolution of plant breeding, scope of plant breeding, sciences related to plant breeding, Vavilov's concept of origin of centers of origin of crop plants; Recent trends in plant breeding; **Breeding Methods-**plant introduction and acclimatization, domestication and agriculture, pure line, clonal, mass and progeny selections, recurrent selection, pedigree, bulk and back cross methods; Heterosis breeding synthetic and composite varieties; **Breeding Techniques-**Mutation breeding, polyploidy, hybridization, tissue culture techniques in crop improvement, protoplast fusion, electrophoration, electro-fusion, biolistics, somatic hybridization, transgenic plants (GMO's); The role of Gene technology in plant breeding.

Unit-2: Breeding for Specific Purposes: Breeding for disease resistance, insect resistance, drought and salinity, quality trait, multiple cropping systems, ideotype breeding, breeding for Adaptation; **Crop breeding and seed production-** Breeding field crops, seed production techniques, release of new varieties, intellectual property rights, computer application in plant breeding, crop breeding Institutes/Centers; Genetic resources and germplasm conservation; Scientific Plant breeding; Green revolution; The elite crop (Golden rice); Contributions of **Dr.**
M.S. Swaminathan, Dr. Norman E. Borlaug and N.I. Vavilov.

Unit-3: Nature of Evolution : The origin, theories of evolution of life, earth and the universe,; Conditions of the early earth, emergence of the first living cell, origin of prokaryotic and eukaryotic cells, life in the Palaeozoic, Mesozoic and Coenozoic era. **Development of Evolutionary thoughts;** Ecological context, before Darwin, Darwinism, Darwin's evolutionary theory, Neo – Darwinism, modern synthesis: **Fossil evidence of Ancient life,** fossilization,; Interpreting geological time scale and fossil records; Evidences from comparative, morphology, patterns of development, comparative physiology and biochemistry, biogeography, palaeontology, taxonomy, anatomy and embryology, plant and animal breeding; Evidence from changing earth and sea; Extinctions; Evolutionary ecology.

Unit-4: Natural Selection : Types of natural selection, selective forces, selection models, sexual selection, selection and non adaptive characters, Adaptive radiation, artificial selection, **Variation- g**ene flow, genetic drift, gene mutation - Mendelian concept, chromosomal mutation, architectural changes in chromosomes; The Hardy – Weinberg law, polyploidy in plant evolution**;** Speciation and origin of higher categories **-**Types of speciation, models of speciation, pattern of speciation, isolating mechanism and species formation, signification of speciation; Molecular evolution.

Practicals-32 Hrs

(1) Study of floral biology of crops - typical examples of self and cross pollinated plants.
(2) Selfing and hybridization techniques - Bagging and emasculation.
(3) Pollen viability: germination test and TTC test.
(4) Studying of centre's of origin of cultivated crops - N.I. Vavilov Concept.
(5) Mode of pollination study in different crops.
(6) Identification of crop breeding institutes/ centers and logos.
(7) Studying and identification of contributors of plant breeding - M.S. Swaminathan, N.I. Vavilov, Norman . E. Borlaug .
(8) Study of contributions of scientists to evolutionary biology.
(9)-12) Study of models and photographs related to evolution.

References

1) Atherly, A.G. Girton, J.R. Donald, J.R. 1999. The Science of Genetics. Saunders College
2) Publishers. Fortworth.
3) Griffith, A.J.F., Gelbart, W.M. Muller, J.H. and Lewintin, R.C. 1999. Modern Genetic analysis. W.H. Freeman and co. New York.
4) Hartl. D. 1991. Basic Genetics. II edn. Jones and Barlett Publishers Inc. Boston.
5) Fairbanks, D.J. and W.R. Anderson. 1999. Genetics the continuity of life. Brooks's/Cole publishing company. California.
6) Brooker, R.J. 1999. Genetics –analysis and principles. Addison Wesley Longman Inc. California.
7) Snustad, D.P., Simmons, M.J. and Jenkins, J.R. 1997. Principles of Genetics. Hohn Wiley & son's inc. New York.
8) Brown, T.A.1989. Genetics a molecular approach. Van Nostrand Reinhold (intn) Co., Ltd. London.
10) Winchester, A.M. 1969. Genetics. III edn. Oxford and IBH, New Delhi.
11) Strickberger, Monroe W. 2000. Evolution. 3rd Ed., Jones & Bartlett Publishers, Inc. 40 Tall PineDrive Sudbury, MA 01776, United States of America
12) Futuyma, Douglas J. 2005. Evolution. Sinauer Associates, Inc., 23 Plumtree Road, Sunderland, MA 01375, United States of America
13) Dodson E. O. and Dodson P. 1976. Evolution: Process and Product. 2nd Ed., D. Van Nostrand Company, 450 West 33rd Street, New York, N.Y. 10001
14) Chopra, V.L. 2000. Plant Breeding- theory and practices. Oxford and IBH Publishing Co. Pvt. Ltd., Oxford.
15) Chahal, G.S. and Gosal, S.S. 2002. Principles and procedures of Plant Breeding. Narosa Publishing House, New Delhi.

BOTANY: II- SEMESTER - SOFT CORE 2.1
PLANT ANATOMY AND HISTO-CHEMISTRY

Theory-32 Hrs

Unit-1: Plant Anatomy: Primary vegetative body of the plant; Anatomical features of leaf, stem and root (dicot and monocot); leaf of fern and gymnosperm; Structure of modified leaves- Kranz anatomy and C4 photosynthesis; Ultra-structure and chemistry of the cell wall; formation of the cell wall and its uses.

Unit-2: Anatomy of Vascular Tissue: Ultra structure and differentiation of xylem and phloem tissues; Apical meristems- shoot apex in Pteridophytes, Gymnosperms and Angiosperms, theories, root apical meristems.

Unit -3: Secondary Growth: Vascular cambium, secondary xylem of gymnosperms and dicots and secondary phloem of Gymnosperms and dicots; Periderm and bark; Anomalous secondary growth in monocots and climbers; Leaf ontogeny - Dicot- simple, compound, Monocot; Floral anatomy-flower parts, floral meristem, vascular system.

Unit-4: Plant Histochemistry: Tests for minerals, carbohydrates, lignins, polyphenols, proteins, lipids and nucleic acids; Study of instruments: (a) Camera lucida (b) Micrometry (c) Microtome. Principles of histo-chemical stains; Killing, fixing and staining of plant tissues; Double staining- TBA method.

Practicals-32 Hrs

1) Staining of xylem and phloem elements.
2) Study of anatomy of roots in: *Ficus, Musa, Dieffenbachia*, *Vanda.*
3) Study of anamalous secondary growth in the following examples: Stem of *Aristolochia*, *Nyctanthes, Pyrostegia, Peperomia, Tinospora, Achyranthes*.
4) Study of Ecological anatomy.
5) Study of Vasculature in floral organs.
6) Studying double staining technique.
7-11) Embedding: TBA method, embedding for electron microscope, Sectioning**,** Microtomes, whole mounts maceration.
12) Histochemical- PAS Test**,** Sudan black- lipids**,** Feulgen reaction – Nucleic acids.

References:

1) Abraham, F. 1982. Plant Anatomy. 3rd edn. Pergaon Press. Oxford.
2) Cariquist, S. 1967. Comparative Plant Anatomy- Holt Reinert and Winston, New York.
3) Cutter, D. G. 1971. Plant Anatomy- Part 1, Cell and Tissues Edward Arnold London.
4) Cutter, D. G, 1971. Plant Anatomy- Part 1, Cell and Tissues Edward Arnold London. Part- II.
5) Eames and McDaniel, 1947. Plant Anatomy. 2nd edn., McGraw Hill, New York.
6) Esau, K. 1965, Plant Anatomy, Joh Wiley and Sons, New York.
7) James, D. Mauseth, 1998. Plant anatomy The Benzamin/ Cummins Publishing Co.Inc.
8) Esau, K. 1979, Anatomy of seed plants- first Wiley eastern reprint. New Delhi.
9) Krishnamurthy, K. V. 1988. Methods in Plant Histochemistry. S. Viswanathan (Printers and Publishers) Pvt. Ltd. Madras.

BOTANY: II- SEMESTER - SOFT CORE 2.2

ETHNO-BOTANY AND INTELLECTUAL PROPERTY RIGHTS (IPR)

Theory - 32 Hrs

Unit-1: Ethno-botany: Introduction, concept, scope and objectives; Ethno-botany as an interdisciplinary science; The relevance of ethno-botany in the present context; Ethnic groups; Ethno-botany- Major and minor ethnic groups of India and their life styles; Forest Vs. ethnic groups; Plants in tribal life with reference to Magico-religious rituals and social customs; Sacred groves.

Unit-2: Methodology used in the study of Ethnobotany and Ethno pharmacology: Field work, Herbarium, Ancient Literature, Archaeological findings, temples and sacred places, protocols. Preliminary phyto-chemical analysis of ethno-botanical important medicinal plants.

Unit-3: Role of ethno-botany in modern Medicine with special examples; Medico-ethno-botanical Sources in India with special reference to Karnataka; Tribals Vs. Agriculture: Shifting, Podu and Jhum cultivation; Role of ethnic groups on surrounding environment; Crop genetic sources; Endangered taxa and forest management (participatory forest management); Ethno- botany as a tool to protect interests of ethnic groups; Sharing of wealth concept with few examples from India.

Unit-4: Study of Intellectual Property Rights – patents, trademark, geographical indication, copyright; IPR and Traditional Knowledge; Bio-piracy of traditional knowledge; Ethno botany and legal aspects; National and international organizations and treaty related to traditional knowledge – WIPO, TKDL, TRIPS, CBD, Nagoya protocol etc., Ethno botany as a source (recent) of already known drugs: a) *Withania* as an antioxidant and relaxant b) *Sarpagandha* in brain ailments c) *Becopa* and *Centella* in epilepsy and memory development in children d) *Phyllanthus fraternus* in diabetic and viral jaundice e) *Artemisia* as a powerful cerebral anti malarial agent and its possible use in tuberculosis.

Practicals-32 Hrs

1) Survey and collection important ethno botanical plants by using questionnaire and interview.
2) Preliminary phyto- chemical analysis of medicinal plants.
3) Study of biological functional properties of crude drugs – Anti microbial activity.
4) Study of methods of *in-situ* or *ex-situ* conservation of important medicinal plants.
5) Study of techniques used in Pharmacognosy – organoleptic, anatomy and chemical methods.
6) A visit to a Tribal area to conduct field work and collect ethno botanical information / data.
7) Listing of Crude drugs in Pansali shops (local crude drugs shops) and their identification (little known drugs only).
8) -12) Visit to nearby Western Ghats and Sacred Groves.

References:

1) Jain, S.K. 1995. Manual of Ethno-botany, Scientific Publishers, Jodhpur.
2) Jain, S.K. 1981. Glimpses of Indian. Ethno-botany, Oxford and I B H, New Delhi
3) S.K. Jain 1989. Methods and approaches in ethno-botany. (ed.) Society of ethno botanists, Lucknow, India.
4) Jain, S.K. 1990. Contributions of Indian ethno-botany. Scientific Publishers, Jodhpur.

5) Colton C.M. 1997. Ethno botany – Principles and applications. John Wiley and sons –
6) Rama Ro, N and A.N. Henry (1996). The Ethno-botany of Eastern Ghats in Andhra Pradesh, India. Botanical Survey of India. Howrah.
7) Rajiv K. Sinha – Ethno-botany The Renaissance of Traditional Herbal Medicine – INA – SHREE Publishers, Jaipur-1996
8) Faulks, P.J. 1958. An introduction to Ethno-botany, Moredale pub. Ltd. London

BOTANY: II- SEMESTER - SOFT CORE 2.3
ECONOMIC BOTANY

Theory -32 Hrs

Unit- 1: Economic Botany: The origin of cultivated plants and Agriculture; The future role of plants in relation to mankind; Introduction to Green revolution; Study of origin, distribution, cultivation and utility of the useful parts of the following- - rice, wheat, maize, barley, sorghum and millets; Red gram, green gram, black gram, horse gram, pea, cow pea, bengal gram; Oil Yielding plants- sunflower, safflower, groundnut, linseed, rape seed; A brief account of economically important horticultural and floricultural plants.

Unit- 2: Economic Botany: Study and utility of the useful parts of the following- Sugar yielding plants- sugar cane and sweet potato, sugar beet and *Stevia*; Spices and condiments - ginger, turmeric, cardamom, cinnamon, clove, saffron, all spice, black pepper, nutmeg, red pepper, coriander, cumin, fennel and *Vanilla.*

Unit -3: Economic Botany Study and utility of the useful parts of the following- fibre- cotton, jute, flax, hemp, Sunn hemp, China grass, coconut and Kapok; Timber yielding plants- *Tectona* and *Dalbergia*; Dyes- indigo, henna; Masticatories and fumitories-areca nut, betel leaf, tobacco; rubber- Para rubber and other substitutes; Gums- Gum Arabic, Karaya gum.

Unit-4: Medicinal Botany: Scope and importance of medicinal plants; Indigenous medicinal Sciences; Important medicinal plants and their uses; Major exporters and importers of traditional medicinal plants and plant products; Application of natural products to certain diseases- jaundice, cardiac, infertility, diabetics, blood pressure and skin diseases; Poisonous plants.

Practicals-32 Hrs

1) Utility, uses and economic importance of cereals and millets.
2) Utility, uses and economic importance of horticultural and floricultural plants
3) Utility, uses and economic importance of pulses and oil yielding crops.
4) Utility, uses and economic importance of sugar yielding crops.
5) Utility, uses and economic importance of spice and condiments.
6) Utility, uses and economic importance of fiber and timber yielding plants.
7) Utility, uses and economic importance of dye, rubber and gum yielding plants
8) Utility, uses and economic importance of masticatories and fumitories
9) -12) Study of medicinal and poisonous plants.

References:

1) Hill, A.F. 1952. Economic Botany, TataMcGraw Hill, New Delhi.
2) Kochhar, S.L. 1998. Economic Botany of Tropics, Macmillan India Publishers, New Delhi.
4) Pandey, B.P. 2000. Economic Botany. S. Chand & Company, New Delhi.
5) Pandey, S.N. and Chandha, A. 1999. Economic Botany. Vikas Publishing House Pvt. Ltd. New Delhi.

BOTANY: II SEMESTER- OPEN ELECTIVE 2.1
MEDICINAL PLANTS

Theory-32 Hrs

Unit-1: Medicinal Plants: History, scope and importance of medicinal plants; Indigenous medicinal sciences; History, origin, panchamahabhutas, saptadhatu and tridosha concept, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e-tabiya, tumors treatments/ therapy, polyherbal formulations.

Unit-2: Medicinal Plants Conservation: Conservation of endangered and endemic medicinal plants; Endemic and endangered medicinal plants; Red list criteria; *In-situ* conservation- biosphere reserves, sacred groves, national parks; *Ex situ* conservation- botanic gardens, ethno medicinal plant gardens; Propagation of medicinal plants - objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.

Unit - 3: Funding for Cultivation of Medicinal Plants: Sources of financial aids for medicinal plant cultivation: Aims and objectives, Functions and activities of the board, Schemes and Projects for Financial assistance, Funding of projects; Procedure for processing project proposal for approval, Implementation and monitoring.

Unit- 4: Ethno botany and Folk medicines: Definition; Ethno botany in India: Methods to study ethno botany; Applications of Ethno botany: National interacts. Ethno medicine. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases. Brief introduction to poisonous plants.

References:

1) Trivedi, P. C. 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2) Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn.
3) Agrobios, India.
4) Yoganarasimhan, S.N. Medicinal Plants of India- Vol 1- Karnataka, Interline Publishing Pvt. Ltd.

BOTANY: III- SEMESTER - HARD CORE 3.1
BIOCHEMISTRY AND PLANT PHYSIOLOGY

Theory -32 Hrs

Unit-1: Biochemistry- Brief account of plant structural and functional molecules-carbohydrates, proteins, lipids and nucleic acids**;** classification, structural and functional properties of bio molecules; Biochemistry of cell membranes; **Lipids-**building and storage molecules, classification and significance; **Proteins-** classification, structure- primary, secondary, tertiary and quaternary structure; properties of proteins; **Enzymes**-Nomenclature, nature and properties of enzymes, active sites, co-enzymes, kinetics of enzyme action, catalysis, specificity and inhibition, allosteric enzymes, ribozyme and abzyme.

Unit-2:Solute transport: Transport of solutes across the membranes Transmembrane proteins, Transport of ions, solutes and macro-molecules, Mechanism of translocations in phloem; Role played in signal transduction pathway stomatal physiology; **Phytosynthesis in higher plants** (i) Photophosphorylation - Calvin cycle; **Photorespiration** - C4 – Pathway, CAM in plants; Oxidative Phosphorylations; Glycolysis -TCA – Cycle and terminal oxidation.

Unit-3: Plant Hormones- plant hormones-discovery, biosynthesis, metabolism, transport and physiological effects of plant hormones and their applications; **Nitrogen metabolism** -(i) Molecular mechanism of N2 fixation (ii) Biosynthesis of amino acids (iii) Assimilation of nitrate and ammonium; **Lipid metabolism-** fats and oils biosynthesis and oxidation of lipids; Physiology of seed germination and flowering.

Unit -4: Stress Physiology: Water deficit and its physiological consequences; Drought tolerance mechanisms, Salinity stress and plant responses. Heat stress and heat shock proteins; Metal toxicity in plants. Biotic stress, HR and SAR mechanisms; **Mineral nutrition**-in plants and deficiency diseases; **Plant development-** physiology of flowering; **Phytochrome**- photochemical and biochemical properties of phytochrome; Concept of photoperiodism and vernalization and its influence on flowering;

Practicals-32 Hrs

1) Estimation of protein by Lowry's method
2) Determination of water potential of tissue by plasmolytic method
3) Determination of water potential by Gravimetric method
4) Quantitative estimation of chlorophyll a, chlorophyll b and total chlorophyll in plant tissue
5) Determination of diurnal fluctuation of acid content of CAM plants (TAN)
6) Determination of temperature quotient (Q10) of water uptake
7) Separation of chlorophyll pigments/Anthocyanin by TLC
8) Protein analysis by SDS PAGE method.
9) Estimation of Alpha-amylase activity in germinating seedling.
10) Silver staining of proteins.
11-12) Visit to Molecular Biology Laboratories.

References:

1) Barkla, B.J., and Pantajo, O. 1996. Physiology of ion transport across the tonoplast of higher plants. Ann. Rev. Plant Physiol. 47: 159-184.
2) Clayton, R.K. 1980. Photosynthesis: Physical mechanisms and chemical patterns. Cambridge Uni. Press, Cambridge.
3) Cohn, E.E., and Stumf, P.K. 1992. Outlines of Biochemistry. Wiley Eastern Pvt. Ltd.
4) Kozaki, A., and Takeba, G. 1996. Photorespiration protects C3 plants from

photooxidation. Nature 384: 557- 560.
5) Taiz, L., and Zeiger, E. 1998. Plant Physiology. Sinaur Associates Inc. Publishers, Sunderland Massachusetts.
6) Mukherji, S., and GHosh, A.K. 1996. Plant Physiology. New Central Book Agency Pvt. Ltd. Kolkatta, India.
7) Rabinowithc, E., and Jee, G. 1969. Photosynthesis. Willey Press, New York.
8) Rudier, W., and Thummlar, K. 1994. The Phytochrome, Chromophore I. Photomorphogenesis in Plants, II Edition, Netherlands, 51-69.
9) Spanswick, R.M. 1981. Electrogenic ion pumps. Ann. Rev. Plant Physiol. 32: 267-289.
10) Mc Elroy, W.D. 1995. Cell Physiology and Biochemistry. Prantice Hall of India.
11) Walsh, C.T. 1979. Enzymatic reaction mechanisms. Editors: W.H. Freeman, New York.
12) Webb, E. 1984. Enzyme nomenclature. Academic Press, Orlando Fla.
13) Zimmermann, M.H., and Milburn, J.A. Transport in Plants. 1. Phloem transport (Encyclopedia of Plant Physiology. New Series Vol. 1), Springer, New York.
14) Devline and Witham, 1986. Plant Physiology. CBS Publs. and Distributors, New Delhi.
15) Hopkins, W.G. 1995. Introduction to Plant Physiology, John Wiley & Sons. Inc., NewYork, USA.
16) Moore, T.C. 1989. Biochemistry and Physiology of Plant Hormones. Springer Verlag, New York, USA.
17) Singhal *et al*. 1999. Concepts in Photobiology, Photosynthesis and Phytomorphognesis, Narosa Pub. House, New Delhi.

BOTANY: III- SEMESTER - HARD CORE 3.2
MOLECULAR BIOLOGY

Theory-32 Hrs

Unit-1: Organization of chromosomes and genes in prokaryotes and eukaryotes - Operon, interrupted genes, gene families, unique and repetitive DNA, heterochromatin, euchromatin, transposons, mitochondrial and chloroplast genome organization, Transposable elements in prokaryotes and eukaryotes, genetic and evolutionary significance, **DNA replication**- patterns, Messelson and Stahl's and Taylor's experiment, enzymes of replication, mechanism of DNA replication in prokaryotes and Eukaryotes, proof reading and error correction mechanisms.

Unit-2: Molecular mechanism of mutation, repair and recombination:- Mutation-DNA damage by spontaneous mutations, physical and chemical mutagens and their molecular mechanisms, **Repair mechanisms**- direct reversal of damage, base and excision repair, recombinational repair, SOS repair, translation repair synthesis, transcription coupled repair, **Recombination**- homologous recombination, models of recombination, mechanisms, protein machinery of homologous recombination, genetic consequence of homologous recombination, gene conversion, site specific recombination, mechanism and biological significance, non homologous recombination- transposition, molecular mechanisms of transposition- conservative, replicative and retro-transposition.

Unit-3: RNA synthesis, processing and translation: transcription activators and repressors, promoters, RNA polymerases and transcription factors, mechanism of transcription in prokaryotes and eukaryotes, **RNA processing**- capping, polyadenylation, splicing, alternative splicing, RNA editing, exon shuffling and RNA transport, **Translation and processing**- ribosomes, tRNA aminoacylation, aminoacyl tRNA synthetase, genetic code, wobble hypothesis, deciphering of the code, translation mechanism , translation proof reading, translation inhibitors and post translational modifications.

Unit-4: Regulation of gene expression in Prokaryotes: Operon concept, regulation at transcription initiation- lac and trp operon control, regulation of lytic and lysogenic cycles in lambda phage, regulation beyond transcription initiation-premature termination- trp operon, ribosomal proteins as translational repressors, riboswitches, **Regulation of gene expression in eukaryotes**-transcription activators and repressors, regulation after transcription initiation- alternative splicing, translational control in ferretin and tranferrin mRNA, RNA interference, role of chromatin in regulation of gene expression and gene silencing.

Practicals-32 Hrs

1) Isolation of DNA from CTAB method.
2) Isolation of DNA from Onion.
3) Isolation of DNA from mulberry leaves.
4) Estimation of DNA by DPA method.
5) Extraction of RNA by trizol/ phenol-chloroform methods.
6) Estimation of proteins by Biuret method.
7) Estimation of protein by Bradford method.
8) Determination of Tm value of DNA.

9-12)Photo graphs/ charts related to molecular biology/Molecular Biologists.

References:

1) Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Rafi, Keith Roberts, and Peter

Walter. 2008. Molecular biology of the cell, 5th edn., Garland science, Taylor & Francis Group, LLC, 270 Madison Avenue, NewYork ,USA.
2) Alberts, B., Bray, D., Lewis, J , Raff, M., Roberts, K and Watson, J.D. 1999 . Molecular biology of the cell. Garland Publishing, Inc., New York
3) Kleinsmith, L.J. and Kish, V.M. 1995 .Principles of Cell and Molecular Biology 2nd Edition Harper Collins College Publishers, New York, USA.
4) Lodish, H. Berk, A., Zipursky, S.L., Matsudaira, P., Baltimore, D. and Darnell, J. 2000. Molecular Cell Biology 4th Edition. W.H. Freeman and Co. New York, USA
5) Malaciniski, G.M. and Freidfelder, D. 1998. Essentials of Molecular Biology 3rd Edition. Jones and Bartlet Publishers, Inc., London.
6) Gunning.B.E.S. and Steer, M.W.1996. Plant Cell Biology; Structure and Function. Jones and Bartlett Publishers, Boston, Massachusetts.
7) Harris,Nand Oparka, K.J. 1994. Plant Cell Biology A Practical Approach. IRL Press, Oxford University Press, U.K.
8) F.M. Ausubel, R.Brent, R.E. Kingston, D.D. Moore, J.G. Seidman, J.A. Smith, K. Struhl, (Current Edition) (2005). Current Protocols in Molecular Biology.
9) B.B. Buchanan, W.Gruissem and R.L. Jones . USA (2000) .Biochemistry and Molecular Biology of Plants. Ed. ASPP Press.
10) T.A. Brown, 2000. Essential of Molecular Biology, Vol-I & 2 Oxford University Press.
11) James D. Watson, Tania,. A. Baker, Stephen, P. Bell, Alexander ,Gannm, Michael Levine.2004. Molecular Biology of the gene. 5th Edition, Pearson Education.Philip M Gilmartin and Chris.
12) Bowle.2002. Molecular Biology of Plants. Vol 1 & 2 Oxford University Press.

BOTANY: III-SEMESTER - HARD CORE 3.3
PLANT BIOTECHNOLOGY

Theory-32 Hrs

Unit-1: Plant Tissue Culture: Scope and importance of plant tissue culture - Media composition and types, hormones and growth regulators, explants for organogenesis; Micro propagation, embryo and endosperm culture, somatic embryogenesis, variation and cell line selection, adrogenesis and microspore culture, significance of haploids, diploidization and bulbosum technique; Cryopreservation, germplasm collection; Somatic Hybrids- Isolation and protoplast culture and somatic hybridization and its significance, Synthetic seed production and somaclonal variations.

Unit-2: Genetic Engineering: Milestones in plant recombinant DNA technology; Importance of gene manipulation in future perspectives; **Tools in Genetic Engineering-** Enzymes in genetic engineering - restriction endonucleases, types and their actions, other DNA modifying enzymes; Cloning vectors- plasmids isolation and purification - Ti Plasmid, pBR322, pUC-series. Phage vectors-M13 phage vectors, Cosmids -types, phasmids or phagemids, shuttle vectors-types; YAC and BAC vectors, Lambda phage vectors, Lamda phage DNA as a vectors; Cloning vectors and expression vectors; Vectors for plant cells; Vectors for animal cells, baculovirus vectors- adenoviruses, retroviruses, transposons as vectors, Synthetic construction of vectors.

Unit 3: Applications of Genetic Engineering for pest, disease and stress tolerance: The genetic manipulation of herbicide resistance with suitable examples; The genetic manipulation of pest and disease resistance with suitable examples; Transgenic approaches to viral and bacterial disease resistance. Engineering for stress tolerance and Metabolic Engineering of Plants; Future prospects for GM crops.

Unit 4: Biofertilizers: Preparation and applications of biofertilizers such as Rhizobium, Azotobacter, Blue Green Algae and VAM. Single Cell proteins (SCP): Health benefits and advantages of single cell proteins- *Spirulina.* Biofuels: Ethanol and Biofuel production from plants. Mushroom cultivation and its advantages. Bioremediation: Phytoremediation; Biodegradation, Xenobiotics. Biotechnology of medicinal and aromatic plants for human welfare.

Practicals-32 Hrs

1) Preparation of plant tissue culture media and types.
2) Organ culture (Shoot tip, nodal and leaf culture) for callus Initiation and regeneration.
3) Anther culture for the production of haploids.
4) Suspension culture and production, separation and estimation of secondary metabolites.
5) Encapsulation of somatic embryos and production of Synthetic seed.
6) Extraction of secondary metabolites using Soxhlet extractor and Identification of In vitro secondary metabolites-alkaloids, steroids and flavonoids.
7) Restriction digestion of plasmid and genomic DNA and gel electrophoresis.

8) Isolation of genomic DNA from bacteria/plants and purification by agarose gel electrophoresis.
9) Restriction analysis of plasmids, gel purification of DNA, small and large scale purification of plasmids.
10) Preparation of competent *E. coli* cells. Bacterial transformation and recovery of plasmid clones.
11) Gene cloning in plasmids, analysis of recombinant plasmids.
12) DNA amplification by PCR, RT-PCR, Real Time PCR.
13) Analysis of DNA and RNA and Protein by Southern, Northern and Western blotting.
14) Primer design for PCR.

References:

1) Slater, N. Scott and M. Fowler. Plant Biotechnology 2003: The genetic manipulation of plants. Oxford University Press, Oxford.
2) Plant Biotechnology. 2000. J.H. Hammond, P. Mcgarvey, and V. Yusibov (eds). Springer Verlag, Heidelberg.
3) Text Book of Biotechnology. 2004. H.K. Das (ed). Wiley India Pvt. Ltd., New Delhi.
4) Plant Biotechnology -The Genetic Manipulation of Plants, Adrian Slater, Nigel Scott and Mark Flower, Oxford University Press, (2000).
5) Plant Genetic Transformation and Gene Expression by (eds) J.Draper *et.al*. Blackwell Scientific Publications, Oxford (1988).
6)Reinert, J. 1982. Plant Cell and Tissue Culture: A Laboratory Manual. Narosa Publishing House, New Delhi.
7)Chawla H.S., 2009, Plant Biotechnology. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
8)Bhojwani, S.S. and Razdan, M.K. 2004. Plant Tissue Culture: Theory and practice. Elsevier Science Publishers, New York, USA.
9)PUROHIT S. D., 2012. Introduction To Plant Cell Tissue And Organ Culture PHI Learning Pvt. Ltd., New Delhi
10) Roberta, H. Smith, 2012. Plant Tissue Culture: Techniques and Experiments 3 edition. Academic Press; US.

BOTANY: III- SEMESTER- SOFT CORE 3.1
MOLECULAR GENETICS OF PLANTS

Theory-32 Hrs

Unit-1: Plants as genetic tools in Biology: *Arabidopsis, Rice, Maize, Saccharomyces;* Genome organization in plants; *Arabidopsis thaliana*- an experimental model for understanding plant development and functions; Plant genes and regulation; nucleus and chromatin organization; Histones and histone modifications; DNA packaging, organization and types of DNA sequences; functional and non- functional sequences, organization of plant nuclear genes, plastid genes and mitochondrial genes.

Unit-2: Genes responding to hormones, phytochrome, responses to abiotic stresses; Genes induced by water stress and freezing stress; Genes involved in photosynthesis and nitrogen fixation and their regulation; Molecular development of leaf and flower - ABC and revised model of flower development; Genes involved in fertilization, seed development, embryo development.

Unit-3: Genetics of *Agrobacterium:* Biology and genetics of *Agrobacterium tumefaciens;* The Ti- plasmid, *Vir* genes and expression, Mechanism of T-DNA transfer and integration; Basic features of vectors for plant transformation; Proteomics, genomics and bioinformatics; Structural and functional genomics, comparative genomics - biochemical, evolutionary, physiological and phylogenomics; Tools to study functional genomics.

Unit-4: Proteomics- functional and comparative proteomics; Protein distribution, characterization and identification, differential display proteomics, detection of functional linkages; Pharmacogenomics; Bioinformatics- tools of bioinformatics, data bases and data base management, bioinformatics in taxonomy, biodiversity, agriculture; Bioinformatics in drug design and drug discovery.

Practicals-32 Hrs

1) *Arabidopsis thaliana*- study of plant system and its biology.
2) *Arabidopsis* RNA extraction (total and polysomal) for Northern blotting.
3) Expression of foreign genes in plant cells through *Agrobacterium tumefaciens* (Chart)
4) Production of tobacco transgenic plants and assay for the introduced transgenic (Chart)
5) Co-cultivation of tobacco *Agrobacterium tumefaciens*
6) -12) Learning gene bank formats- EMBL format, FASTA format, Swiss- PROT, Ex PASy

References:

1) Buchmann, B.B., Gruissem, W., and Jones, R.L. 2000. Biochemistry and Molecular Biology of Plants. ASPP Press, USA.
2) Ausubel, F.M., Brent, R., Kingston, R.E., Moore, D.D., Seidman, J.G., Smith, J.A., and Struhl, K. 2005. Current protocols in molecular biology. Current Edition.
3) Brown, T.A. 2000. Essentials of Molecular Biology. Vol. I & II, Oxford University Press.
4) Potrykus, I., and Spangenberg, G. 1995. Gene transfer to plants. Springer, Berlin, Heidelberg.
5) Watson, J.D., and Baker, T.A., Bell, S.P. Gannm, A. and Levine, M. 2004. Molecular Biology of Genes. 5th edn., Pearson Education.
6) Gilmartin, P.M., and Bowler, C. 2002. Molecular Biology of Plants. Vol. I & II, Oxford University Press.
7) Karchar, S.J. 1995. Molecular Biology- A Project Approach, Academic Press, New York.
8) Sambrock, J., Fritch, E.F., and Maniatis, T. 1989. Molecular cloning- a laboratory manual.
9) Slater, A., Scott, N., and Flower, M. 2000. Plant Biotechnology- the Genetic Manipulation of Plants, Oxford University Press, Oxford.

10) Lea, P.J., and Leegood, R.C. 1999. Plant Biochemistry and Molecular Biology. John Willey and Sons Press, New York.
11) Draper, J. 1988. Plant Genetic Transformation and Gene Expression. Blackwell Scientific Publications, Oxford.
12) Old, R.W., and Primrose, S.B. 2004. Principles of Gene Manipulation. An introduction to Genetic Engineering. 5th Edition, Blackwell Science Publications.

BOTANY: IV- SEMESTER- SOFT CORE 3.2
MOLECULAR PLANT PATHOLOGY

Theory-32 Hrs

Unit-1: Concepts and scope of physiological and molecular plant pathology; Molecular approaches to plant disease diagnosis; Nucleic acid based probes for detection of plant pathogens including non-culturable organisms; **Pathogenicity and Disease Development**-factors; induced resistance, virulence and pathogenecity factors; Plant-pathogen interactions with emphasis on incompatible interactions and induced resistance.

Unit -2: Pathogenesis: Necrogenic plant pathogenic bacteria with emphasis on hrp and avr genes and virulence factors; Fungal plant pathogens with emphasis on virulence and pathogenicity factors; Plant viruses with emphasis on virus replication, virus transport in plants and control of plant viruses with transgenic plants; **Signal Transuduction-** recognition of the pathogen by the host, transmission of the alarm signal to the host defense providers; Necrotic defense reaction, defense through hypersensitive response; Molecular basis of induced biochemical reaction; Local and systemic acquired resistance (SAR).

Unit-3:Genetics of Plant Diseases and Resistance: Genes and diseases; physiological specialization among plant pathogens; Variability in viruses, bacteria and fungi; Levels of variability in pathogens and loss of virulence in plant pathogens; Genetics of virulence in pathogens and of resistance in host plants; Molecular plant breeding for disease resistance.

Unit-4: Genetics and molecular basis of host-pathogen interaction: Evolution of parasitism; genetics oh host-pathogen interaction; Gene for gene relationship; Criteria for gene for gene type relationship; Molecular basis of host pathogen interaction; Host-parasite-interaction. **Biotechnological methods of plant disease management;** Genetic engineering and crop protection; Cross protection; Gene silencing and disease control- mechanism of gene silencing and control of viral diseases; Engineered resistance to viral, bacterial, fungal and insect diseases of crop plants.

Practicals-32 Hrs

1-2) Testing hypersensitivity reaction on *Nicotiana and Bajra.*
3) Estimation of lypoxygenease in diseased and healthy plants.
4) Estimation of polyphenols in diseased and healthy
plants. 5-7) Studying systemic acquired resistance in
crop plants.
8) Genetic testing of disease resistance in plants.
9-11) Molecular detection of viruses, Mycoplasma, fungi and bacteria from infected plants.
12) In-vitro testing of pathogen virulence.
Visit to agricultural research station to study diseases on different crop plants.

References:

1) Singh, R. S. (1973). Plant Disease. Oxford and IBH Pub.Co. New Delhi.
2) Agrios, G. N. (1994). Plant Pathology 2nd Edn. Academic Press NY.
3) Johnston A and Both, C. 1983-Plant Pathologists Pocket-book. 2nd Edn.
Commonwealth Mycological Institute, Oxford and IBH Pub. Co. Calcutta.
5) Rangaswamy G and Mahadevan A 2002. Diseases of crop plants in India, Prentice
Hall of India Pvt. Ltd. New Delhi.
6) Mehrotra, R. S.1983-Plant Pathology Tata Mc. Graw Hill Pub. Co. Ltd., New Delhi.
7) Vidhyasekaran, P. 2004. Encylopedia of Plant Pathology.Viva Books Pvt.Ltd. New Delhi.

BOTANY: III SEMESTER- SOFT CORE 3.3
PLANT PROPAGATION AND PLANT BREEDING

Theory-32 Hrs

Unit-1: **Plant Propagation:** History, scope and importance of plant propagation; Propagation structures with reference to green house equipment and media; Seed propagation and vegetative propagation; Propagation by cuttings; Biology and techniques of grafting; Techniques of budding; Layering and its natural modifications; Propagation by specialized stems and roots; Micro propagation **–** techniques and applications in forestry and horticulture; Limitations and applications of vegetative propagation; Propagation methods of some selected plants – Citrus, Grape, Mango, Mulberry, Hibiscus, Rose, Croton, Eucalyptus.

Unit-2: Plant Breeding: History of plant breeding, objectives of plant breeding, salient achievements of plant breeding; Centres of origin of crop plants, Exploration and collection of plant genetic resources, evaluation of germplasm collection, documentation, conservation of plant genetic resources, utilization of genetic resources; The theory of pure line selection – Genetic basis, sources of genetic variation in pure lines, the land variety (races); Mendelian experiments of plant hybridization; Quantitative Inheritance; Applications of biometrical genetics in plant breeding.

Unit-3: Plant Breeding: Types of plant breeding; Fertility regulating mechanisms - manual or mechanical control, genetic control, incompatibility, male sterility, genetic engineering for male sterility, chemical control, genetic basis of heterosis; Synthetic and composite varieties **-**genetic basis, procedure for developing synthetic and composite varieties - genetic basis, procedure for developing synthetic varieties; Breeding for resistance to disease and insect pests.

Unit - 4 :Mutation Breeding: Significance of induced mutations in plant breeding; Polyploidy in plant breeding**- t**ypes of polyploids, induction of polyploidy, phenotypic effects of polyploidy, significance of polyploids; Tissue culture in crop improvement; Molecular approaches to crop improvement- probes, gel electrophoration, electrofusion, biolistics, gene cloning, transgenic plants (GMO's), molecular markers, construction of genetic maps, application of DNA makers in plant breeding, the role of gene technology in plant breeding; Crop breeding Institutes/Centers, Molecular biology in relation to intellectual property rights.

Practicals-32 Hrs

1) Study of types of vegetative propagation: Cutting, Grafting, budding, layering.
2) Study of propagation by modified stems and modified roots.
3) Preparation of media, explants, culture, initiation of shoot multiplication.
4) Pot and green house implants (demonstration) (5) Studying of floral biology.
6) Hybridization techniques - bagging and emasculation.
7) Pollen viability test : Seed germination test, TTC test.
8) Mode of pollination study in different crops.
9) Visit to crop breeding stations/institutes / centres.
10) Estimation of protein quality, Amino acid Analysis and determination of oil and fatty acids.
11) Observation of colour and conditions of mature anthers in different crops.
12) Identification of and studying of important plant breeders.

References:

1) Abbottt, A.J. and Atkin, R.K. eds. 1987. Improving vegetatively propagated crops.

Academic press, New York.
2) Bose, T.K., Sadhu, M.K., & Das, P., 1986. Propagation of Tropical and Subtropical Horticultural crops, Nowya Prakash, Calcutta.
4) Hartmann, H.T., Kester E.D., Davis, F.T., and Geneve, R.L. 1997. Plant propagation. Principles and practices. Prentice Hall of India Private Limited, New Delhi.
5) Krishnamurthy. H.M. 1981. Plant Growth substances including application in Agriculture.
6) Pierik, L.M. 1987. In vitro culture of Higher plants Murtinus Nijhoff pub. Dordrecht.
7) Razdan, M.K. 1994. An Introduction to Plant tissue culture, Oxford and IBH Pub. Co., PVT. Ltd., Bombay and Calcutta.
8. Mac Donald, B. 1987. Practical woody plant propagation for nursery growers. Portland, OR: Timber press.
9. Sadhu, M.K. 1989. Plant propagation Wiley eastern Ltd. N. Delhi.

BOTANY: III SEMESTER SOFT CORE 3.4
PHYTOCHEMISTRY AND HERBAL TECHNOLOGY

Theory-32 Hrs

Unit-1: **Phytochemisrty:** Scope of phytochemistry, plants as source of chemical compounds, primary and secondary metabolites and its applications; Definition, source of herbal raw materials, identification, authentication, standardization of medicinal plants as per WHO guidelines and different herbal pharmacopoeias; Natural pigments, natural products as markers for new drug discovery.

Unit-2: Extraction, isolation and purification of phytochemicals: Selection of plant samples, processing and storage of samples for extraction; Factors influencing the choice of extraction, principles of extraction methods, infusion, decoction, digestion, maceration, percolation, solvent extraction, fluid extraction, ultrasound, microwave assisted extraction, advantage and disadvantage involved in each method; Isolation of selected primary and secondary metabolites – amino acids, proteins and carbohydrate; Phenolics, flavonoids, alkaloids, lipids, oils, terpenes and saponins; Purification techniques for primary and secondary metabolites – solvent-solvent fractionation and chromatography techniques.

Unit-3: Characterisation of Phytochemicals: Preliminary, qualitative and quantitative techniques – paper chromatography, thin layer chromatography, column chromatography-HPLC, GC (qualitative and quantitative), colour reactions for amino acids, sugars, phenolics, flavonoids, alkaloids, terpenes, saponins, oils, lipids; Spectroscopic estimations/gravimetric determination of total sugars, amino acids, proteins, phenolics, flavonoids, alkaloids, terpenes, saponins, oils, lipids; Characterisation using spectroscopic techniques - UV/VIS, FTIR, DSC (differential scanning calorimeter), NMR, MS, MALDI. XRD – single crystal and powder.

Unit-4: Standardisation and Validation of Photochemical: Quality determination of herbal drugs; Role of processing methods and storage conditions on quality of drugs; Standardisation parameters- impurity limit, ash content, extractable matter, moisture content, other phytochemicals, microbial contaminants, pesticides; Validation of drug – guidelines, limit of detection and quantification of impurities, organoleptic properties, physical, chemical, biological characteristics, stability testing, storage conditions and packing system/unit.

Practicals-32 Hrs

1) Survey and collection of medicinal plants for analysis.
2) Selection of plant part, processing and storage of samples for further analysis.
3) Extraction methods - aqueous and sequential solvent extraction of compounds.
4) Preliminary phytochemical analysis of active principles from the extracts.
5) Antibacterial/antifungal activity of crude /active principles
6) Identification of secondary metabolites using TLC- phenolics, flavonoids, alkaloids, terpenes, saponins etc.
7) Column chromatographic separation of active principles.
8) Characterisation of active principle using spectroscopy, HPLC, GCMS, LCMS, FTIR, and MALDI TOF.
9) -12) Submission of report on TEN important curative principles of Indian medicinal plants.

References:

1) Braithwaite, A. and Smith, F.J. 1996. Chromatographic Methods. 5th edn., Blackie Academic & Professional, London.
2) Bourne, U.K. Kokate, Purohit, C.K. and Gokhale S.B. 1983. Pharmacognosy. Nivali Prakashan Publication.
3) Braithwaite, A. and Smith, F. J. 1996. Chromatographic Methods. 5th edn. Blackie Academic & Professional, London.
4) Sadasivam. S. and A. Manickam, 0000. Bio Chemical methods 2nd edn. New Age International Pvt Ltd. New Delhi.
5) Harborne, J.B. 1984. Phytochemical Methods, 2nd edn. Chapman and Hall, London. Harborne J.B., 1973. Phytochemical methods a guide to modern techniques of plants analysis. Chapman and Hall Ltd. London.

BOTANY: III SEMESTER- OPEN ELECTIVE 3.1
PLANT PROPAGATION TECHNIQUES

Theory-32 Hrs

Unit-1: History, scope and importance of plant propagation; Propagation structures with reference to green house equipment and media; Seed propagation – the development of seeds, techniques of seed production and handling principles and media.

Unit-2: Vegetative propagation: Techniques of propagation by cuttings; stem cuttings – hard wood, semi hard wood, soft wood and herbaceous, leaf cuttings, leaf bud cuttings, root cuttings; Biology and techniques of grafting: Whip and tongue, wedge and cleft, bark, side grafting, approach.

Unit-3: Techniques of budding: T- budding patch budding, chip budding, ring budding; Layering and its natural modifications- simple layering, tip layering, mound or stool layering, air layering, compound or serpentine layering and trench layering; Propagation by specialized stems and roots.

Unit- 4: Micro propagation – techniques and applications in forestry and horticulture; Advantage, limitations and applications of vegetative propagation, Somaclonal variations; Propagation methods of some selected plants – Citrus, gape, mango, mulberry, hibiscus, rose, Croton, Eucalyptus.

References:

1) Abbott, A.J. and Atkin, R.K. (eds.) 1987. Improving vegetatively propagated crops. Academic press, New York.
2) Bose, T.K., Sadhu, M.K., and Das, P., 1986. Propagation of Tropical and Subtropical Horticultural crops, Nowya Prakash, Calcutta.
3) Hartmann and Kester, 1983. Plant propagation
4) Hartmann, H.T., Kester E.D., Davis, F.T. and Geneve, R.L. 1997. Plant propagation. Principles and practices. Prentice Hall of India Private Limited, New Delhi.
5) Krishnamurthy. H.M. 1981. Plant Growth substances including application in Agriculture.
6) L.M. Pierik 1987. In vitro culture of Higher plants Murtinus Nijhoff pub. Dordrecht.
7) M.K. Razdan 1994. An Introduction to Plant tissue culture, Oxford and IBH Pub. Co., PVT. Ltd., Bombay and Calcutta.
8) Mac Donald, B. 1987. Practical woody plant propagation for nursery growers. Portland, OR: Timber press.
9) Sadhu, M.K. 1989. Plant propagation Wiley eastern Ltd. N. Delhi.

BOTANY: IV- SEMESTER- HARD CORE 4.1
ECOLOGY, CONSERVATION BIOLOGY AND PHYTOGEOGRAPHY

Theory-32 Hrs

Unit-1: Introduction and scope of Ecology: Plants and the environment- plant adaptation, ecotypes, habitat ecology- fresh water and marine water ecology (ecosystems), wetlands and their characteristics; Ecosystem function; The distribution of biomes; Major Terrestrial Biomes; Forests-Tropical Forests-Temperate Forests, Taiga, Grasslands, Savanna, Temperate Grasslands/Prairies, Tundra, Deser and Chaparral.

Unit-2: Environmental Biology: Global warming: Greenhouse gases - causes and consequences; Ozone depletion- causes and consequences; Air, water and soil pollution - major pollutants, their source, permissible limits - and control methods; Radioactive pollution- Ionising radiation, disposal of radioactive waste, nuclear accidents; Environmental Education Programmes - WWF, UNEP, MAB; Role of plants in solving energy crisis and ameliorating global warming.

Unit-3: Biodiversity and Conservation Biology: Science in the service of Biodiversity, biodiversity and its value, biodiversity issues, concerns, management; Biodiversity hot spots; Biodiversity- threats and current status of biodiversity; IUCN categories, Red Data book and Red lists, invasive alien species as threat to biodiversity; Conservation strategies- past, present, and future; Attitudes about conservation; conservation movements; CITES (Convention on international trade in endangered species), WCU (World Conservation Union); Endangered species Act. 2002 (GOI); Protected areas, Network of India- history, size, scale and management; Heritage trees.

Unit-4: Phytogeography: Biogeography of the world, India and Karnataka; Climatic zones, tectonics, continental movements; Types of plant distribution – discontinuous distribution - land bridge theory, continental drift; continuous distribution-cosmopolitan, circumpolar, circumboreal, circumaustral, pantropical; Distribution of plants - islands; Phytochorea of the world, India; Plant dispersal, migrations and isolation; Eendemic plants of Western Ghats and Eastern Himalayas; Origin, distribution and acclimatization of coffee, cardamom, sugarcane, cashew, ragi, maize, wheat, rice and cotton; Remote sensing and GPS, study of vegetation by GIS (Geographical Information system).

Practicals-32 Hrs

1) Study of local vegetation by quadrate method.
2) Water analysis for pollution studies.(Bio-monitoring: TDS, Hardness, Chlorides, CO_2 COD, DO, BOD)
3) Rapid detection of bacteriological quality of water with special reference to feacal coliforms.
4) Morphology and anatomy of plants in relation to habitats - Xerophytes, Mesophytes, Hydrophytes.
5) *In situ* and *Ex situ* method of conservation.
6) Eminent phytogeographers of the world (photos).
7) Continental drift (charts).
8) Application of Remote Sensing, GIS and GPS in Forestry and Wild life management.
9) Biogeography of the world – Oceans, deserts, islands, mountains.

10) Biogeography of India –rivers, mountains, islands.
11) Floristic regions of world – India and Karnataka.
12) Study of endemic plants of India.
13) Origin, acclimatization and distribution of Coffee, Cardamom, Sugarcane, Cashew, Ragi, Maize, Wheat, Rice and Cotton.

References:

1) Polunin, N. 1961. Introduction to plant geography.
2) Good R.D. 1974. Geography of the flowering plants.
3) James H. B. 1998. Biogeography.
4) Cain, S.A. 1944. Foundations of plant Geography.
5) Croiat, 1952. Manual of Phytogeography.
6) Edgar A. 1972. Plants, Man and Life.
7) Valentine, D. H. 1972. Taxonomy, Phytogeography & Evolution.
8) Phil Gibson J. and Gibson Terri, R. 2006. Plant ecology.
9) Primack, R. B. 2006. Essentials of conservation biology.

10) Ricklefs, R. E. 2001. The Economy of Nature.
11)Narasaiah M. L., 2005. Biodiversity and Sustainable Development.
12)Tondon P, Abrol Y. P, Kumaria S., 2007. Biodiversity and its significance.
14) Krishnamurthy K. V. 2007. An Advanced Textbook on Biodiversity: Principles and Practice.
15) Christian Leveque and Jean-Claude Mounolou (2003). Biodiversity.
16) Jeffries Michael J. 2006. Biodiversity and conservation.

BOTANY: IV- SEMESTER- SOFT CORE 4.2
PROJECT WORK

BOTANY: IV- SEMESTER- SOFT CORE 4.1
SEED TECHNOLOGY

Theory-32 Hrs

Unit-1: Seed Technology: Introduction to seed science and technology and its goals; Development of seed technology industry in India; Seed as basic input in agriculture; Seed Biology - Seed development, morphology and anatomy of dicot and monocot seeds; Seed structure and functions; Seed programmes and organizations; Seed village concept, seed production agencies, seed industry and custom seed production in India; International Seed Science and Technology Organizations.

Unit-2:Seed Production: General principles of seed production in self and cross pollinated and vegetatively propagated crops; Hybrid seed production; Maintenance of inbred lines and breeders seeds; Synthetic and composite seeds; Improved seed and their identification; Germplasm banks; **Seed Processing**-Harvesting, seed drying, seed cleaning and grading; Equipments; Seed Storage- types of storage structure; seed factors affecting storage life, effect of storage on relative humidity, temperature and moisture; Seed deterioration; Seed treatment.

Unit-3: Seed Quality Testing: Devices and tools used in seed testing; ISTA and its role in seed testing; Seed sampling- physical purity and heterogeneity test; Seed moisture content-importance and determination and methods; Viability and vigour testing; Genetic purity testing -objective and criteria for genetic purity testing, seed health testing, field and seed standards, designated diseases, objectionable weeds; Significance of seed borne diseases, seed health testing and detection methods for seed borne fungi, bacteria, viruses and nematodes; Preparation and dispatch of seed testing reports, storage of guard samples, application and use of seed standards and tolerances.

Unit- 4: Seed Certification: Principles and philosophy of seed certification, purpose and procedures, national seed programme; National Seed Corporation (NSC) - agencies responsible for achieving self-reliance in seed production and supply of quality of seeds (State Seeds Corporation; National Seed Development Council (NSDC); Central Seed Committee(CSC) ; Seed market surveys, seed industry in relation to global market; Concept of WTO, GATT, IPR, Plant Variety Protection and its significance seed technology; UPOV and its role.

Practicals-32 Hrs

1) Determination of physical purity of seed samples.
2) Determination of density or weight per thousand seeds.
3) Determination of seed Heterogeneity.
4) Visual examination of dry seeds for disease symptoms.
5) Determination of moisture content by hot air oven method.
6) Seed viability test- TTC method.
7) Determination of seed germination by TP/BP/Sand method.
8) Evaluation of seedlings vigour by BP/Sand methods.
9) Seed vigour evaluation by (a) conductivity test (b) Hiltner's test (c) Performance test(d) Accelerated ageing test (e) Cold test.
10) Examination of suspensions obtained from washings of seed.
11) Infection sites studied by planting seed components.
12) Detection of seed-borne fungi and their characters of five seed borne pathogens. Vist: Visit to seed industries/seed companies/ seed research stations.

References:

1) ACAR.2009. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi.

2) ACAR.2013. Handbook of Horticulture. Indian Council of Agricultural Research, New Delhi.

3) Agarawal, P. K. 2005. Principles of Seed Technology.2nd edn. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

4) Basra, A. S. 2006. Handbook of Seed Science and Technology, The Haworth Press, USA.

5) Copeland, L. O. and McDonald, M. B. 2001. Principles of Seed Science and Technology. 4th edn. Chapman & Hall.

6) Copeland, L.A. 1995. Principles of Seed Science and Technology- Kluwer Academic Publishers, The Netherlands.

7) Michael, B. and Bewley, D. 2000. Seed technology and its biological basis. Wiley- Blackwell.

8) Neergaard, P. 2005. Seed Pathology, Palgrave, Macmillan, Denmark. Science, Technology and Uses. CABI, UK.

9) Vanangamudi, K., Natarajan, K., Saravanan, T., Natarajan, N., Umarani, R., Bharathi, A. and Srimathi, P. 2006. Advances in Seed Science and Technology: Vol: III: Forest Tree Seed Technology and Management, Agrobios, New Delhi.

BOTANY: IV- SEMESTER- SOFT CORE 4.2
SEED PATHOLOGY

Theory - 32 Hrs

Unit-1: Seed Pathology: Introduction, historical development, development of seed health testing; Reduction in crop yields loss in due to seed-borne diseases; Seed-borne pathogens **(**Fungi, Bacteria, Mycoplasma-like Organisms, fastidious Vascular Bacteria, Spiroplasmas, Viruses, Viroids, Nematodes); Location of seed-borne inoculums, histopathology of some seed-borne pathogens; Seed infection, mechanism of seed infection, seed infestation or contamination; Factors affecting seed infection; Longevity of seed-borne pathogens.

Unit-2: Seed transmission and inoculation, factors affecting seed transmission; Cultural practices, epidemiology and inoculum thresholds of seed-borne pathogens; Classification of seed-borne; Role of Seed-borne inoculum in disease development; Economic loss due to seed borne pathogens; Certification program; Seed health tests, Nonparasitic seed disorders; Deterioration of grains; Storage fungi, field and storage fungi; Invasion by storage fungi; effects of seed deterioration.

Unit-3: Detection of Seed-borne Diseases: Examination of dry seeds; Isolation of fungi, Bright-field microscopic examination, observation under UV light, measurement of gases, Determination of FAV, Moldy smell, collection of seed exudates; Immunoassays, ergosterol estimation; Avoiding damage to seeds during harvesting; Processing, threshing, storage conditions, reducing seed moisture to safe limits, seed treatment, resistance.

Unit-4: Mycotoxins - Fungi known to produce mycotoxins, Factors affecting mycotoxin production the effects and control of mycotoxins, storage conditions, sorting of grains, cultural operations, chemical treatment, biological control, detoxification, regulatory measures, use of resistant cultivars; Control of seed-borne pathogens; Selection of seed production areas; Crop management, crop rotation, isolation distances, rouging, biological control, chemical method, mechanical method, physical methods; Certification- certification standards, plant quarantine, national and international regulations.

Practicals-32 Hrs

1-5) Detection of seed-borne fungi and their identification.
6) Detection of Seed-borne bacteria.
6) Detection of seed-borne viruses.
7) Detection of seed-borne insects by egg-plug staining.
8) Detection seed-borne nematodes.
9) Effect of deterioration of grains by Storage Fungi.
10) Detection of seed-borne fungi by PCR.
11) Estimation of ergosterol by UV-visible Spectrophotometer.
12) Detection of mycotoxins by thin Layer chromatography.

References

1) Agarwal, V. K. and Sinclair, J. B. 1996. Principles of Seed Pathology, 2nd edn. CRC Press, Tayler and Francis, USA.
2) Neergaard, P. 1977. Seed Pathology. Vol. I..Macmillan Press, Cornell University, USA.
3) Agrios, G. N. 1994 -Plant Pathology 2nd edn. Academic Press, New York.
4) Mehrotra, R. S. 1983-Plant Pathology Tata Mc. Graw Hill Pub. Co. Ltd., New Delhi.

5) Rangaswamy, G. and Mahadevan, K. 2002. Diseases of Crop plants in India. Prentice Hall of India Private Limited New Delhi.
6) Agarawal, P. K. 2005. Principles of Seed Technology.2 nd edn. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.
7) Basra, A. S. 2006. Handbook of Seed Science and Technology, The Haworth Press, USA.
8) Copeland, L.A. 1995. Principles of Seed Science and Technology- Kluwer Academic Publishers, The Netherlands.
9) Vanangamudi, K., Natarajan, K., Saravanan, T., Natarajan, N., Umarani, R., Bharathi, A. and Srimathi, P. 2006. Advances in Seed Science and Technology: Vol: III: Forest Tree Seed Technology and Management, Agrobios, New Delhi.

BOTANY: IV- SEMESTER- SOFT CORE 4.3
BIO- ANALYTICAL TECHNIQUES

Theory-32 Hrs

Unit- 1: Spectroscopy: Principles of UV-Visible spectroscopy, chromophores and their interaction with UV-visible radiation and their utilization in structural, qualitative and quantitative analysis of drug molecules; Infrared Spectroscopy, Infrared radiation and its interaction with organic molecules, vibrational mode of bonds, instrumentation and applications, interpretation of IR spectra; FTIR and ATR, X-ray diffraction methods.

Unit-2: Nuclear Magnetic Resonance Spectroscopy: Magnetic properties of nuclei, field and precession, instrumentation and applications of NMR; Chromatographic techniques- Principles and applications- types- column, paper, thin layer and gas chromatography, HPLC, HPTLC, size exclusion chromatography, Affinity chromatography, Mass spectrometry, MALDI-TOF.

Unit-3: Electrophoresis: Principle and application of PAGE, SDS PAGE, immunostaining, immuno-electrophoresis, Iso-electric focusing, 2D electrophoresis Centrifugation- Principles, techniques of preparative and analytical centrifugation. Ultracentrifuges, molecular weight determination, sedimentation analysis, RCF. Microscopy- principles and applications of electron microscope (SEM and TEM), CryoEM, Preparations of specimen for electron microscopy- freeze drying, freeze etching, fixing, staining; confocal, fluorescent, flow cytometry - principles and applications.

Unit-4: Molecular Biology Techniques: Primer designing; Principles and applications of PCR; Blotting techniques; Hybridization techniques; Micro-array; Next Generation Sequencing- Nucleic acid sequencing.

Practicals-32 Hrs

1) Calibration of bio-analytical instruments.
2) Principles and instrumentation and applications of imaging techniques:
3) Separation of fatty acids/lipids by TLC/HPTLC.
4) Separation of proteins by PAGE, SDS- PAGE.
5) Agarose gel electrophoresis of DNA/RNA.
6) Immunoelectrophoresis
7) Agar gel diffusion, counter immuno electrophoresis.
8) Verification of Beer Lambert law with the U.V. spectrophotometer.
9) Demonstration of blotting techniques.
10) Performing PCR for amplification of ITS regions of fungi/ bacteria.

References

1) Braithwaite, A. and Smith, F.J. 1996. Chromatographic Methods. 5th edn. Blackie Academic & Professional London.
2) Budzikiewicz, H., Djerassi, C. and Williams, D.H. 1968. Mass Spectrometry of Organic Compounds. Holden-Day, San Francisco, CA
3) Harborne, J.B. 1984. Phytochemical Methods. 2nd edn. Chapman and Hall, London.
4) Harborne J.B. (1973) Phytochemical methods a guide to modern techniques of plants analysis. Chapman and Hall, London Ltd.

BOTANY: II SEMESTER - OPEN ELECTIVE 4.1
PLANT DIVERSITY AND HUMAN WELFARE

Theory-32 Hrs

Unit -1: Plant Diversity and Significance: Role of plant diversity in ameliorating energy crisis and global warming; Types of biodiversity-genetic diversity, species diversity, plant diversity at the ecosystem level; Agro-biodiversity and cultivated plant taxa, wild taxa; **Values and uses of Biodiversity-** Ethical and aesthetic values, precautionary principle, methodologies for valuation, uses of plants and microbes.

Unit -2: Loss of Biodiversity: Major causes of for biodiversity loss; Loss of genetic diversity, Loss of species diversity; Loss of ecosystem diversity; Loss of agro-biodiversity; Projected scenario for biodiversity loss; Management of Plant Biodiversity- Organizations associated with biodiversity management; Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations; Biodiversity information management and communication.

Unit -3: Conservation of Biodiversity: Conservation of genetic diversity, species diversity and ecosystem diversity, *In situ* and *ex situ* conservation, Social approaches to conservation, Biodiversity awareness programmes, Conservation of Heritage Trees.

Unit-4: Role of plants in relation to Human Welfare: Importance of forestry their utilization and commercial aspects, Avenue trees, Ornamental plants of India, Alcoholic beverages through ages, Fruits and nuts- Fruit crops of Karnataka and their commercial importance; Wood and its uses.

References:

1) Krishnamurthy K. V. 2007. An Advanced Textbook on Biodiversity: Principles and Practice. Oxford & IHB Publishing Co. Pvt. Ltd. New Delhi.
2) Christian Leveque and Jean-Claude Mounolou, 2003. Biodiversity. John Wiley & Sons Ltd, The Atrium, Southern Gate, Chichester, West Sussex PO19 8SQ, England.
3) Jeffries Michael J. 2006. Biodiversity and conservation, 2nd edn. Taylor and Francis Group, New York.

J.S.S. College of Arts, Commerce and Science
(Autonomous)
Ooty Road, Mysuru-570 025

DEPARTMENT OF ZOOLOGY (PG)

Programme outcome, Programme specific outcome, Course outcome and curriculum for Postgraduate Zoology
(2018-2019 & onwards)

Program Outcome

1. Imbibe the knowledge with facts and figures related Zoology.
2. Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
3. Identify, formulate, research literature, and analyze complex problems reaching substantiated conclusions using first principles of mathematical, biological, physical and chemical sciences.
4. Will be able to think creatively to propose novel ideas in explaining facts and figures or providing new solution to the problems.
5. Develop scientific outlook not only with respect to Zoology but also in all aspects related to life.
6. Realize that interdisciplinary knowledge in other faculties can have greatly and effectively influence which inspires in evolving new scientific theories and inventions.
7. Imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.
8. Develop various communication skills such as reading, listening, speaking, etc.
9. Realize that acquiring knowledge is a continuous process and in combination with untiring efforts and positive attitude and other necessary qualities leads towards a successful life.

Programme Specific outcome:

At the completion of M.Sc. in Zoology the students are able to:

1. Understand the classification and taxonomic aspects of the animal world (chordates and non-chordates). The students will be able to identify the taxonomic group of a given animal based on the external characteristics.
2. Understand the basic concepts of Animal physiology. The students will be able to identify and understand the important life processes which are essential for continuation of life on earth.
3. Understand the nature and structure of biomolecules and basic concepts of Biological chemistry.
4. Understand the concepts of Genetics, Cell Biology and Molecular Biology.
5. Understand the basic principles and concepts of environmental science, ecology and nature conservation.
6. Understand the importance of knowledge of wild life and animal behaviour for conservation and balancing the nature.
7. Understand the tools and techniques employed in Biological research and experiments.
8. Understand the process of evolution.
9. Understand the concept and applications of sericulture, apiculture, animal husbandry, Lac culture etc.

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
OOTY ROAD, MYSURU
PG DEPARTMENT OF ZOOLOGY
Syllabus Adopted from the academic year 2018-19

Semester	HC / SC	Paper title	CREDITS			Total Credits
			L	T	P	
I	HC - 1.1	Biosystematics & Non Chordata	2	0	2	**4**
	HC - 1.2	Biological Chemistry	2	0	2	**4**
	HC - 1.3	Cytogenetics	2	0	2	**4**
	SC - 1.4	Tools and techniques in Biology	3	1	0	**4**
	SC - 1.5	Chronobiology	3	1	0	**4**
	SC - 1.6	Histology and Histopathology	3	0	1	**4**
	Any two of the Soft core paper may be opted					**20**
II	HC - 2.1	Chordata	2	0	2	**4**
	HC - 2.2	Animal Physiology	2	0	2	**4**
	HC - 2.3	Entomology	2	0	2	**4**
	SC - 2.4	Developmental Biology	3	0	1	**4**
	SC - 2.5	Immunology	3	1	0	**4**
	SC - 2.6	Evolutionary Biology	3	1	0	**4**
	Any two of the Soft core paper may be opted					**20**
III	HC - 3.1	Molecular Biology & Biotechnology	2	0	2	**4**
	HC - 3.2	Reproductive Biology	2	0	2	**4**
	HC - 3.3	Ecology and Wildlife**	2	0	2	**4**
	SC - 3.4	Ethology *	3	1	0	**4**
	SC - 3.5	Pollution and Toxicology *	3	1	0	**4**
	OE - 3.6	Concepts of Zoology	3	1	0	**4**
	Any one of the Soft core paper may be opted** * Field visits are included in this paper**					**20**
IV	HC - 4.1	Advanced Genetics and Computational Biology	2	0	2	4
	HC - 4.2	Applied Zoology*	2	0	2	4
	HC - 4.3	Project	0	2	6	**8**
	*** Field visits are included in this paper**					**16**

Total credits

Hard Core - 52 Credits

Soft Core - 20 Credits

Open Elective - 04 Credits

Total credits required to complete M.Sc Course - 76 Credits

M.Sc, I SEMESTER
HC 1.1 Non Chordata

32hrs

Course Outcome:
After completing the course student will be able to

1. Understand the classification of major and minor invertebrate phyla
2. Give some examples and basic characteristics of some examples of each phylum
3. Understand the evolutionary pathway and its significance
4. Adaptive characters of animals coming under different invertebrate phyla

UNIT I Basic concepts of animal taxonomy: 8 hrs

A. Introduction and history of taxonomy
B. Species concept
C. Zoological classification - theories of classification - taxonomic ranks – hierarchy
D. Zoological nomenclature: Binomial nomenclature, trinomial nomenclature-ICZN
E. taxonomical keys: key to the species
F. Linnaean taxonomy and classical taxonomy - level of taxonomy.

Unit II : Classification, Locomotion and Nutrition: 8 hrs

A. General Characteristics of Non chordata.
B. Locomotion: Muscle filaments and myonemes,
Flagella and cilia. Amoeboid movement.
C. Nutrition in Protozoa: Filter feeding in polychaetes, Filter feeding and digestion in Deuterostomia and molluscs.
D. Respiration:
Structure and function of respiratory organs- Skin, gills, book lungs and Trachea. Respiratory pigments

Unit III: 8 hrs

A. Excretion and osmoregulation:
Osmoregulation in fresh water and marine Invertebrates
Structure and function of excretory organs- Coelom, Coelomoducts, Nephridia, Maliphigian tubules and Coxal glands
B. Nervous system:
Primitive nervous system: Coelenterata and Echinodermata
Advanced nervous system: Annelida, Arthropoda(Crustacea and insecta) and Mollusca (Cephalopod)
C. Sense organs and their importance

Unit IV: 8 hrs

A. Invertebrate paleontology and larval forms:
Free living and parasitic Larval forms
B. Fossil: types and importance of fossil study, overview of Geological Time Scale

NON CHORDATA –PRACTICALS 4x16=64 Hrs

1. PROTOZOA; 4x12=48 hrs

Slides : 1) *Trypanosoma cruzi* 2) Plasmodium – signet ring stage 3) Ceratium 4)*Leishmania donovani* 5) Vorticella 6) Noctiluca 7) Radiolaria 8*) Entamoeba histolytica* 9) Foraminifera 10) Opalina

2. PORIFERA;

a) Slides: 1)Sponge spicules 2)Sponge gemmules

b) Specimen: 1) Grantia 2) Euspongia 3) Clypeaster

3. CNIDARIA:

a) Slides: 1) Obelia polyp and Medusa 2) Pennaria 3) Aurelia-tentaculocyst

b) Specimens: 1) Physalia 2) Gorgonia 3) Spongodus 4) Zoanthus 5) Favia 6) Pennatula 7)Sea anemone 8) *Corallium rubrum*

4. HELMINTHES:

a) Slides: 1) *Fasciola hepatica* 2) *Ancylostoma*

b) Specimens: 1) Planaria 2) Male and female *Ascaris lumbricodes* 3) *Taenia solium* 4)

5. ANNELIDA:

a) Slides: 1) Leech 2) Earthworm setae

b) Specimens: 1)Neries 2) *Chloea flava* 3) *Pheretima postuma* 4) Terebella 5) Eurythoe

6. ARTHROPODA:

a) Slides: 1) Daphnia 2) Sacculina 3) T.S of Peripatus

b) Specimens: 1) Balanus 2) Lepas 3) Palinurus 4) Scolopendra 5) Rhinocerous beetle 6)Spider 7) Gongylus 8) Belostoma 9) Limulus 10) Squilla 11) Eupagarus 12) Julus

7. MOLLUSCA :

Specimens: 1) Aplysia 2) Glochidium 3) Loligo 4) Chiton 5) Cypreae 6) Octopus 7)Sanguinolaria 8) Chicoreus 9) Ficus 10) Lambis 11) Mytillus 12) Doris 13) Onchidium 14) Oliva 15) Murex 16) Turritella 17) Cardium

8. ECHINODERMATA:

Specimens: 1) Sea Urchin 2) Linckia 3) Echinodiscus 4) Holothuria 5) Antedon

9. MINOR PHYLA: —1) Lingula

10. LARVAL FORMS:

Slides: 1) Cercaria 2) Trochophore 3) Megalopa larva 4) Nauplius 5) Zoea 6) Mysis

7) Phyllosoma 8) Protozoea 9) Bipinnaria 10) Veliger 11) Tornaria

12) Glochidium 13) Pluteus

11. Field Study: Visit to different areas around the college campus, to observe and study Non chordates in their natural habitat. **4x2=8 hrs**

II. Study of Nervous system, Respiratory system, Reproductive system and Excretory system in invertebrates by employing computer animation/charts: **4x2=8 hrs**

REFERENCES :

1. Barnes, R.D.1974. Invertebrate Zoology, III edition. W.B Saunders Co., Philadelphia
2. Barrington, E.J.W, 1976. Invertebrate Structure and Function. Thomas Nelson and Sons Ltd.,London.
3. Hyman L,H. 1940. The invertebrates. Vol. 1. Protozoa through Ctenophora, McGraw hill Co.,N.Y.
4. Hyman. L H. 1959. The Invertebrates smaller coelomate groups, Vol. V. McGraw Hill Co.,
5. Hyman. L. H. 1951. The Invertebrates. Vol. 2. McGraw Hill Co., N.Y.
6. Hyman. L H. 1968. The invertebrates Vol. 8. McGraw Hill Co., N.Y and London.
7. Simpson, G C. Principles of Taxonomy.

M.Sc, I SEMESTER
HC -1.2 BIOLOGICAL CHEMISTRY

32 hrs

Course Outcome:

After completing the course student will be able to

1. Identify the five classes of polymeric biomolecules and their monomeric building blocks.
2. Explain the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action.
3. Understand types, Structure, biochemical properties and functions of vitamins.
4. Explain how the metabolism of organic compounds leads ultimately to the generation of large quantities of ATP.

UNIT I Chemical Bonds and Carbohydrates: 8 Hrs

A. Structure of an atom, orbitals, chemical bonds - covalent, co-ordinate, ionic and hydrogen; Vander-Waal's force; hydrophobic interactions; Normality and Molarity of solutions.

B. Carbohydrates – Chemistry and biological properties

UNIT II Proteins and Lipids: 8 Hrs

A. Proteins- Chemistry and biological properties, Christian Anfinsen's experiment, Biological values of proteins

B. Lipids: Chemistry, triglycerides; prostaglandins and steroids –biosynthesis, Chemical importance of lipids.

UNIT III Enzymes: 8 Hrs

A. Enzymes: Nomenclature – current status; factors influencing velocity of enzyme reaction, enzyme dynamics and enzyme inhibition.
Ribozymes and abzymes; co-enzymes, isozymes, clinical importance.

UNIT IV Nucleic acids & Vitamins: 8 Hrs

A. Nucleic acids: Chemistry, alternative models of DNA,

B. Vitamins and trace elements – chemical nature, vitamins as co-enzymes, Deficiency diseases, role of trace elements

Biological Chemistry practicals 4x16=64 Hrs

1. Qualitative analysis for identification of carbohydrates (Starch, Glycogen, Sucrose, Lactose, Maltose, Glucose, Fructose).
2. Qualitative analysis for identification of Proteins (Egg albumin, Casein, Gelatin, Peptone)
3. Precipitation reaction of proteins (Egg albumin, Peptone)
4. The absorbance curves for two dyes and demonstration of Beer-Lambert's law.
5. Estimation of amino acids by Sorenson's formal titration (Arginine, Alanine, Leucine, lysine)
6. Determination of concentration of Glucose and Maltose by calibration curve.
7. Determination of amylase activity.
8. Determination of effect of temperature, pH and incubation period on amylase activity.
9. Test for non-esterified fatty acid.
10. Demonstration of gel electrophoresis.

REFERENCES

1. Barrington, E. J. W (1976) An introduction to general and comparative endocrinology, Oxford University press, London.
2. Conn, E. E., Stumpt, P. K., Bruencing, G. and Dol, R. G. 1995. Outlines of Biochemistry. Pub. John Wiley, Singapore.

3. Eckert, R and Randall, D. 2002, Animal physiology, 2nd Edn, W.H..Freman
4. Guyton. A.G. 1986, Text book of Medical Physiology, 7th Edn., Saunders Publication
5. Harper, H. A. 1993. A review of Physiological Chemistry, Lange Medical Publication, 2nd Edn.
6. Lehninger, A. L., Nelson, D. L. and Cox, M. M., 2nd Edn. 1993. Principles of Biochemistry,CBS Publishers and Distributors, New Delhi.
7. Oser, B. L. (Ed.) 1993. Hawk's Physiological Chemistry. Tata Graw Hill Publishing Co. Ltd.New Delhi.

M.Sc., I SEMESTER
HC – 1.3 CYTOGENETICS

32 Hrs

Course Outcome:

After completing the course student will be able to

1. Described the fundamental molecular principles of genetics
2. Understood the structure and function of DNA & RNA
3. Understand about the transmission, distribution, arrangement, and alteration of genetic information and how it functions and is maintained in populations
4. Described the basics of genetic mapping
5. Explain basic structure of animal cell and its organelles
6. Describe the functions and organization of cell organelles

Unit I: Introduction to the Cell & Cell Organelles **8 hrs**

A. The origin and evolution of the cell, From molecules to first cell, from Prokaryotes to eukaryotes, from single cell to multicellular organisms.
B. Membrane Structure and Function,
C. Structural organization and functions of intracellular organelles- The nucleus, Mitochondria, Lysosomes, Peroxisomes, Golgi apparatus, and endoplasmic reticulum.

Unit II: Cell Cycle and Cell signalling **8 Hrs**

A. Phases of cell cycle.
B. Biochemical studies with oocytes, eggs and early embryos.
C. Regulation of cell cycle: Molecular mechanisms regulating mitotic events.
   Regulation of cell cycle progression.
   Check points in cell cycle regulation.
   Cell cycle control in polytene cells.
D. Molecular basis of signal transduction
E. Cellular aging and death: (a)Causes of aging
   (b)Cellular changes due to aging
   (c)Theories of aging
   (d) Apoptosis
   (e) Longivity genes

UNIT III Gene mutations **8 Hrs**

A. Types of mutations (Spontaneous, Induced, Base substitutions and frameshifts - Transitions, Transversions, gain in function, loss in function, Neutral mutations),
B. Molecular mechanism of mutations (Base analogs, alkylating agents); Detection of mutations: Dominant lethal test, Sex-linked recessive lethal test, II-III translocations, Ames test, P-mediated mutagenesis

UNIT IV Chrmosomal mutations **8 Hrs**

A. Structure and organization of eukaryotic chromosomes
B. Structural and numerical variations of chromosomes, Chromosomal rearrangements and their cytogenetic consequences with examples from plants, Drosophila and Man,

Practical applications of chromosome rearrangements - Balancers and attached X-chromosome in Drosophila. Cytogenetic effects of ionizing and nonionizing radiations

CYTOGENETICS PRACTICALS **4X16 =64 Hrs**

1) Life cycle of *Drosophila melanogaster* 1x4=04hrs
2) Preparation of culture media. Culture of Drosophila - Methods of maintenance. 1x4=04hrs
3) Study of morphology of *Drosophila melanogaster* 1x4=04hrs
4) Mounting of Sex comb of *Drosophila melanogaster* 1x4=04hrs
5) Mounting of Wing of *Drosophila melanogaster* 1x4=04hrs
6) Study of mutants of *D. melanogaster* 1x4=04hrs
7) Preparation of genital plate of *D. melanogaster* 2x4=08hrs
8) Chi square Analysis of F1, F2 and Test cross progeny in *Drosophila melanogaster* to understand pattern of inheritance of different characters and to demonstrate. 3x4=12hrs
   a) Law of segregation
   b) Law of Independent assortment
   c) Sex-linked inheritance
9) Temporary squash preparation of Mitotic chromosomes from root tip meristem of *Allium cepa* 2x4=08hrs
10) Temporary squash preparation of Meiotic chromosomes from testis of *Poicelocerus pictus* 2x4=08hrs
11) Study of Barr body using buccal smear of volunteers 1x4=04hrs

REFERENCES:

1. Alberts, B., A. Jhonson, J. Lewis, M. Raff, K. Roberts and P. Walter 2008. Molecular Biology of the cell. V Ed. Garland Science, New York.
2. Brachet, J. 1985. Molecular Cytology, Academic Press, N. Y.
3. Furukawa, R., and M. Fechheimer. 1997. The structure, function and assembly of actin filament bundles. Int. Rev. Cytol. 175: 29-90.
4. Lewin B. (1997) Gene VI Oxford University Press, Oxford
5. Lodish, H., A. Berk, C.A Kaiser, M.P. Scott, A Bretscher, H. Ploegh, P. Matsudaira. 2008. Sixth Edition, Molecular Cell Biology. W. H. Freeman and Co., N. Y.
6. Pollard, T. D. and W. C. Earnshaw. 2002. Cell Biology. Saunders
7. Russel P.J (1998) Genetics. The Benjamin Cummings Publishing Co Inc.
8. Snustad D.P and M.J.Simons. (1997) Principles of Genetics. John Wiley and Sons Inc. N.Y.
9. Strickberger M.W. (1977) Genetics. MacMillan Collier Co. Pvt Ltd
10. Watson J.D, Hopkins, N.H, Roberts J.A, Steitz and A.M.Weiner. (1987) Molecular biology of gene. The Benjamin Cummings Publishing Co Inc.
11. Wolfe, A. 1995. Chromatin: Structure and function. Academic Press, N. Y.

****

M.Sc., I SEMESTER
SC – 1.4 TOOLS AND TECHNIQUES OF BIOLOGY

48 hrs

Course Outcome:
After completing the course student will be able to

1. Describe the methodology involved in biotechniques.
2. Describe the applications of bioinstruments
3. Demonstrate knowledge and practical skills of using instruments in biology and medical field.
4. Perform techniques involved in molecular biology and diagnosis of diseases
5. Update current knowledge regarding biomedical engineering involving new methods and the instrumentation.

UNIT I: MICROSCOPY: 12hrs

Basic principles of microscopy, Types of microscopes and their biological applications Bright-field microscope, numerical aperture, limit of resolution, types of objectives, ocular & stage micrometers, Electron Microscope, SEM, Confocal microscope.
Dark-field microscope
Phase-contrast microscope
Differential interference contrast microscope
Fluorescence microscope
Photomicrography and image processing

UNIT II: SEPARATION TECHNIQUES: 12hrs

Centrifugation - Basic principles, Types of rotors, Clinical, high speed & ultracentrifuge
Electrophoresis – Agarose and polyacrylamide gel, Two-dimensional, Isoelectrofocussing
Chromatography - Paper and Thin layer chromatography, Column chromatography, Gel filtration, Ion-exchange, Affinity, Introduction to FPLC and HPLC

UNIT III: 12hrs

A. Radio-tracer techniques
Unit of radioactivity and half life, Measurement of radioactivity (β and γ emission), Applications of radioisotopes, Safety measures
B. Techniques in immunodetection: Immunoblotting and immunofluorescence
C. Immunological techniques: Immunodiffusion and Imunoelectrophoresis

UNIT IV: 12hrs

A. Cell culture techniques: Design and functioning of tissue culture laboratory; Culture media, essential components and preparation; Cell viability testing
B. Cytological techniques: Mitotic & Meiotic chromosome preparations from insects and vertebrates Chromosome banding techniques (G-, C-, Q-, R- banding etc.)
C. Molecular cytological techniques: In situ hybridization (radiolabelled & non-radiolabelled methods), FISH, and Restriction banding
D. Molecular biology techniques: Southern hybridization and Northern hybridization DNA sequencing Polymerase chain reaction (PCR)

TUTORIALS 2x16 = 32 Hrs

REFERENCES

1. Alberts et al: Molecular Biology of the Cell, Garland, 2002
2. Karp: Cell and Molecular Biology, John Wiley & Sons, 2002
3. Lodish et al: Molecular Cell Biology, Freeman, 2000
4. Pollard & Earnshaw: Cell Biology, Saunders, 2002
5. Ruthman: Methods in Cell Research, Bell & Sons, 1970.

6. Boyer: Modern Experimental Biochemistry and Molecular biology (2nd Ed.), Benjamin/Cumin, 1993
7. Freifelder: Physical Biochemistry (2nd Ed.), Freeman, 1982
8. Holme and Peck: Analytical Biochemistry (3rd Ed.), Tata McGraw Hill, 1998
9. Plumer: An Introduction to Practical Biochemistry (3rd Ed.), Tata-McGraw Hill, 1990
10. Switzer and Garrity: Experimental Biochemistry 92nd Ed.), Freeman, 1999
11. Wilson and Walker: Practical Biochemistry (3rd Ed.), Cambridge Univ. Press, 2000

*****

M.Sc., I SEMESTER
SC – 1.5 CHRONOBIOLOGY

48 hrs

Course Outcome:

After completing the course student will be able to

1. Understand the concept of Chronobiology
2. Identify the way by which circadian rhythms affect life from the genome to the complex behaviour of the individual
3. Acknowledge the role of Chronobiology and chronodisruption on several physiopathological events
4. Acknowledge the input of the synchronizers on homeostasis
5. Characterize the biological relevance of several chronotypes
6. Acknowledge the relevance of circadian rhythms on therapeutic interventions
7. Acknowledge the importance of scientific research on Chronobiology
8. To interpret study designs and scientific parameters related to Chronobiology.

UNIT I: Introduction: **4 hrs**

History, Biological rhythms, Biological clocks, Significance of biological timekeeping

UNIT II: Biological rhythms: **10 hrs**

A. Types of rhythms- Circadian, Circatidal,Circalunar, Circannual
B. Methods of measurement
C. Properties: Entrainment, Re-entrainment, Phase angle difference, Freerun, Phase shift, Phase response curve, Arrhythmia.

UNIT III: Factors influencing biological rhythms: **10 hrs**

A. Environmental: Photoperiod -Photoreception and photo-transduction;
   The physiological clock and measurement of day length;
   Role of photic and non-photic cues in seasonality,Other zeitgebers
   Reversal of roles of principal and supplementary cues.
B. Evolution of photoperiodism: comparative studies; Circannual rhythms and seasonality.

UNIT III: Circadian pacemaker system: **8 hrs**

A. Suprachiasmatic nuclei, B. Pineal gland, C. Optic lobes.

UNIT IV: Molecular basis of circadian rhythms **8 hrs**

A. Clock genes, B. Drosophila, C. Mouse

UNIT V: Applied Chronobiology: **8 hrs**

A. Human circadian rhythms: Melatonin: Input or output signal of the clock system, Clock function (dysfunction); Human health and diseases
B. Applications of circadian rhythm principles: Jet-lag/shift work, Depression and

sleep disorders, Chronopharmacology and Chronotherapy

TUTORIALS **2X16=32 Hrs**

References

1. Binkley, S. (1990): The clockwork sparrow: time, clocks, and calendars in biological organisms, Prentice-Hall, New Jersey.
2. Chandrashekaran, M. K. (1985): Biological rhythms, Madras Science Foundation, Chennai.
3. Jay. C. Dunlap, Jennifer. J. Loros, Patricia J. DeCoursey (ed). 2004: Chronobiology Biological Timekeeping, Sinauer Associates, Inc. Publishers, Sunderland, MA, USA
4. Nelson, R. J. (2000) An Introduction to Behavioural Endocrinology, 2nd edition, Sunderland Publishers, Massachusetts.
5. Saunders D.S., C.G.H. Steel, X., afopoulou (ed.)R.D. Lewis. (3rd Ed) 2002: Insect Clocks, Barens and Noble Inc. New York, USA
6. Shapiro, C. M. and Heslegrave, R. J. (1996): Making the shift work, Joli Joco Publications, Inc. Toronto.
7. Vinod Kumar (ed 2002) : Biological Rhythms Narosa Publishing House, Delhi/ Springer-Verlag, Germany

******

M.Sc., I SEMESTER
SC – 1.6 HISTOLOGY AND HISTOPATHOLOGY

48 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the applications of dyes and its classification.
2. Know the functional morphology of various mammalian organs.
3. Imbibe the knowledge on histochemical techniques.
4. Describe the etiology and pathology of liver cirrhosis and atheroscleorsis.
5. Explain histopathology of breast and prostate tumours.

UNIT – I Basics of Histology **8Hrs**

A. Objectives and applications
B. Tissue fixation : Objectives, methods, chemical fixatives-types and chemistry of fixation; Physical methods-:freezing and microwave fixation; choice of fixatives, fixation artifacts.
C. Dyes. –Natural and Synthetic, Classification

UNIT-II Functional Morphology (mammalian) **8 Hrs**

A. Histological organization of GI tract- stomach and intestine,
B. Histological organization of lungs & kidney
C. Histological organization of spleen & thymus,
D. Bone and bone marrow.

Unit-III Histochemistry **8 Hrs**

A. Principles and methods of application
B. Classical histochemical Techniques: for localization of glycoproteins (PAS), nucleic acids (Feulgen) and steroid dehydrogenase activity.

Unit-IV Immunohistochemistry **8 Hrs**

A. Principles, method of application
B. Imunohistochemistry techniques for localization of proteins in endocrine cells (Pituitary cell types or islet of Langherhans)

C. Immunofluorescence: In situ hybridization of nucleic acids

UNIT-V Histopathology **8 Hrs**

A. Morphological alterations in cells due to disease,
B. Types of degeneration: clouding, hyaline, hydrophic and fatty degeneration.
C. Etiology, pathogenesis and histopathology of Liver cirrhosis and atheroscelerosis
D. Neuropathology of alcoholism and methanol poisioning.

Unit-VI Histopathology of tumors **8 Hrs**

A. Malignant and non-malignant
B. Types of carcinoma
C. histopathology of breast and prostate tumors

PRACTICALS **2x8= 16 Hrs**

I. Histology:

1. Microtomy and staining: Hematoxylin-eosin - Demonstration 2x2=4 hrs
2. Histology: 2x2=4 hrs

Observations of permanent slides of mammalian organs – stomach, intestine, spleen, liver, kidney, lungs, testis, epididymis, vas deferens, ventral prostate, seminal vesicle, ovary, uterus and Fallopian tube.

II. Histometry: **2x3=6hrs**

Histometrical measurements and statistical analysis of some tissues.

III. Histopathology: **2x1=2hrs**

Study of histopathological changes (permanent slides) – gastric ulcers, cirrhosis of liver, breast tumors, cystic follicles of ovary, pancreas in diabetics, cryptorchid testis and leukemia.

REFERENCES:

1. Boyd,W. 1976:A text book of Pathology. Structure and function in disease, 4th edition. Lea and Fibiger, Philadephia.
2. Pearse, A.G.E. (1980): Histochemistry, theoretical and Applied ,J & A, Churchill Ltd., London.
3. Rogers, A.W.(1983): Cells and Tissues, An introduction to Histology and Cell Biology, Academic Press, NY.
4. Telford, I.R. and Bridgman,C.F.(1990). Introduction to Functional Histology, Harper and Row, NY.

******

M.Sc., II SEMESTER
HC – 2.1 CHORDATA

32 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the classification of chordates
2. Give some examples and basic characteristics of some examples of protochordates
3. Give some examples and basic characteristics of some examples of vertebrates
4. Understand the evolutionary pathway and its significance
5. Analyse adaptive characters of animals coming under different vertebrate classes

UNIT I General characters and outline classification of Chordata **8hrs**

A. General and Comparative study: Comparision of three Protochordates, Subphyla in terms of General comparision, Habits and habitats,

B. Alimentary canals and associated glands, Pharynx, Food and feeding and excretory system in Protochordates.
C. Adaptive radiation in vertebrates – fishes, amphibians, reptiles, aves and mammals

UNIT II **8hrs**

A. **Integument and its Derivatives**: Epidermal Integument or Skin Functions, Structure & its Derivatives (Glands, Scales and scutes, digital cornifications, horns, feathers, hairs), Integument in different classes of Chordates.
B. **Nervous system**- Development of Brain, spinal cord, Peripheral nerves and sense organs

UNIT III **8hrs**

A. **Respiratory System**: Introduction Respiratory organs: Gills (Internal or true gills, External or Larval gills). Lungs and Ducts, Accessory Respiratory organs and Swim Bladders.
B. **Circulatory system:** Evolution of heart and aortic arches

UNIT IV **8hrs**

A. **Digestive System:** Introduction Embryonic Digestive Tract
Alimentary Canal: Divisions, Digestive Glands
B. **Urinogenital System:** Vertebrate kidneys and ducts, Gonads and their ducts

CHORDATA PRACTICALS **4x16=64 Hrs**

1. **Protochordates**: Specimens:1)Amphioxus , Herdmania
Slides- Salpa (sexual), Doliolum

2. **Fishes** : 1) *Rhinobatus* 2) *Hippocampus* 3) Goldfish (aquarium fish) 4) *Clarius*
5) *Anabas* 6) Coffer fish 7) *Acipenser* 8) *Periopthalmus* 9) *Triacanthus*
10) *Notopterus* 11) *Exocoetus* 12) *Diodon hysterix* 13) *Echenenis neucrates*

3. **Amphibians** : 1) Ichthyophis 2) Axolotl Larva 3) *Rana tigrina* 4) *Amblystoma*

4. **Reptiles** : 1) *Calotes* 2) *Mabuya* 3) Chameleon 4) *Phrynosoma* 5) *Chelone mydas*
5) Varanus 6)*Naja naja* 7) Krait 8) Hydrophis 9)Viper

5. **Birds** : 1) Blue jay 2) Indian koel -male and female 3) Kite

6. **Mammals** : 1) Guinea pig 2)Domestic cat 3) Loris 4) *Megaloderma lyra* (bat)
5) Pangolin

7. **Integuments of vertebrates**: Scales of fish, Hoofs, nails, horns, claws,
plastron and carapace of tortoise, snout of saw fish

8. **Osteology :**
1) **Skull and lower jaw**:- a) Crocodile b) Bird c) Carnivore mammal (dog)
d) Herbivore mammal (horse)
2) **Types of vertebrae**:- a) Procoelous b) Ophisthocoelous c) Amphicoelous
d) Amphiplatian e) Heterocoelous f) Axis and atlas vertebrae.

II. Study of following systems in rat by employing computer animation/charts:
a) Circulatory system b) Nervous system c) Reproductive system
d) Digestive system e) Sense organs f) Urinary system

REFERENCES :

1. Alexander, R. M. 1975. The Chordata. Canbridge University Press, London.
2. Barrington, E.J.W. 1965. The Biology of Hemichordata and Protochordata, Oliver and Boyd, Edinbourgh.
3. Colbert, E. H, 1969. Evolution of the vertebrates, John Wiley and Sons, Inc., N.Y.
4. Kent, C. G. 1954. Comparative anatomy of vertebrates
5. Kingsley, J.S. 1962. Outlines of Comparative anatomy of vertebrates. Central book depot Allahabad.

M.SC., II SEMESTER
HC – 2.2 ANIMAL PHYSIOLOGY

32 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the mechanism of transport of molecules, stepwise release of energy , aerobic and anaerobic respiration
2. Describe the physiology of digestive and respiratory system of human beings.
3. Understand the blood composition, types, groups and circulatory system.
4. Describe the physiology of excretory system and nervous system of human beings.
5. Know the physiology of sense organs, muscles and reproductive system.

UNIT I: Membrane Transport, Bioenergetics & Circulation — 8 Hrs

A. Membrane Transport:

Molecular mechanisms of passive and active transport.

B. Bioenergetics:

a) Energy – Concept, laws of thermodynamics
b) Redox potential
c) Stepwise release of energy through cytochromes, production of ATP, uncoupling of oxidative phosphorylation,inhibitors.
d) Anaerobic and aerobic breakdown of glucose, alternate pathway – HMP shunt and glucoronic acid pathway.
e) Citric acid cycle as common metabolic pathway.

C. Circulation:

a) Major types of body fluids and their composition.
b) Neurogenic and myogenic hearts.
c) Mammalian heart – cardiac cycle, ECG.

UNIT II: Physiology of excitation & Excretion — 8 Hrs

A. Muscle Physiology:

a) Molecular organization of sarcomere.
b) Mechanism of contraction with emphasis on sliding filament and Davies models, regeneration of storage phosphate.
c) Physiological adaptations of muscles for jumping, swimming and flight.

B. Neurophysiology:

a) Axonal and synaptic transmission of nerve impulses.
b) Synaptic integrity, synaptic plasticity.
c) Molecular mechanism of sensory transduction and neural output in receptor cells.

C. Excretion:

a) Comparative physiology of excretion in animals- Nitrogenous wastes and waste elimination.
b) Mammalian kidney- Structure and physiology of urine formation.

Unit III: Basic Concepts of Endocrinology **8 hrs**

A. Chemical messengers:
Autocrine, Paracrine and endocrine secretions,
Types of hormones, an overview of human endocrine system

B. Hormone synthesis: Peptide and steroid hormones.
Role of Hormones in homeostasis- Glucose and Water balance

C. Hypothalamus and pituitary gland:
Structure, function and control of hypothalamic hormones.
Pituitary hormones and their physiological actions
chemical structure and. Feedback regulation. Pathophysiology.
Hyppothalamo - hypophysial portal system

D. Pineal gland–Structure and function**.**

Unit IV: **8 hrs**

A. Thyroid gland: Structure, function and biosynthesis of thyroid hormone

B. Parathyroid : Structure and PTH – Calcitonin – Role of hormones in calcium and phosphate metabolism.

C. Adrenal gland hormones
Adrenal cortex hormones: Corticoids: role played in Stress management – Aldosterone and the rennin- angiotensin system
Adrenal medullary hormones: Catecholamines as emergency hormones

D. Gastrointestinal hormones: Secretion, control and function

E. Pancreatic Hormones: Insulin and glucagons, their role in the regulation of Carbohydrate, protein and lipid metabolisms.

ANIMAL PHYSIOLOGY PRACTICALS **4x16=64 Hrs**

1. Estimation of Proteins by Lowry *et al* method. (in tissue sample from slaughter house)
2. Determination of serum cholesterol. (Clinical sample)
3. Determination of glucose content by Anthrone method. ((in tissue sample from slaughter house)
4. Estimation of liver and skeletal muscle glycogen. (in tissue sample from slaughter house)
5. Determination of serum/ blood urea by DAMO method. (Clinical sample)
6. Estimation of creatinine in the urine sample.
7. Total count of RBC and WBC.
8. Differential count of WBC
9. Response of RBC's to Hypertonic, hypotonic and isotonic solutions
10. Observation of permanent slides of T.S of endocrine glands
    a. Pituitary gland b. Thyroid gland c. Adrenal gland d. Pancreas
11. Identification of chemical structures of steroid hormones

REFERENCES:

1. Adler N. T (1981) Neurcendocrinology of Reproduction, Physiology and Behaviour.Austin, C. R and R. V. Short (eds) (1972) Reproduction in mammals. (1) Germ cells andFertilization (2) Embryonic and Foetal development (3) Hormones in Reproduction (4) Reproduction pattern (5) Artificial control of reproduction, Cambridge University press,London.
2. Barrington, E. J. W (1976) An introduction to general and comparative endocrinology,Oxford University press, London
3. Raghavendra Puri (2003) Mammalian endocrinology Vol. I & II, Dominant Publishers and Distributors, New Delhi.
4. Eckert, R and Randall, D. 2002, Animal physiology, 2nd Edn, W.H..Freman

5. Guyton. A.G. 1986, Text book of Medical Physiology, 7th Edn., Saunders Publication

M.Sc., II SEMESTER
HC – 2.3 ENTOMOLOGY

32hrs

Course Outcome:
After completing the course student will be able to

1. Understand insects encountered in agricultural fields.
2. Envisage an insight on economically important pests of various foods, fiber and household
3. Understand various insect pest management methods and its significance
4. Learn to apply various agricultural equipment and understand the effect of chemicals and its dosages in agricultural pest management
5. Learn to apply the pest control methods wisely to minimise ecological backlash
6. Discuss the evolutionary significance of insect plant interaction and insect animal interaction.

Unit I: General Entomology **10 hrs**

A. Classification of class Insecta up to orders with suitable examples; Integument appendages.

B. Insect Endocrinology

I. Insect Hormones and their regulation**:** Chemistry and functions of hormones, Hormones in metamorphosis, Ecdysis and Diapause

II. Semiochemicals:**:** Allelochemicals and Pheromones (Primer & releaser)

Unit II: Agricultural Entomology **10hrs**

A. Role of insects in plant pollination

B. Insects pests: Classification and categories of pests, origin and emergence of pests, pest out breaks and pest resurgence
Structure, life history, significance, nature of damage and control methods of major pests of sugarcane, Paddy and Coconut.

C. Structure, life history, significance, nature of damage and control measures of stored grain pests: (a) *Sitophilus* (b) *Trogoderma* (c) *Rhizopertha* (d) *Tribolium* (e) *Bruchus* (f) *Sitotruga* (g) *Ephestia*

Unit III: General and household insect pests **06hrs**

A. Structure, life history, significance, nature of damage and control measures of following general pests: (a) grasshoppers & locusts (c) termites (d) aphids (e) hairy caterpillars

B. Household pests: Cockroaches, Ants, Wasps, Silverfish, furniture beetle, and their control

Unit IV: Medical Entomology **06hrs**

A. Insect vectors: Role of insect as vectors of human diseases (Malaria, filariasis, Kala azar and their control)
Mosquitoes as pests and their control.
Housefly: A human health hazard and its control

B. Arboviral diseases: Dengue, chicken gunya, swine flu.

PRACTICALS: **4x16=64 Hrs**

1. Collection and preservation of dead insects for systematic studies & field report 4x4=16 hrs
2. Identification of different insects upto orders- House fly, Cockroach :
Mosquitoes, stored grain beetles, destructive insects, important crop and household pests
4x4=16 hrs

4. Fixing and preservation of dead insects by Plastination technique. 4x4=16 hrs
5. Field studies of insects to understand their habit: Ants, Butterflies, termite, wasps, Moths. 4x2=08 hrs
6. Study of insect mouth parts: Mosquito, Cockroach, House fly, Butterfly 4x2=08 hrs

REFERENCES:

1. Awasti V.B. 2009 Introduction to general entomology 3rd Ed. Scientific publication (India), Jodhpur
2. Awasti V.B.2007, Agricultural Insect Pests and their control. Scientific publishers (India) Jodhpur
3. Trigunayat M.M. 2009, A Mannual of practical entomology, scientific publishers, Jodhpur, India.
4. Dhaliwal G.S. Ramsingh and B.S. Chillar 2006, Essentials of Agricultural entomology. Kalyani Publishers, New Delhi.
5. L . K Jha. Applied Agricultural Entomology. New central book agency. Culcutta

M.Sc., II- SEMESTER
SC – 2.4 DEVELOPMENTAL BIOLOGY

48 Hrs

Course Outcome:

After completing the course student will be able to

1. Understand the molecular concepts of developmental biology during fertilization.
2. Know about Noble prize concepts during frog development viz., Nucleocytoplasmic interactions.
3. Explain on axis development in drosophila.
4. Describe endocrine and molecular control in metamorphosis of insects and amphibians.
5. Explain the various stages of chick embryonic development.

Unit I:

A) Introduction : Descriptive V/s. Experimental Embryology **8hrs**

B) Fertilization : a) An overview of structure and differentiation of egg and sperm
b) General sequence and molecular events during fertilization

Unit II: Early development - I **8 hrs**

a) Nucleocytoplasmic interactions in early development: An overview of Nuclear transplantation experiments in Amphibians and mammals
b) Creations of multicellularity: Cleavage-Regulatory mechanism
c) Gastrulation: Morphogenetic movements and regulatory mechanisms in amphibian and mammalian embryo.

Unit III: Early development - II **8hrs**

a) Morphogenetic determinants and their role in development:
Yellow cytoplasm in Ascidians, Polar body in Mollusca, Pole plasm in *Drosophila*

b) Laying down the embryonic body plan :
Determination of embryonic axes in *Drosophila* – Anterior-posterior (maternal effect genes) & Dorsoventral; Amphibians (cell-cell interaction) & Mammals (Hox Genes)

c) Cell lineage studies and cell death genes in *Caenorhabditis elegans*.

Unit IV: Morphogenesis –I **8 hrs**

a) Early embryogenesis in Drosophila : Regional specification by. Segmentation genes: Gap genes, Pair rule genes, Segment polarity genes, and Homeotic genes.
b) Cellular differentiation and morphogenesis:
i. Neuronal v/s epidermal fate specification in *Drosophila*.

ii. Vulval induction in Caenorhabditis elegans.

Unit V: Morphogenesis-II **8 hrs**

a) Role of Cell Adhesion molecules in morphongenesis : Cadherins and Fibronectins
b) Genetics of imaginal discs and transdetermination
c) Limb development-an over view :
i. Proximo-distal axis specification in developing limb.
ii. Cell death and formation of digits.

Unit VI: Post embryonic development **8 hrs**

a) Metamorphosis : Endocrine and molecular control of metamorphosis in insects and amphibians b) Types of growth c) Regeneration : Types, Blastema formation,Sources of cells for regeneration d) Abnormal development as seen in Teratogenesis.

PRACTICALS **16X2=32Hrs**

1. Study of internal changes during early development of frog & chick (permanent slides) 3X2=06hrs
2. Development of chick-Embryo mounting-permanent preparation 2X2=04hrs
3. Study of early developmental stages of *Drosophila* (Live Observation of embryo) and dechorionation and observation of embryos 2X2=04hrs
4. Study of Imaginal discs – the precursors of adult structures in *Drosophila* 3X2=06hrs
5. Demonstration of window technique to observe chick embryo development 2X2=04hrs
6. Effect of thyroid hormone on development in frog 2X2=04hrs
7. Study of various developmental stages in frog up to tadpole stage 2X2=04hrs

REFERENCES:

1. Balinsky, B.I., 1965. An introduction to embryology, W.B.Saunders company.
2. Gilbert, S. F. 2006, Developmental Biology, 8th Ed.Sinauer Associates Inc.,
3. Kalthoff, 2000, Analysis of Biological Development, 2nd Ed., McGraw-Hill Science, New Delhi, INDIA. Massachusetts, USA.
4. Vasudeva Rao, 1994. Developmental Biology: A modern synthesis, Oxford & IBH, New Delhi.
5. Wolpert, Beddington, Brockes, Jessell, Lawrence,Meyerowitz, (3rd Ed., 2006)Principles of Development, , Oxford University Press, New Delhi, INDIA.
6. Wolpert, L, Beddington, R Jessell, T. Lawrence P, Meyerowitz, E, Smith J., 2001, Principles of Deveopment Oxford University Press Oxford.
7. Ann Kiessling and Scott C. Anderson, Human Embryonic Stem Cells: An Introduction to the Science and Therapeutic Potential, 2003. Jones and Bartlett Publishers, Boston MA, USA

****

M.Sc., II SEMESTER
SC – 2.5 IMMUNOLOGY

48hrs

Course Outcome:

After completing the course student will be able to

1. Outline the key components of the innate and adaptive immune responses.
2. Describe about cell types and organs which are involved in an immune response¬
3. Describe the Infectious diseases, hypersensitivity, autoimmune disorders,¬ immunodeficiency diseases

Unit I: Introduction to immunity **8hrs**

A. History; types of immunity – Innate and acquired immunity.
B. Cells and Organs of immune system: Cells: Lymphocytes (T & B cells), monocytes, macrophage; eosinophills, basophills, neutrophils and mast cells.
C. Primary and secondary lymphoid organs: Bone marrow, Thymus, Spleen, Lymph nodes

Unit II: Antigens and Immunoglobulins **8hrs**

A. Antigens: factors influencing immunogenicity, adjuvant, epitope, hapten
B. Immunoglobulins: Basic structure of the immunoglobulin;
Types and functions of immunoglobulins.
C. Monoclonal antibodies:Antigen-antibody reactions

Unit III: Immune response **8hrs**

A. Humoral and cell mediated immune responses
B. Primary and secondary immune modulation; Cytokines; role of complement system in immune response (Classical pathway, Alternate pathway);
C. Immune response against bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections;

Unit IV Immunotechniques **8hrs**

A. Agglutination; Precipitation;
B. Immunofluorescence; RIA, ELISA, Immuno-electrophoresis and Western blotting.

Unit V Major histocompatibility complex and Hypersensitivity **8hrs**

A. Transplantation and graft rejection,
B. Genetic organization of H2 and HLA complexes, HLA typing;
C. Immediate and delayed hypersensitivity.

Unit VI Vaccines and Vaccination **8hrs**

A. Types of Vaccines and their significance
B. Vaccine delivery systems.
C. Congenital and acquired immunodeficiencies

TUTORIALS **2X16=32 Hrs**

References:

1. Austyn, J.M. and Kathym, J. Wood. 1993. Principles of cellular and molecular Immunology. Oxford University Press. Oxford.
2. Benjamin, Elisunshine, Geoffrey Leskowitz.1996. Immunology: A short course. 3rd Edition. New York.
3. Kubey, J.M. 1990. Essential Immunology. 6th Edition. Blackwell Scientific Publication, New York.
4. Rao, C.V. 2002. An introduction to Immunology. Narona Publishing House, New Delhi.
5. Rotti, I. 1994. Essential Immunology. Blackwell, London.
6. Stibes, D.P. and Terr, A.I. 1991. Basic and Clinical Immunology. 7th Edition. Appleton and Large. California.

M.Sc., II SEMESTER
SC – 2.6 EVOLUTIONARY BIOLOGY

48 Hrs

Course Outcome:
After completing the course student will be able to

1. Understand that many of the organisms that inhabit the Earth today are different from those that inhabited it in the past
2. Understand that the propositions underlying Darwin's theory of evolution.
3. Explain adaptation, providing examples from several different fields of biology
4. Explain how the molecular record provides evidence for evolution
5. Understand the Human origin and evolution.

UNIT I Emergence of concept of evolution: 8 Hrs

A. Pre Darwinian concepts, Darwinism and its impact in the development of synthetic theory.
B. Neodarwinism: Birth of population genetics, Components of population genetics, Mendelian population, gene pool, allele frequencies and genotype frequencies,

UNIT II Speciation: **8 Hrs**

A. Concept of species,
B. Types of species
C. Models of speciation,
D. Patterns and mechanisms of reproductive isolation,
E. Hybridization, polyploidy and speciation.

UNIT III Molecular evolution 8 Hrs

A. Phyletic gradualism and punctuated equilibrium.
B. Micro and macroevolution.
C. Molecular evolution: Selectionists theory of evolution, Neutral theory of evolution and Molecular clock and emergence of non-darwinism,

UNIT IV Phylogeny 8 Hrs

A. Phylogenetic trees : Construction with nucleic acid and amino acid sequences,
B. Types of trees and Techniques employed in construction of phylogenetic trees,
C. Molecular phylogenetics of Homo sapiens.

UNIT V Population genetics and Evolution 8 Hrs

A. Gene pool, gene frequency, Hardy-Weinberg Law.
B. Destabilizing forces of evolutionary equilibrium (Mutation, Migration, Selection, Meiotic drive and genetic drift).
C. Founder effect, Isolating mechanisms and speciation.
D. Micro Macro and Mega evolution, Co-evolution.

UNIT VI Genome and Evolution **8 Hrs**

A. Genes and gene clusters
B. Origin of new genes by gene duplication (Ohno's concept)
C. Selfish DNA
D. Karyotypic evolution (Drosophila).

TUTORIALS 2X16=32Hrs

REFERENCES:

1. Dobzhansky Th, (1951) Genetics and origin of species, 3rd Edn. Chapman and Hall, London.
2. Dobzhansky Th, Ayala F.J, Stebbins G.L and J.M. Valentine, (1976) Evolution, Surjeet Publication, New Delhi.
3. Futuyama D.J (1986) Evolutionary Biology, Sinuauer Associates Inc. USA
4. Hartl D.L (2000) A primer of population genetics, Sinuauer Associates Inc. USA
5. Jha A.P (1992) Genes and Evolution - John Wiley Publicaion, New Delhi

6. King M (1993) Species evolution - The role of chromosomal change. The Cambridge University Press, Cambridge

M.Sc., III SEMESTER
HC – 3.1 MOLECULAR BIOLOGY AND BIOTECHNOLOGY

32 hrs

Course Outcome:
After completing the course student will be able to

1. Know nucleic acids, DNA replication and its mechanism.
2. Understand transcription and its modifications.
3. Explain genetic code, enzymes, factor and the process of translation.
4. Analyse gene regulation, lytic and lysogenic cycles in prokaryotes.
5. Understand gene regulation in eukaryotes.
6. Explain molecular mechanism of DNA damage repair.

Part A: Molecular Biology

Unit I Introduction to nucleic acids **8hrs**

A. DNA Replication: i) Enzyme components of replication unit ii) Mechanism with emphasis on Dna A in initiation, Co-ordinated synthesis, End replication in eukaryotes iii) Fidelity.
B. Transcription: i) Transcription apparatus and process (RNA polymerase, cisregulatory elements, terminators, transcription factors). ii) Post transcriptional modifications of mRNA in eukaryotes (G-cap, Poly tail, Splicing).
C. Translation: i) Genetic code (major features, usage of different codons). ii) Enzymes, factors and the process (Aminoacyl t-RNA synthatase, Peptidyl transferase, IFs, EFs, RFs and Ribosome)

Unit II Gene regulation **8hrs**

A. Gene regulation in Prokaryotes: (i) Regulation at transcription initiation: Eg. lac operon (+ve and -ve control) (ii) Regulation beyond transcription initiation: trp attenuator (iii) Regulation in Lambda Phage - Lytic and lysogenic cycle induction.
B. Gene regulation in Eukaryotes: (a) Transcriptional activators (b) Transcriptional repression: (i) direct repression, indirect repression (ii) Gene silencing by modification of histones and DNA (c) RNA interference
C. Molecular basis of homologous recombination: Models and protein machinery
D. Molecular mechanisms of DNA damage repair**.**

Part B: Biotechnology

Unit III: **8 hrs**

A. **Genetic engineering:**
Definition, objectives and outline of recombinant DNA technology procedure.
Enzymes**:** Restriction Enzymes; DNA ligase, Klenow enzyme,
T4 DNA polymerase, Polynucleotide kinase, Alkaline phosphatase.
Cloning vectors: Plasmids, Phages, Cosmids, Phagemids, Artificial chromosomes (YAC, BAC, HAC),

B. **Cloning:**
Construction of Genomic and cDNA libraries.
Indetification of Recombinants: Genetic selection, Use of chromogenic substrates, Insertional inactivation.
Analysis of recombinant DNA clones: Characterization of clones, Restriction mapping, Southern hybridization.
Polymerase chain reaction and DNA sequencing-Maxam and Gilbert's method, Sanger's method, Automated DNA sequencing

Unit IV: **8 hrs**

C. **Applications of Biotechnology:**
Production of medicinally important products – vaccines, Gene therapy, AIDS therapy, Biofertilizers, biopesticides, medicine and human health

D. **Animal Biotechnology**
Animal cell and Tissue culture: Principles of cell culture, cell and tissue types, cell lines, transformation.
Cell and tissue culture media: Natural and defined, role and components of serum in culture.
Applications of tissue culture: Tissue culture in biomedical research karyological studies, amniocentesis, mutagenesis, Cytotoxicity assays.

PRACTICALS **4x16=64 Hrs**

1. Extraction of DNA by rapid method.
2. Extraction of DNA by standard method.
3. Estimation of DNA concentration by Diphenylamine method.
4. Localization of DNA in prefixed paramecium slides by Feulgen staining
5. Localization of nucleic acids in prefixed paramecium slides by Toluidine blue staining
6. Estimation of RNA concentration by Orcinol method
7. PCR amplification of DNA and gel electrophoresis.
8. Restriction digestion and gel electrophoresis.
9. Isolation of plasmid DNA from bacteria.
10. Molecular biology problems

REFERENCES

1. Griffiths A J F, H. J. Muller, D. T. Suzuki, R. C. Lewontin and W. M. Gelbart 2000. An introduction to genetic analysis. W. H. Greeman. New York.
2. Lewin, B 2003 Genes VIII. Oxford University Press. Oxford
3. Dale, Jeremy W and Schantz, Malcom V. 2002. From Gene to Genomes. John Wiley and Sons Ltd,NY,USA
4. Das, H.K. 2007. Text book of Biotechnology.Wiley India Pvt. Ltd. New Delhi
5. Freshney, Ian, R. 2006. Culture of Animal Cell (5th edn).Wiley- Liss publications
6. Pandian, T.T. and Kandavel, D.2008. Text Book of Biotechnology. I.K International Publishing House, New Delhi. 47
7. Primrose, S.B., Twyman, R.M., and Old, R.W. 2001. Principle of Gene Manipulation (6th edn). Blackwell Science Ltd, London
8. Singh .B.D. 2006. Biotechnology. Kalyani Publishers, New Delhi
9. Sobti, R. C. and Pachauri, Suparna S. 2009. Essentials of Biotechnology. Ane Books Pvt. Ltd. New Delhi

M.Sc., III SEMESTER
HC – 3.2 REPRODUCTIVE BIOLOGY

32 hrs

Course Outcome:
After completing the course student will be able to

1. Understand structure and function of reproductive organs
2. Explain the structure of reproductive cells
3. Describe the role of internal cues in reproduction
4. Describe the role of external factors in reproduction
5. Analyse the role of endocrine glands and their secretions in reproduction
6. Identify the factors affecting fertility
7. Know different types of assisted reproductive technologies.

UNIT I: Male reproduction: **8 hrs**

A. Functional morphology of male reproductive system
B. Kinetics of spermatogenesis – wave and cycle
C. Hormonal control of mammalian testis and spermatogenesis
D. Ultrastructure of spermatozoa
E. Abnormalities of sperm
F. Brief description of histomorphology and hormonal control of male accessory organs viz., epididymis, vas deferens, seminal vesicles, ventral prostate, bulbourethral gland and preputial gland
G. Sperm maturation – morphological and biochemical events, influence of accessory organ secretions
H. Biochemistry of semen and capacitation

UNIT – II Female reproduction : **8 hrs**

A. Origin and migration of primordial germ cells; genetic and hormonal control of differentiation of gonads and gonadal ducts in mammals.
B. Female Reproductive System-Functional morphology of mammalian ovary, Fallopian tube and uterus.
C. Ovarian steroid hormones and their actions

UNIT III: Reproductive cycles in Mammals: **8 hrs**

A. Comparison of estrous and menstrual cycles
B. Menstrual cycle : Different phases, changes in the ovary and uterus and hormonal control
C. Implantation – Process, Types and hormonal control
D. Pregnancy – length of gestation, hormonal control
E. Parturition – Process of birth and influence of hormones
F. Lactation – Hormonal control of mammary gland, development and lactogenesis

UNIT – IV: Fertility and reproductive management **8 hrs**

A. Fertility control – Need, principles of different male and female temporary and permanent contraceptive methods.
B. Assisted Reproduction: Causes of infertility, Artificial insemination, different methods of assisted reproduction (*In-vitro* Fertilization, Gamete Intra Fallopian tube Transfer, Zygote Intra Fallopian tube Transfer).

PRACTICALS **16X4=64 hrs**

1. Demonstration of surgical technique by video clipping
2. Counting of spermatozoa in semen sample collected from volunteers
3. Staining of spermatozoa for abnormalities in semen samples collected from volunteers /clinical samples
4. Study of different contraceptive devices
5. Observation of permanent Histology slides
   a. Comparative morphology of ovary
   b. Comparative morphology of testis
   c. Comparative study of male accessory organs
   d. Comparative study of female accessory organs
6. Observation of permanent slides of T.S of endocrine glands
   a. Pituitary gland b. Thyroid gland c. Adrenal gland d. Pancreas

REFERENCES

1. Adler N. T (1981) Neurcendocrinology of Reproduction, Physiology and Behaviour.
2. Austin, C. R and R. V. Short (eds) (1972) Reproduction in mammals. (1) Germ cells andFertilization (2) Embryonic and Foetal development (3) Hormones in Reproduction (4) Reproduction pattern (5) Artificial control of reproduction, Cambridge University press,London.
3. Barrington, E. J. W (1976) An introduction to general and comparative endocrinology,Oxford University press, London
4. Raghavendra Puri (2003) Mammalian endocrinology Vol. I & II, Dominant Publishers and Distributors, New Delhi.
5. Muneeth Kainth (2005) Chordate Embryology, Dominant Publishers and Distributors, New Delhi.
6. Moudgal, N. R. Yoshinaga K Rao, A. J. and P. R. Adiga (1991) Perspectives in primate reproductive biology. Wiley Eastern Ltd., New Delhi, Bangalore
7. Paul Wassar man and Jimmy D. Neill (2005) Knogbil and neill's physiology of reproductive volume 1st and 2nd and 3rd edition
8. Jones, R. E (1991) Human Reproductive Biology press N.Y
9. Knobil, E and Neil J. D (1994) The physiology of reproduction, Vol. I & II. Raven press, New York.

M.Sc., III SEMESTER
HC – 3.3 ECOLOGY AND WILDLIFE

32 hrs

Course Outcome:

After completing the course student will be able to

1. Demonstrate and Understand ecological relationships between organisms and their environment.
2. Present an overview of diversity of life forms in an ecosystem.
3. Explain and identify the role of the organism in energy transfers
4. Describe the Habitat ecology and Resource ecology
5. Understand the types of environmental Pollution and their management
6. Scope, Values and Conservation strategies of wildlife.

Part-A Ecology

UNIT - I **8 hrs**

A. Ecosystem: Historical account, Scope, Basic concepts and Approaches to the study of Environmental Biology. Components of Environment - An overview of abiotic factors and Biotic factors. Concepts of habitat and Ecological niche. Ecotone and Edge effect. Food chains, Food-webs and their structure in Ecological Pyramids in aquatic, terrestrial and parasitic Environments.

B. Population Ecology: Introduction. An overview of important population attributes – Density, Natality, Growth rates, Growth forms and concept of carrying capacity, Patterns in human population growth and its explosion -Remedial measures. Mortality - life tables and survivorship curve, sex ratio, age distribution, dispersal and dispersion, aggregation and Allee's principle, population fluctuation and cyclic oscillations and Population interactions.

UNIT - II **8 hrs**

A. Community Ecology Concept of community - community structure and attributes, concept of climax Species diversity in community and it's measurement- Alpha diversity- Simpson's diversity index, Shannon index, Fisher's alpha, rarefaction. Beta diversity- Sorensen's similarity index, Whittaker's index, Evenness, Gamma diversity. Drivers of species diversity loss and conservation.

B. Bioecology of Freshwater Zooplankton: Definition, Types and adaptations of Zooplankton. Brief study of organizations, life cycles and Ecological importance of Rotifers, Cladocerans, Copepods-Calanoids, Harpacticoids and Cyclopoids, and Ostracods. Mass culturing of Zooplankton.

C. Microbial Ecology: Ecological role, beneficial and pathogenic Microorganisms. Indicator Microorganisms. Role of microorganisms in biodegrading and bioremediation of organic and metal pollution.

Part B Wildlife Biology

UNIT – III **8hrs**

A. Scope and values of wildlife (Ecological, Aesthetic, Scientific, Recreational, Medicinal)

B. Causes of wildlife depletion: Degradation and destruction of natural habitats, Exploitation for commercial purposes, Deforestation, Agricultural expansion, Urbanization and Industrialization, forest fires and hunting.

C. Wildlife corridors, Human-wildlife conflicts

D. Wildlife awareness and education, Wildlife and tribal welfare

UNIT – IV

A. Conservation strategies: Red data book, protected area network, Role of NGOs in conservation.

B. Wildlife act and legislation: Wildlife Protection Act 1972; Biological Diversity Act 2002.

C. Wildlife conservation projects in India (with special reference to Project Tiger, Project Hungul and Gir Project)

D. In-situ conservation: Bioreserves, National parks, Wildlife sanctuaries and Safari's in India

E. Management of Bioreserves, National parks, Wildlife sanctuaries and Safari.

F. Ex-situ conservation: Zoo garden, Management of Zoos, Captive breeding, Artificial insemination, Cryopreservation (techniques and applications) Germplasm banks,

PRACTICALS: **4X16=64 Hrs**

1. Qualitative and Quantitative study of freshwater planktons.
2. Determination of species diversity by Shannon-Weiner Index
3. Determination of species diversity by Simpson's index
4. Field visit to Sewage pond, Natural lake (and if possible river): Collection of water samples and study of physico-chemical parameters such as colour, pH, temperature, conductivity, total solids and turbidity
5. Estimation of Dissolved Oxygen in three natural (sewage, pond and Tap) water samples.
6. Estimation of free Carbon di-Oxide in three natural (sewage, pond and Tap) water samples.
7. To study the relationship between Dissolved Oxygen and free Carbon di-Oxide, if any, in three natural (sewage, pond and Tap) water samples.
8. Determination of BOD in three natural (sewage, pond and Tap) water samples
9. Determination of COD in three natural (sewage, pond and Tap) water samples
10. To study the relationship between BOD and COD, if any, in three natural (sewage, pond and Tap) water samples
11. Collection, observation of planktons (Phytoplankton and Zooplankton) from polluted and non-polluted water bodies.
12. Estimations of bacterial abundance in different water samples – using DEMT.
13. Visit to RMNH, Mysore, to study models of freshwater, marine, estuarine and terrestrial habitats.
14. Survey of Animal Population - to visit different habitats/areas in and around Mysore and collect data on some population attributes, application of Bio-statistical tests to the collected data and its interpretation.
15. Visit to nearby Zoological garden, wildlife sanctuaries, Animal rehabilitation centres.

REFERENCES

1. Begon, Harper and Townsend, 1995. Ecology: Individuals, populations and community. II edition. Blackwell Series, U.S.A.
2. Bhatia, H.S. 1998: A Text book on Environmental Pollution and Control, Galgotia, New Delhi.
3. Clarke, G.L. 1963. Elements of Ecology, . Wiley Eastern Limited. New Delhi.
4. Emmel, T.C. 1976. Population Biology, Harper and Row publishers, N.Y.
5. Kormondy, E.J. 1978. Concepts of Ecology, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Odum E.P. 1971. Fundamentals of Ecology. III Edition. W.B.Saunder's Co., Philadelphia.
7. Odum, E.P. 1983. Basic Ecology, Holt Saunders, Japan.
8. Sharma, P.D. 1996: Ecology and Environment Rastogi, Publications, Meerut.
9. APHA, 1992: Standard methods for examination of water and waste water, 18th edition
10. Negi,S.S and Bahuguna, V.K. 1983. An Introduction to wildlife management. Bishen Singh Mahendra Pal Singh. Dehara Dun, India.
11. NBA. 2004. The Biological Diversity Act (2002) and Biological Diversity rules (2004). National Biodiversity Authority, India.
12. Saharia, V.B. 1982. Wildlife in India. Natraj Publishers. Dehara Dun.

M.Sc., III SEMESTER
SC 3.4 ETHOLOGY

48 Hrs

Course Outcome:
After completing the course student will be able to

1. Evaluate the learning and instinct behavior.
2. Explain the mechanisms in instinct and behaviour
3. Explain how animals learn
4. Compare learning and instinct behaviour.
5. Analyse any problem about animal behaviour
6. Explain the importance of evolution for animal behaviour.
7. Explain evolution and behaviour.
8. Explain natural selection and behaviour.
9. Explain the relationship between predators and prey
10. Explain social behaviour.

UNIT - I **8 Hrs**

A. Descriptive versus experimental approaches

B. Reflexes and complex behaviour- Latency, after discharge, summation, warm up, fatigue inhibition and feedback control

C. Instinctive Behaviour - Fixed action pattern, Types of sign stimuli and releasers as triggers, Genetic basis of instinctive behaviour.

UNIT- II **8 Hrs**

A. Development and behaviour- Causes of behavioral changes during development, development of bird song.

B. Learning- Classical conditioning experiment, latent and insight learning. Social learning, learning sets and play.

C. Importance of early experience – Critical period- Filial imprinting, Sexual imprinting in birds, Imprinting like process in mammals.

UNIT- III Foraging and anti-predator behaviour **8 Hrs**

i. Anti predator behaviour – avoiding detection through colour and Markings (Mullarian mimicry)

ii. Warning coloration
iii. Batesian mimicry

UNIT-IV Biological communication **8 Hrs**

i. Forms of signals,
ii. Visual communication with suitable examples,
iii. Auditory Communication
iv. Tactile and Chemical communication

UNIT -V Sexual Behaviour **8 Hrs**

i. Hormones and sexual behaviour – Selected examples of courtship and mating behaviour.
ii. Pheromones in Insects and Mammals
iii. Lee Boot, Whitten, Bruce, Collidge and Castro-Vandenberg effect/s
iv. Selected examples of courtship and mating behaviour

UNIT-VI Social Behaviour **8 Hrs**

i. Introduction
ii. Advantages of grouping
iii. Social organization in insects with special reference to ants and honeybees
iv. Social organization in sub human primates
v. Altruism, Kin selection and Genetic control of behaviour

TUTORIALS – On the basis of the proposed chapters. **2x16 = 32 Hrs.**

REFERENCES

1) Goodenough J.E., Mc Guire B. and Wallace R. A. (1993) Perspectives on Animal Behaviour. John Wiley and sons, New York.
2) Tinbergen (2006) Social ehaviour in Animals. J.V. Publishing House Jodhpur India.
3) Vandenbergh. J.E.(Ed) (1983). Pheromones and Reproduction in mammals. Academic Press. NewYork.
4) Agrawal, K.C. 2000. Biodiversity. Agrobios. India.

M.Sc., III SEMESTER
SC – 3.5 POLLUTION AND TOXICOLOGY

48hrs

Course Outcome:

After completing the course student will be able to

1. broader understanding of how science and the scientific method work to address environmental problems.
2. Earth's major systems (ecosystems and biogeochemical cycles), how they function and how they are affected by human activity (population growth, air, water and soil pollution, ozone depletion, global warming, and solid waste disposal).
3. the interaction of human society (urban sprawl, energy use/generation, resource consumption and economics) with the Earth's systems.

Part A - Pollution **24 hrs**

Unit I: **8 hrs**

A. Concept of Biosphere: Its components, hydrosphere, atmosphere, and lithosphere, Origin of life in the biosphere.

B. Water pollution: Definition, sources Types and classification of pollutants. Effects of Water Pollution, River Pollution, Oxygen sag curves and Eutrophication Drinking water: Collection, purification and distribution. Wastewater treatment: Primary, secondary and tertiary treatment.

Unit II: **8 hrs**

A. Atmospheric pollution: Primary and secondary air pollutants. Biological effects of Nox, SOx, SPM, Hydrocarbons, Acid rain, Global warming, Photochemical smog and Ozone hole.
B. Solid waste and Biomedical waste: Sources, collection, transport, treatment and Disposal methods.. Noise Pollution: Sources, Biological effects, Control measures and OSHA standards.

UnitIII: **8hrs**

A. Radiation & Thermal pollution: Sources, types, effects, Atmospheric fallout and abatement.
B. Environmental Impact Assessment: Basic elements, Methods Guideline for industrial EIA, Aquaculture related EIA, Transport related EIA and Water related EIA. Case studies: Konkan Railway, Silent valley, Bhopal Tragedy and Love canal tragedy, Mangalore Bojpe tragedy

Part B – Toxicology **24 hrs**

Unit IV: **8hrs**

A. General Principles of Toxicology: Introduction, Definition of toxicology Importance of Dose and Dose-response, factors influencing toxicity, Bioassay-toxicity evaluation studies using fish as model.
B. Toxic compounds: Heavy metals-Lead and mercury, Hydrocarbons- Aromatic and Aliphatic, and cyanides, and toxic gases - Bhopal tragedy.

Unit V: **8hrs**

A. Biotransformation: Bioactivation, Biodetoxification of organo phosphates and organo chorines in the bodies of animals.
B. Natural toxins, Venoms and poisons: Properties and their effects, Major Sites and mechanism of action, Toxins in lower and higher organisms, Toxin and Venom therapy.

Unit VI: **8hrs**

A. Smoking aids: Active and Passive smoking, Consumption of tobacco, Mariguana(Ganja), their effects and Prevention measures.
B. Cosmetics: Types of cosmetics, Chemical Characteristics, Applications, Exposure and risk assessment, Cosmetic safety regulations.
C. Risk assessment: Exposure assessment, Dose-Dosage, Risk characterization, Risk analysis and communications, Occupational health and illness.

TUTORIALS – On the basis of the proposed chapters **2x16 = 32 Hrs**

REFERENCES:

1. Nandini, .N. Sunitha N. and T. Sucharita 2010. Environmental Studies, Sapna Book House Bangalore
2. Frant C.L.V. 1991, Basic Toxicology II (Eds.), Hemisphere publishing corporation, Washington, London
3. Sambasiva Rao K.R.S. 1999. Pesticide impact on fish metabolism. (Eds.) Discovery Publishing House, New Delhi.
4. Bio-pesticides in Insect Pest Management 1999. S. Ignacimuthu and Alok Sen, Phoenix Publishing House Pvt., Ltd., New Delhi.
5. APHA, AWWA and WEF. 1992: Standard Methods for Examination of Water and Wastewater, XVIII Ed, American Public Health Association. NY, USA
6. Nebel, B.T. and Wrigly R.T. 1998. Environmental Science, VI Ed. Prentice Hall New Jersey, USA

7. Hosetti, B.B. 2001. A Text Book of Applied Aquatic Biology, Daya Publishing House, Delhi.
8. Hassall, K.A. 1990. The Biochemistry and uses Pesticides structure, metabolism and Mode of action and uses in crop protection, John Wiley & Sons. Inc.
9. Pandey, K. and J.P. Shukla, 1990. Elements of Toxicology. Radha publ. New Delhi.

M.Sc., III Semester:
OPEN ELECTIVE-(For Science discipline students).
CONCEPTS OF ZOOLOGY.

48 Hrs

Course Outcome:
After completing the course student will be able to

1. Broader understanding of Zoology and its concepts
2. Understand the concepts and basics of animals taxonomy
3. Understand the basics of histology
4. Describe the structure and basic functions of organ systems
5. Explain ecological concepts and effects of environmental pollution
6. Explain the mechanism of inheritance.

1. Introduction: **8 Hrs**

a) Branches of animal science: Taxonomy, Animal Physiology, Genetics, Developmental Biology, Evolution, Ethology, Ecology, Applied Zoology, Entomology, Histology, c) Indian Wildlife- Status, Causes of wildlife depletion, Wildlife corridors, Conservation strategies- *In situ* and *Ex situ* d) e) Animals and human welfare.

2. Animal Taxonomy: **4 Hrs**

a) Carl Linnaeus – Taxonomic hierarchy: Kingdom, Division, Phylum, Class, Order, Family and Binomial nomenclature

3. Animal cells and Tissues : **8 Hrs**

a) Brief description of animal cell (light and ultra structure) b) Functions of cell organelles c) Structure and functional diversity in animal cell d) Cell division: Types and significance e) Structure and functions of basic tissues.

5. Structure and functions of organ systems: **16 Hrs**

a) Human alimentary canal and outlines of digestion and absorption
b) Respiration: Human respiration – exchange of gases.
c) Circulation : Structure of human heart, Blood vessels and capillaries, composition of blood, blood coagulation.
d) Excretion : Mammalian kidney and urine formation.
e) Locomotion in vertebrates – Swimming, walking running, flying
f) Nervous system and their functions, A brief account of human endocrine system
g) Reproduction : Asexual and sexual reproduction, significance of sexual reproduction, outlines of human reproduction and fertility control

6. Ecology and Environmental Biology: **8 Hrs**

a) Abiotic and Biotic factors b) Environmental Pollution – brief account of Air, Water and Noise pollution.

7. Heredity: **4 Hrs**

a) Continuity of life – Mendel's laws b) Structure of chromosomes c) DNA and RNA

TUTORIALS **2x16=32 Hrs**

REFERENCES :

1. Barnes, R. D. 1974. Invertebrate Zoology, III edition, W. B. Saunders Co., Philadelphia.
2. Barrington, E. J. W. 1976. Invertebrate structure and function. Thomas Nelson and Sons
3. Ltd., London

4. Hyman L. H. 1940. The invertebrates Vol.1 Protozoa through Ctenophora, McGraw hill
5. co., N. Y.
6. Hyman. L. H. 1968. The Invertebrates Vol.8 McGraw Hill Co., N. Y and London.
7. Parker, T. J. Haswell, W. A. 1961. Text book of Zoology, Vol.I, Macmillon Co., London.
8. Russel – Hunter, W.D 1969. A. biology of higher invertebrates, Mac millon Co., Ltd.,
9. London.
10. Barrington, E. J. W. 1965. The Biology of Hemichordata and Protochordata – Oliver and Boyd, Edinbourgh.
11. Clark, W. E 1963. History of the Primates IV Edn., Univ. of Chicago Press, Chicago.
12. Malcom Jollie, 1962. Chordata morphology – East-West Press Pvt. Ltd., New Delhi.
13. Romer, A. S. 1966. Vertebrate Paleontolgy, 3rd Ed., Univ. of Chicago Press, Chicago.
14. Romer A. S., 1960. Vertebrate body, 3rd Ed., W. B. Saunders Co., Philadelphia.
15. Young. J. Z., 1950. Life of vertebrates The Oxford University Press, London
16. Young J Z 1957 Life of mammals, Oxford University Press, London.

M.Sc., IV SEMESTER
HC – 4.1 ADVANCED GENETICS AND COMPUTATIONAL BIOLOGY

32 hrs

Course Outcome:
After completing the course student will be able to

1. Understand the genomic organization of prokaryotes and eukaryotes.
2. Know the applications of various model organisms in genomic research.
3. Able to analyse the pedigree, psychosomatic disorders, prenatal diagnosis and genetic counselling.
4. Recognise few heritable diseases in man.
5. Understand the basic concepts of genomics
6. Understand the basic concepts of proteomics
7. Understand the nucleic acid and proteinr databases and tools**.**

Part A-Advanced Genetics

Unit I: Genome organization: 3 hrs

Prokaryotes, Eukaryotic nuclear genomes - C-value paradox, Eukaryotic organelle genomes Split Genes Mobile genetic elements in Prokaryotes (bacteria) and Eukaryotes (Drosophila, maize and humans), Genome Projects of model organisms (*C. elegans*, *Drosophila* and Mouse).

Unit II: Cancer Genetics: 5 hrs

Cancer incidence and mortality, types of cancer, causes of cancer, properties of cancer cells, Genetic basis of Carcinogenesis- Oncogenes: proto-oncogenes, oncogenes, retroviral oncogenes in human cancer. Tumor suppressor genes: Functions of tumor suppressor gene products. Cancer as a multistep process. Animal models of cancer research: Transgenic mouse and Drosophila models.

Unit III: Human genetics: 5 hrs

History of human genetics, pattern of inheritance, pedigree analysis. Human genome: Organization, distribution of genes, gene families. Genetic basis of syndromes and disorders: Cystic fibrosis, Neurofibromatosis, Schizophrenia, Anxiety disorder, Congenital heart diseases, Dyslexia.

Unit IV: Quantitative genetics: 3hrs

Introduction, types of quantitative trait, Nature of quantitative traits and their inheritance-Polygenic inheritance (Multifactorial hypothesis) – analysis of continuous variation; Variations associated with polygenic traits.

Part B-Computational Biology

Unit VII: Introduction and Scope of the Computational Biology 4 hrs

Genomics: Definition and types of genomics Structural genomics: whole genome shotgun sequencing, gene annotation, gene families and clusters. Orthologs and paralogs. Functional genomics: Transcriptome, Microarray technology.

Unit VIII: Proteomics: 4 hrs

Definition, Protein structure determination, protein domains, protein folding, Computer aided protein structure analysis, Protein-protein interactions, Protein microarrays.

Unit IX: Nucleic acid sequence and Protein analysis: 4 hrs

Alignment, similarity searches including remote similarity searches, secondary structure element, motifs, Single nucleotide polymorphism (SNP), Two dimensional polyacrylamide gel electrophoresis, Mass Spectrometry.

Unit X: Genomics and proteomics databases and tools: 4 hrs

Nucleic acid sequence databases and tools: Genbank, UCSC, ENSEMBL, EMBL, DDBJ, BLAST vs FASTA, file formats-FASTA, GCG, Genscan and ClustalW. Protein sequence databases and tools: Uni- prot, PDB, PIR, BLAST, PSI- BLAST (steps involved in use and interpretation of results).

PRACTICALS:

1. Study of mitotic chromosomes of *Drosophila* species- *Drosophila melanogaster*, *Drosophila nasuta*.
2. Preparation of metaphase chromosomes from bone marrow cells of mouse.
3. Karyotypic studies of normal human chromosomes and syndromes.
4. Creation of pedigrees and study of patterns of inheritance.
5. Studies on phenotypes of different diseases and syndromes.
6. Study of Quantitative characters: Sternopleurals, Acrosticals – mean, standard deviation.
7. Data mining for sequence analysis.
8. Web– based tools for sequence searches and homology screening-BLAST, FASTA
9. Nucleic acid sequence databases: GenBank retrieval, GeneScan.
10. Proteomics data bases: Uni-Prot, PROSITE, PDB, PIR, ProtParam.
11. Annotations: ORF finder, Use of ARTEMIS or any other suitable software

REFERENCES:

1. The Human Genome 2001, Nature Vol. 409.
2. The Drosophila Genome. 2000, Science Vol. 267.
3. The Caenorhabditis elegans genome 1998. Science Vol. 282.
4. Introduction to Genetic Analysis. Griffiths, Anthony J.F.; Miller, Jeffrey H.; Suzuki, David T.; Lewontin, Richard C.; Gelbart, William M. New York: W.H. Freeman & Co.; 1999
5. Fundamental Neuroscience. Larry R. Squire, Darwin Berg, Floyd Bloom, and Sascha du Lac. Third Edition, Academic Press; 3 edition (2008)
6. Principles of Neural Science. Eric R. Kandel, James H. Schwartz, and Thomas M. Jessell. McGraw-Hill Medical; 4 edition(2000)
7. Neurogenetics: Scientific and Clinical Advances (Neurological Disease and Therapy) David R. Lynch, Informa HealthCare; 1 edition (2005)
8. The Molecular and Genetic Basis of Neurologic and Psychiatric Disease. Roger N Rosenberg, Salvatore DiMauro, Henry L Paulson, and Louis Pt (2007) Lippincott Williams & Wilkins; Fourth edition

9. Bioinformatics for Dummies, Claverie J. M., Notredame C., (2nd Ed., 2007), Wiley Publishing, Inc., New York, USA
10. Brown T. A. 2007, Genomes 3. Garland Science Publishing, New York.
11. A.Malcolm Campbell and Laurie J.Heyer. Discovering Genomimcs, Proteomics and Bioinformatics. 2004. Low Price edition. Pearson Education, Inc.

M.Sc., IV SEMESTER
HC – 4.2 APPLIED ZOOLOGY

32 hrs

Course Outcome:

After completing the course student will be able to

1. Explain plant insect interaction, origin of pest and its control.
2. Understand vectors and its communicable diseases.
3. Explain races of silkworm their disease and its control.
4. Know about the importance of insects in forensic science and medicine.
5. Know about aquaculture and its practices in India.

UNIT I: Aquaculture **8hrs**

Aquaculture in India: an overview – nutritional value and food security - Site selection and preparation of culture ponds - Fish culture: carps, marine fishes and ornamental fishes. Prawn culture: Freshwater prawns and marine shrimps. Fattening of crabs. Crayfish and Lobster - Molluscs: mussels, clams, chanks and oysters including pearl oyster. Live feeds: micro algae, micro-invertebrates (*Artemia* nauplii, Rotifers, Cladocerans, Copepods, Ostracodes) and worms as live baits – Water quality management and maintenance of sanitation - Plant and animal nutrients - Balanced diet (iso-nitrous and iso-caloric) - Artificial feed formulation – Low cost feed formulation - Aquatic weeds.

UNIT II: Sericulture **8hrs**

Salient features of Saturnidae and Bombycidae. Mulberry and non mulberry silkworms, classification based on voltinism, moulting and geographic origin.

Morphology and life cycle of *Bombyx mori*. Structure and functions of Silk glands.

Silkworm rearing technology: Building, equipments, disinfection, environmental factors, Seed cocoons, preservation, grainage activity, LSPs, egg production, incubation, artificial hatching.

Pests and diseases: Protozoan, Fungal, Viral and Bacterial diseases and their control measures. Silkworm pests and Predators

UNIT III: Apiculture **8hrs**

Scope and its importance, Classification and morphology of honey bees, species and races of honey bees, tribal life and bee hunting. sex seperation, comb building, orientation of comb, communication, collection of propolis and water.

Honey and its chemical composition, medicinal importance.

Eonomic importance of honey, wax, bee pollination, pollen and Venom.

UNIT IV: Vermiculture **8hrs**

A. Introduction to vermiculture. Definition, meaning, history, economic importance, their value in maintenance of soil structure. Useful species : Local species and Exotic species of earthworms. Role of four R's.

B. Taxonomy Anatomy, Physiology and Reproduction of Lumbricidae and Eudrilidae.

C. Earthworm Farming (Vermiculture) for home gardens, larger scale, Extraction (harvest), vermicomposting harvest and processing.

D. Nutritional Composition of Vermicompost for plants, comparison with other fertilizers

E. Enemies of Earthworms, Sickness

PRACTICALS: **16X4=64 hrs**

1. Study of morphometric characters of Indian major carps.
2. Diversity of fishes.
3. Collection of phytoplankton and zooplankton from natural resources and their identification.
4. Study of morphology of honey bee and cast system.
5. Mounting of mouth parts, stinging apparatus of honey bee.
6. Study of digestive system of honeybee.
7. Study of structure and types of honey comb.
8. Study of bee plants.
9. Study of morphology of lifecycle of *Bombyx mori*
10. Study of digestive and silk gland of *Bombyx mori*
11. Study of Non mulberry silkworms and their food plants.
12. Field trip- Collection of native earthworms & their identification
13. Study of systematic position& External characters of locally available earthworm species.
14. Mounting of setae and identification of earthworm species.
15. Study of equipments used in Vermiculture.

REFERENCES

1. Ashok Kumar (2009) Textbook of Animal Diseases
2. Edwards, C.A. and J.R. Lofty (1977) "Biology of Earthworms" Chapman and Hall Ltd., London.
3. G.S. Shukla, V.B. Upadhyay (2006) Economic Zoology.
4. Kevin, A and K.E.Lee (1989) " Earthworm for Gardeners and Fisherman" (CSIRO, Australia, Division of Soils)
5. Lee, K.E. (1985) "Earthworms: Their ecology and Relationship with Soils and Land Use" Academic Press, Sydney.
6. Pradip. V Jabde, (2005) Text Book of Applied Zoology.
7. R. L. Kotpal (2000) Modern Textbook of Zoology. Rastogi Publications
8. Satchel, J.E. (1983) "Earthworm Ecology" Chapman Hall, London.
9. Wallwork, J.A. (1983) "Earthworm Biology" Edward Arnold (Publishers) Ltd. London.

M.Sc., IV SEMESTER
HC – 4.3 Project

Course Outcome:

After completing the course student will be able to

1. understand the concepts of Project Management for planning to execution of projects
2. find importance of reference work Using tools of information such as periodical , journals, online resources
3. break work down the tasks of project and determine handover procedures
4. Interpret, analyse and presentation of the results obtained and compare with similar works and draw conclusion.

M.Sc., Examination
(Scheme CBCS)
M.Sc., ZOOLOGY
HARD CORE- Model question paper

Time: 3 hrs **Max Marks: 70**

Instructions: ***1. Answer all questions***
2. Illustrate your answer wherever necessary

I. Write short notes on the following: **[8×2=16]**

1.
2.
3.
4.
5.
6.
7.
8.

II. Write elaborate notes on any FIVE of the following: **[5×6=30]**

9.
10.
11.
12.
13.
14.
15.
16.

Q3. Answer the following: **[2×12=24]**

17. (i)
Or
(ii)

18. (i)
Or
(ii)

M.Sc Examination
(Scheme CBCS)
M.Sc., ZOOLOGY
Softcore - Model question paper

Time: 3 hrs **Max Marks: 70**

Instructions: ***1. Answer all questions***
2. Illustrate your answer wherever necessary

I. Write short notes on the following: **[8×2=16]**

1.
2.
3.
4.
5.
6.
7.
8.

II. Write elaborate notes on any FIVE of the following: **[5×6=30]**

9.
10.
11.
12.
13.
14.
15.
16.

Q3. Answer the following: **[2×12=24]**

17. (i)
Or
(ii)

18. (i)
Or
(ii)

M.Sc Examination
(Scheme CBCS)
M.Sc., ZOOLOGY
Open Elective-Model question paper

Time: 3 hrs **Max Marks: 70**

Instructions: ***1. Answer all questions***
2. Illustrate your answer wherever necessary

I. Write short notes on the following: **[8×2=16]**

1.
2.
3.
4.
5.
6.
7.
8.

II. Write elaborate notes on any FIVE of the following: **[5×6=30]**

9.
10.
11.
12.
13.
14.
15.
16.

Q3. Answer the following: **[2×12=24]**

17. (i)
Or
(ii)

18. (i)
Or
(ii)

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(AUTONOMOUS)

OOTY ROAD, MYSURU-570 025

(Autonomous under University of Mysore: Re-accredited by NAAC with 'A' Grade)

Choice Based Credit System and CAGP

MASTERS DEGREE

Syllabus

2020-22

Postgraduate Department of Computer Science

JSS College of Arts, Commerce and Science

Ooty Road, Mysore-25

2020-2022

PROGRAMME: MASTER OF SCIENCE IN COMPUTER SCIENCE

2 Years /4 Semesters (under CBCS-CAGP)

ADMISSIONS:

i) 50% seats of the total intake for M.Sc., Computer Science Programme of the College will be filled-up by University of Mysore through Centralized Admission Cell as per University regulations.

ii) Remaining 50% seats will be filled-up by the College under College Quota.

ADMISSION REQUIREMENT

Eligibility - All students who have 45% (40% for SC/ST) in their B.Sc degree (from Recognised University/ Open University) with Mathematics as one subject and any one-two among Electronics, Instrumentation, Computer Science or Computer Maintenance and Physics as other subject. OR Student with B.Sc (IT) are permitted provided they have not studied Mathematics in their 2 years PUC. OR Diploma (in Electronics, Computer Science and Information Technology) holders with B.Sc (IT) are permitted if they have SSLC level Mathematics. OR BCA degree from recognized University OR equivalent to this from any other recognized University in India or abroad is also permitted.

PROGRAMME OUTCOMES:

After Completing the M.Sc Program Students will be able to:

PO1. Identify, formulate, and solve computer science problems

PO2. Design, implement, test, and evaluate a computer system, component, or algorithm to meet desired needs

PO3. Receive the broad education necessary to understand the impact of computer science solutions in a global and societal context

PO4. Communicate effectively

PO5. Success in research or industry related to computer science

PO6. Have solid knowledge in computer science and engineering, including programming and languages, algorithms, theory, databases, etc.

PO7. Integrate well into and contribute to the local society and the global community related to computer science

PO8. Practice high standard of professional ethics

PO9. Draw on and integrate knowledge from many related areas

PROGRAMME SPECIFIC OUTCOMES:

PSO1. Programmers or the Software Engineers with the sound knowledge of practical and theoretical concepts for developing software.

PSO2. Serve as the Computer Engineers with enhanced knowledge of computers And its building blocks. Work as the Hardware Designers/Engineers with the knowledge of Networking Concepts.

PSO3. Work as the System Engineers and System integrators Serve as the System Administrators with thorough knowledge of DBMS.

PSO4. Work as the Support Engineers and the Technical Writers

PSO5. Work as IT Sales and Marketing person.

PSO6. Serve as the IT Officers in Banks and cooperative societies.

PSO7. Computer Scientist in research and R & D laboratories.

PSO8. Faculty for Graduate and Under graduate Colleges**.**

MSc. in Computer Science – 2018

I Semester

Course Code	Course	L:T:P	Credit Value
CSC101	HC1 (Data Structures and Algorithms)	3:0:1	4
CSC102	HC2 (System Software)	2:1:1	4
CSC103	HC3 (Computer Networks)	2:1:1	4
CSC104	SC1		4
CSC105	SC2		4
	TOTAL		**20**

II Semester

Course Code	Course	L:T:P	Credit Value
CSC201	HC4 (Analysis and Design of Algorithms)	2:1:1	4
CSC202	HC5 (Operating System and Unix)	2:0:2	4
CSC203	HC6 (Computer Graphics)	3:0:1	4
CSC204	SC3		4
CSC205	SC4		4
	TOTAL		**20**

III Semester

Course Code	Course	L:T:P	Credit Value
CSC301	HC7 (Software Engineering)	3:1:0	4
CSC302	HC8 (Theory of Languages)	3:1:0	4
CSC303	HC9 (Database Management System)	2:1:1	4
CSC304	SC5 / Term Work		4
CSC305	SC6 (Open Elective ****)		4
	TOTAL		**20**

IV Semester

Course Code	Course	L:T:P	Credit Value
CSC401	HC10 (Major Project)	0:1:7	8
CSC402	SC7		4
CSC403	SC8		4
	TOTAL		**16**

****** Open Elective Course: III Semester**

Course Code	Course	L:T:P	Credit Value
CSC305	OE- Computer Fundamentals / Programming with C	2:0:2	4

HARD CORE:

Sl. No.	Course	L:T:P	Credit Value
1	Computer Networks	2:1:1	4
2	Computer Graphics	3:0:1	4
3	Data Structures and Algorithms	3:0:1	4
4	Analysis and Design of Algorithms	2:1:1	4
5	DBMS	2:1:1	4
6	Software Engineering	3:1:0	4
7	Theory of Languages	3:0:1	4
8	Operating System and Unix	2:0:2	4
9	System Software	3:1:0	4

SOFT CORE:

Sl. No.	Course	L:T:P	Credit Value
1	Principles of Programming Language and C	2:1:1	4
2	Internet Technology	2:0:2	4
3	Java Programming	2:0:2	4
4	Multimedia	3:1:0	4
5	Microcontroller	3:1:0	4
6	Discrete Mathematics	3:1:0	4
7	Simulation and Modeling	3:1:0	4
8	Operations Research	3:1:0	4
9	Mobile Communication	3:1:0	4
10	C++	2:0:2	4
11	Pattern Recognition	3:0:1	4
12	Image Processing	2:1:1	4
13	Software Testing	3:0:1	4
14	Computational Techniques	3:0:1	4
15	Graph Theory	3:1:0	4
16	OOAD	2:1:1	4

17	Probability and Statistics	3:1:0	4
18	Data Mining	2:1:1	4
19	Artificial Intelligence	3:1:0	4
20	.NET Technologies	2:0:2	4
21	Object Oriented Modeling and Design with UML	2:1:1	4
22	Android Application Development	2:0:2	4
23	Advanced Database Management Systems	2:1:1	4
24	Compiler Design	3:0:1	4

SCHEME OF EXAMINATION AND ASSESMENT:

In view of the CBCS syllabus, Each Course is Assess with Components . Component 1 (C1), Component 2 (C2), and Component 3 (C3),

The following is the scheme which will be followed for the assessment of marks for both theory (HC/ SC/ OE) as well as practicals (HC/ SC) irrespective of the Credits associated with each Course. Thirty percent of the marks will be assessed for the internals (C1 and C2) and remaining seventy percent will be for the semester end examinations (C3). Each Course carries 100 marks and hence thirty marks for internal assessment and remaining seventy marks will be for Semester End Examinations. Out of thirty marks for internals, fifteen marks will be allotted to each C1 and C2 components.

Each theory Course (HC/ SC/ OE) consists of three components namely C1, C2 and C3. C1 and C2 are designated as Internal Assessment (IA) and C3 as Semester End Examination. Each Course (HC/ SC/ OE) carries 100 Marks and hence the allotment of marks to C1, C2 and C3 Components will be fifteen, fifteen and seventy marks respectively. i.e.,

C1 Component : 15 Marks C2 Component : 15 Marks	Internal Assessment Marks
C3 Component : 70 Marks	Semester End Examination
Total : 100 Marks	

The above will be followed in common for all the theory (HC/ SC/ OE) Courses in all the four semesters.

DATA STRUCTURES & ALGORITHMS **3:0:1**

Course Code:CSA100

Course Outcomes: At the end of the course students will be able to:

CO1. Select appropriate data structures as applied to specified problem definition.

CO2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.

CO3. Implement Linear and Non-Linear data structures.

CO4. Implement appropriate sorting/searching technique for given problem.

CO5. Design advance data structure using Non Linear data structure.

UNIT I: Introduction

Introduction to Stages in Problem Solving, Difference between Data Type, Data Structure and Storage Structure, Formal Definition of Data Structure, Classification of Data Structure
Analysis of Algorithms: Algorithm, Time Complexity and Space Complexity, O-Notation, Omega Notation and Theta Notation.
Primitive Data Structure: Integer, Real, Character and Boolean and Its Storage Representation

UNIT II: Non-Primitive Data Structures

Arrays: Introduction to Array Data Structure and Its Representation, Sparse Matrix Representation. Introduction to Structures
Stacks: Introduction, Implementation Using Arrays, Applications - Tower Of Hanoi, Expression Evaluation, Conversion of Expressions

UNIT III: Stacks and Queues

Queue: Introduction, Types – Ordinary, Circular, Doubly Ended, Priority, Implementation Using Arrays

Linked List: Introduction, Types, Operations, Implementation of Stacks and Queues Using Linked List

UNIT IV: Non-Linear Data Structures

Graphs: Introduction, Basic Terminologies, Graph Representation – Adjacency and Incidence Matrix Representation

Trees: Introduction, Binary Tree Representation – Array and Linked List Representations, Traversals – Preorder, In-order, Post order, Binary Search Tree, Introduction to B-Trees

Hash Tables: Direct Address Tables, Hash Tables, Hash Functions, Open and Closed Addressing

References:

1. Data Structures and Algorithms, 2nd Edition, 2006 , Andrew Tanenbaum
2. "An Introduction to Data Structures, with Applications" McGraw Hill, Kongakusha 1976, Trembley and Sorenson
3. "Data Structures" SBCS Publication, 1980, Horowitz and Sahni
4. Data Structures using c, A K Sharma
5. Data Structures and program design in C, Kruse Robert L
6. Data Structures and analysis in C, Mark Allen Weiss
7. Data Structures and Algorithms, Alfred V AHO and Jeffrey D Ullman

SYSTEM SOFTWARE **2:1:1**

Course Code:CSA110

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand fundamentals of language processing and grammar

CO2. Apply knowledge of compilation and code optimization steps to mimic a simple compiler

CO3. Demonstrate the working of various system software like assembler, loader, linker, editor and device driver

UNIT 1

Background: Machine Structure, Evolution of the components of a programming system, evolution of operating system, operating system user view point functions, facilities

General Machine Structure, General Approach to a new machine, Machine Structure – 360 and 370, Assembly Language

UNIT 2

Assemblers: General design procedure, design of an assembler.

Macro language and macro processor, macro instructions, features of macro, implementation

UNIT 3

Loaders, different types of loaders, loader schemes, design of an absolute loader, design of direct linking loader.

Compilers: Structure and phases

UNIT 4

Lex and yacc: The Simplest lex Program, Recognizing Words with Lex, Parser-Lexer Communication, Regular Expressions, Grammars, Shift/Reduce Parsing, Structure of lex and yacc Programs, Programs in lex and yacc

References:

1. Systems Programming by Donovan
2. Principles of Compiler design by Ullman
3. System programming by Dhamdhare
4. Lex and yacc by John R Levine, Tony Mason and Doug Brown
5. System Software- Prof. Liland L Beck.

6. System Software- Prof. John R Levine

COMPUTER NETWORKS **2:1:1**

Course code:CSA120

Course Outcomes:

At the end of the course students will be able to:

CO1. Master the terminology and concepts of the OSI reference model and the TCP-IP reference model.

CO2. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.

CO3. Master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks

CO4. Acquire knowledge of Application layer and Presentation layer paradigms and protocols.

CO5. Study Session layer design issues, Transport layer services, and protocols.

CO6. Gain core knowledge of Network layer routing protocols and IP addressing.

CO7. Study data link layer concepts, design issues, and protocols.

CO8. Read the fundamentals and basics of Physical layer, and will apply them in real time applications.

CO9. Familiar with wireless networking concepts

CO10. Familiar with contemporary issues in networking technologies
CO11. Familiar with network tools and network programming

UNIT 1

USES OF COMPUTER NETWORK: Business Applications, Home Applications, Mobile Users, Social Issues

NETWORK HARDWARE: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks, Home Networks, Internetworks

NETWORK SOFTWARE: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Service, Service Primitives, the Relationship of Services to Protocols

REFERENCE MODELS: The OSI Reference Model, The TCP/IP Reference Model, A comparison of OSI and TCP/IP Reference Model

UNIT 2

THE PHYSICAL LAYER

THE THEORETICAL BASIS FOR DATA COMMUNICATION: Fourier Analysis, Bandwidth-Limited Signals, The Maximum Data Rate of a Channel

GUIDED TRANSMISSION MEDIA: Magnetic Media, Twisted Pairs, Coaxial Cable, Fiber Optics

WIRELESS TRANSMISSION: The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared and Millimeter Waves, Light wave Transmission

COMMUNICATION SATELLITES: Geostationary Satellites, Medium-Earth Orbit Satellites, Low-Earth Orbit Satellites, Satellites versus Fiber

THE DATA LINK LAYER

DATA LINK LAYER DESIGN ISSUES: Services Provided to the Network Layer, Framing, Error Control, Flow Control

ERROR DETECTION AND CORRECTION: Error-Correcting Codes, Error-Detecting Codes

ELEMENTARY DATA LINK PROTOCOLS: A Utopian Simplex Protocol, A Simplex Stop-and-Wait Protocol

SLIDING WINDOW PROTOCOLS: A One-Bit Sliding Window Protocol, A Protocol Using Go-Back-N

UNIT 3

THE MEDIUM ACCESS CONTROL SUBLAYER

THE CHANNEL ALLOCATION PROBLEM: Static Channel Allocation, Dynamic Channel Allocation

MULTIPLE ACCESS PROTOCOLS: ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols

ETHERNET: Ethernet Cabling, Manchester Encoding, The Ethernet MAC sub layer protocol, the binary exponential back off algorithm, Ethernet Performance, Switched Ethernet, IEEE 802.2: Logical Link Control

THE NETWORK LAYER

NETWORK LAYER DESIGN ISSUES: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks

ROUTING ALGORITHMS: The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing
CONGESTION CONTROL ALGORITHMS: Approaches to Congestion Control, Traffic-Aware Routing, Admission Control, Traffic Throttling, Traffic Shaping
INTERNETWORKING: How Networks Differ, How Networks Can Be Connected, Tunneling, Internetwork Routing, Fragmentation
THE NETWORK LAYER IN THE INTERNET: The IP Protocol, IP Addresses, IPv6

UNIT 4

THE TRANSPORT LAYER
THE TRANSPORT SERVICE: Services Provided to the Upper Layers, Transport Service Primitives
ELEMENTS OF TRANSPORT PROTOCOLS: Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery
THE INTERNET TRANSPORT PROTOCOLS: UDP: Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols
THE INTERNET TRANSPORT PROTOCOLS: TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window, TCP Timer Management
THE APPLICATION LAYER
DNS—THE DOMAIN NAME SYSTEM: The DNS Name Space, Resource Records, Name Servers
ELECTRONIC MAIL: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery
NETWORK SECURITY:
CRYPTOGRAPHY: Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, Two Fundamental Cryptographic Principles
SYMMETRIC-KEY ALGORITHMS: DES—The Data Encryption Standard, Cipher Modes
PUBLIC-KEY ALGORITHMS: RSA, Other Public-Key Algorithms
DIGITAL SIGNATURES: Symmetric-Key Signatures, Public-Key Signatures

MANAGEMENT OF PUBLIC KEYS: Certificates

Reference Books:

1. Computer Networks, 5th Edition, Prentice Hall, 2006, Andrew S. Tanenbaum & David J. Wetherall
2. Data & Computer Communications, 6th Edition, Pearson Education, 2002, William Stallings
3. Computer Networks: 3rd Edition, Elserier, 2003, Larry L. Peterson & Bruce S. Davie
4. Data Communication & Networking, 4th Edition, Mc Graw Hill, 2006, Behrouza Forouzan
5. Computer & Networks with Internet Applications, 4th Edition, Pearson Education, 2004, Douglas E. Comer

ANALYSIS AND DESIGN OF ALGORITHMS **2:1:1**

Course Code:CSB060

Course Outcomes:

At the end of the course students will be able to:

CO1. Analyze different scenarios for running time of algorithms using asymptotic notations and Design using Recursion.
CO2. Apply divide and conquer strategy for design of various algorithms.
CO3. Develop algorithms for well known problems using greedy methods.
CO4. Describe and apply dynamic-programming approach for designing graph and matrix based algorithms.
CO5. Understand the concept of backtracking for traversal and search algorithms.
CO6. Apply the knowledge earned to determine the efficiency of algorithms considering time and space tradeoffs.

UNIT 1

INTRODUCTION**:** Algorithm specification, pseudo code conventions

PERFORMANCE ANALYSIS: Space Complexity, Time Complexity, Asymptotic Notation,

Mathematical Analysis: Recursive and Non recursive algorithms

BRUTE FORCE – Bubble Sort, Selection Sort, Sequential Search, String Matching

UNIT 2

DIVIDE- AND – CONQUER: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication

THE GREEDY METHOD: The General Method, Knapsack Problem, Tree Vertex Splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees - Prim's Algorithm, Kruskal's Algorithm, Optimal Storage on Tapes, Optimal Merge Patterns, Single-Source Shortest Paths.

UNIT 3

DYNAMIC PROGRAMMING: The General Method, Binomial Coefficient, Multistage Graphs, All Pairs Shortest Paths Single-Source Shortest Paths: General Weights, String Editing, 0/1 Knapsack, the Traveling Salesperson Problem

BACKTRACKING: The General Method, the 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles

UNIT 4

Elementary Graph Problems: Depth First Search, Breadth First Search, Topological Sort

NP-Hard and NP-Complete Problems: Basic Concepts, Nondeterministic Algorithms, The Classes NP-Hard And NP-Complete

NP-Hard Graph Problems: Clique Decision Problem (CDP), Node Cover Decision Problem, Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP), AND/OR Graph Decision Problem (AOG)

References:

1. Analysis and Design of Algorithms: Horowitz Sahani
2. Analysis and Design of algorithms: Trembly
3. Introduction to Algorithms: Thomas H. Cormen
4. Analysis and Design of Algorithm: Padma Reddy
4. Introduction to the design and analysis of algorithm: Anany Levitin.
5. Design and analysis of algorithm: S Shridhar.

OPERATING SYSTEM and UNIX **2:0:2**

Course Code:CSB070

Course Outcomes:

At the end of the course student will be able to:

CO1. Understand device drivers
CO2. Write applications with improved performance and stability
CO3. Write set of small commands and utilities that do specific tasks well
CO4. Run multiple programs each at the same time without interfering with each other or crashing the system.
CO5. Implement Commands of UNIX.
CO6. Implement various file processing commands and shell Programming.

UNIT 1

Introduction to Operating System, Operating System Structures

Process Management: Processes, CPU Scheduling

UNIT 2

Deadlocks, Storage Management: Memory management, Virtual Memory, File-System Interface

UNIT 3

Introduction: Why UNIX? The Unix Environment, UNIX Structure, accessing UNIX, UNIX commands

File Systems: File Names, File Types, Regular Files, Directories, File System Implementation, Operations unique to directories, Operations unique to regular files, Operations common to both.

Vi editor, local commands, range commands in vi, global commands in vi, rearrange text in vi, ex editor.

UNIT 4

Introduction to shells: Unix Session, Standard Streams, Redirection, pipes, tee command, command execution, command line editing, quotes, command substitution, job control, aliases, variables, predefined variables, options, shell/environment customization.

Security and file permission: User and groups, Security levels, changing permissions, User masks, Changing ownership and group, Regular expressions: Atoms, Operators, grep: operation, grep family, Searching for file content, sed and awk.

C Shell Programming: Basic script concepts, Expressions, Decision making selections,, Built in commands, Scripting techniques, Shell environment & Script, Script examples

References:

1. Unix and Shell Programming, Behrouz A Forouzan and Richard F.Gilberg, 2nd Edition, 2003, Thomson.
2. System Programming and Operating Systems, Dhamdhare. D.M., 4th Edition, TataMcGraw Hill, 2006
3. A Practical Guide to Linux, Mark G. Sobell, 1st Edition, 2002, Pearson Education (Chapters:1 to 5, 8, 10, 11, 15)
4. UNIX: The Complete Reference, Kenneth Rosen and others, 2nd Edition, 2002,Obsborne/McGraw Hill
5. Design of the UNIX Operating System, Maurice J Bach.
6. Operating System: A Modern Perspective , Gary J Nutt.

COMPUTER GRAPHICS **3:0:1**

Course code:CSB080

Course Outcomes:

At the end of the course students will be able to:

CO1. Utilize the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.

CO 2. Learn the basic principles of 3- dimensional computer graphics.

CO3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.

CO4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.

CO 5. Implement the applications of computer graphics concepts in the development of computer games, information visualization, and business applications.

CO6. Comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles

UNIT 1

Introduction, Video Display Devices, Refresh Cathode-Ray Tubes, Raster-Scan Display, Random-Scan Displays, Color CRT Monitors, Flat-Panel Displays, Raster Scan Systems, Input devices.

Output primitives: Points & Lines, Line Drawing Algorithms, Loading the Frame Buffer, Circle Generating Algorithms, Pixel Addressing and Object Geometry

UNIT 2

Two dimensional transformations Basic & other transformations, Matrix representations, Homogeneous coordinates Composite transformations, General-pivot-point transformations.

Three Dimensional Transformations: Introduction to 3D Translation, Rotation & Scaling, Other Transformations, Modeling and Co-ordinate Transformations.

UNIT 3

Three Dimensional Viewing :Viewing Pipeling, window to viewport transformations, Projections, Types of projections.

Graphical User Interface & Interactive Input Methods : The User Dialogue, Windows & Icons, feedback, Input of Graphical Data, Interactive Picture Construction Techniques, Basic Positioning Methods, Constraints, Grids, Gravity Field, Rubber-Band Methods, Dragging, Painting & Drawing

UNIT 4

Curves & Surfaces: Properties, Bezier curves properties, Design techniques, Bezier surfaces, Displaying curves & surfaces

Hidden line removal algorithms

Introduction to fractals, Serpinsky's triangle, Construction, Koch curves.

Windowing & Clipping: Clipping operations, Line clipping algorithms, point clipping, text clipping, polygon clipping algorithms, Exterior clipping

Reference:

1. "Computer Graphics", Pearson Education, Donald D. Hern and M. Pauline Baker
2. " Principles of Interactive Computer Graphics" McGraw Hill 1989, W. M. Newman and Robert Sproull
3. "Computer Graphics a Programming Approach" McGraw Hill 1987, Steven Harrington
4. " Schaums outline of theory and problems of Computer Graphics" 2nd printing 1987, 1986 Edition, Roy A Plastock and Gardon Kelley
5. " Procedural Elements of Computer Graphics" McGraw Hill 2nd edition 1990, David F Frogers and J Alan Adams
6. Computer Graphics, James.D.Foley, A Vandam etal

SOFTWARE ENGINEERING **3:1:0**

Course Code:CSC040

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.

CO2 Learn methods of capturing, specifying, visualizing and analyzing software requirements.

CO3. Understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.

CO 4. Basics of testing and understanding concept of software quality assurance and software configuration management process.

CO 5. Understand need of project management and project management life cycle.

CO 6. Understand project scheduling concept and risk management associated to various types of projects.

UNIT 1

INTRODUCTION TO SOFTWARE ENGINEERING: Software and Software Engineering, phases in Software Development, Software Development Process models, Agile modeling, Introduction to metrics.

UNIT 2

SOFTWARE REQUIREMENT SPECIFICATION: Role of SRS, Problem Analysis, Requirement specification, validation, metrics, Monitoring and control

PLANNING A SOFTWARE PROJECT: Cost Estimation, Project Scheduling, Staffing personal planning, Team Structure, Software Configuration Management, Quality Assurance Plans, Project Monitoring plans, Risk Management.

UNIT 3

SYSTEM DESIGN: Design Objectives, design principles, Module level Concepts, Design methodology – object oriented approach Design Specification, Verification, Metrics, monitoring and control.

DETAILED DESIGN: Module Specification, Detailed design and process design Language, Verification

UNIT 4

CODING: Programming practice, Verification, Metrics

TESTING: Testing Fundamentals, Fundamental testing, Structural Testing. Testing process Clean Room approach

References:

1. "An Integrated approach to the Software Engineering" 2ed. Narosa Publishing House, New Delhi, 2002, Pankaj Jalote
2. Software Engineering Principles & Practice - 3rd Edition, Tata Mc Graw Hill Companies – 2006, Waman S Jawadekar
3. Software Engineering A Practitioner's Approach - 6th Edition
   McGraw Hill – 2005, Roger S Pressman
4. Software Engineering - 7th Edition : Pearson Education Ltd- 2006, Sommerville

THEORY OF LANGUAGES **3:1:0**

Course Code:CSC050

Course Outcomes:

At the end of the course students will be able to:

CO1. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.

CO2. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.

CO3. Design different types of Push down Automata as Simple Parser.

CO4. Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.

UNIT - 1

INTRODUCTION TO FINITE AUTOMATA**:** Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata.

FINITE AUTOMATA, REGULAR EXPRESSIONS: An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions

UNIT - 2

REGULAR LANGUAGES, PROPERTIES OF REGULAR LANGUAGES: Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Equivalence and minimization of automata.

CONTEXT-FREE GRAMMARS AND LANGUAGES: Context –free grammars; Parse trees; Ambiguity in grammars and Languages.

UNIT – 3

PUSHDOWN AUTOMATA: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.

PROPERTIES OF CONTEXT-FREE LANGUAGES: Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFL

UNIT - 4

TURING MACHINE: The turing machine; Extensions to the basic Turing Machines; UNDECIDABILITY: A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem

REFERENCES:

1. Introduction to Automata Theory, Languages and Computation – John E.. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman:, 3rd Edition, Pearson education, 2007.
2. Fundamentals of the Theory of Computation: Principles and Practice – Raymond Greenlaw, H.James Hoove, Morgan Kaufmann, 1998.
3. Introduction to Languages and Automata Theory – John C Martin, 3rd Edition, Tata McGraw-Hill, 2007.

DATABASE MANAGEMENT SYSTEM **2:1:1**

Course Code:CSC060

Course Outcomes:

At the end of the course students will be able to:

CO1. Explain the features of database management systems and Relational database.
CO2. Design conceptual models of a database using ER modelling for real life applications and also construct queries in Relational Algebra.
CO3. Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
CO4. Retrieve any type of information from a data base by formulating complex queries in SQL.
CO5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
CO6. Build indexing mechanisms for efficient retrieval of information from a database

UNIT 1

Introduction and conceptual modeling databases and Database users, Data modeling using the entity relationship (ER) model, the enhanced entity – relationship (EER) model.

UNIT 2

Relational model: Concepts constraints, Languages, Design and programming.

The relational data model and relational database constraints, Relational algebra and relational calculus, Introduction to SQL Programming technique

UNIT 3

Database design theory and methodology functional dependencies and Normalization for relational database, Relational database design algorithms and further dependencies, practical database design methodology and use of UML diagrams.

UNIT 4

Introduction to transaction processing concepts and theory recovery

REFERENCES

1. Fundamentals of database system – 5th Edition – Ramez elmasri, Navathe – Person edition

2 .An introduction to database system – 8th Edition – C. J. Date, Kannan – Person Education

3.Database system concepts – 5th Edition – Korth, Sudarshan – McGraw Bill Edition

4. Database Management System- Raghuramakrishnan.

5. An Introduction to Database System- Bipin Desai

6. Principles of Database System- J D Ullman

Softcore:

PRINCIPLES OF PROGRAMMING LANGUAGES AND 'C' 2:1:1

Course Code:CSA020

Course Outcomes:

At the end of the course students will be able to:

CO1. Analyzing semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing, and exception handling.

CO2. Implementation techniques for interpreted functional languages.

CO3. Using object-oriented languages.

CO4. Familiar with design issues of object-oriented and functional languages.

CO5. Familiar with language abstraction constructs of classes, interfaces, packages, and procedures.

CO6. Familiar with implementation of object-oriented languages.

CO7. Familiar with using functional languages

.

UNIT 1: Preliminaries

Reasons for studying concepts of programming languages, Programming domains, Language evaluation criteria, Implementation methods Names, Bindings, Type Checking, and Scopes Introduction, Names, Variables, The concept of Binding, Type Checking, String Checking, Type Compatibility, Scope, Scope and Lifetime, Referencing Environments, Named Constants, Variable Initialization.

UNIT 2: Data Types

Introduction, Primitive Data types, Character String Types, User-Defined Ordinal Types, Array Types and Associative Arrays, Record Types, Union Types, Set Types, Pointes Types.
Expression, Assignment Statements and Statement Level Control Structures
Introduction, Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational And Boolean Expressions, Short-Circuit Evaluation, Assignment Statements, Mixed-Mode assignment.

UNIT 3

Compound Statements, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands, Conclusion.

Subprograms: Introduction, fundamentals, design issues, local referencing environments, parameter passing methods, overloaded programs, generic subprograms, coroutines, user defined overloaded operators

UNIT 4

C LANGUAGE: C Fundamentals, Operation data input and output, Control statements, Function Storage classes, Arrays, Pointers, structures and unions, Enumeration, Command line parameters, Macros, 'C' processor.

Reference:

1. Concepts of Programming Languages, Eight Edition, Pearson, Robert W. Sebesta
2. Foundation for Programming Languages, John C Mitchell
3. Principles of Programming Language, Chopra Rajiv
4. Principles of Programming Language, Dowek
5. Types and Programming Languages, Benjamin C Pierce
6. Programming Languages: Principle and Practices ,3rd Edition, Kenneth C Louden

INTERNET TECHNOLOGY **2:0:2**

Course Code:CSD220

Course Outcomes:

At the end of the course students will be able to:

CO1. Develop analytical ability in network technology.

CO2. Create quality websites
CO3. Work individually as a web designer and set up their own business
CO4. Get the job opportunities in most companies for professional web designers and build websites more visually elegant and interactive
CO5. Implement interactive web page(s) using HTML, CSS and JavaScript.
CO6. Design a responsive web site using HTML5 and CSS3.

UNIT 1

Fundamentals: introduction to the Internet, WWW, Web Browsers, Web Servers, URL, Multipurpose Internet Mail Extensions (MIME), HTTP, Security,

Introduction to HTML: Origins and Evolution, Basic Syntax, Document Structure, Basic tags, Images, Links, Lists, Tables, Forms, Frames.

UNIT 2

Introduction to XML: Syntax of XML, XML Document Structure, Document Type Definition.

Introduction to XHTML: Origins and Evolution, Basic Syntax, Document Structure, Basic tags, Images, Links, Lists, Tables, Forms, Frames, Syntactic difference between HTML and XHTML.

Cascading Style Sheets (CSS): Introduction, levels of style sheets, Selector Forms, Property value forms, Font properties, Color, Alignment of Text, Box model, Background Images, and tags.

UNIT 3

The basics of JavaScript: Overview, Object Orientation and JavaScript, General syntactic characteristics, Primitives, Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Objects, Arrays, Functions, Constructors, Errors.

JavaScript and XHTML Documents: Element access, Events and Event Handling, Handling Events from Body elements, Handling Events from Button elements, Handling Events from Text Box and password elements.

Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating Mouse Cursor, Reacting to Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

UNIT 4

Introduction to PHP: Origins and Uses, Overview, General Syntactic Characteristics, Primitive, Operations and Expressions, Output, Control Statements, Arrays, Functions, Form Handling, Cookies.

REFERENCES:

1. Programming the World Wide Web – by Robert W. Sabesta 4th Edition Pearson Publications
2. HTML and XHTML the Complete Reference.
3. How to program the World Wide Web – by Deitel and Deitel
4. Mastering in HTML – by Ray and Ray.
5. Web programming and Internet Technologies: An E Commerce approach- By Porter ` Seobey and Pawan Lingras.
6. Internet Technology and Information services by Joseph Miller

JAVA Programming **2:0:2**

Course Code:CSA270

Course Outcomes:

At the end of the course students will be able to:

C01. Understand concept of Object Oriented Programming & Java Programming Constructs.

C02. Understand basic concepts of Java such as operators, classes, objects, inheritance, packages ,Enumeration and various keywords.

C03. Understand the concept of exception handling and Input/Output operations.

C04. Design the applications of Java & Java applet.

C05. Analyze & Design the concept of Event Handling and Abstract Window Toolkit.

UNIT 1

History and evolution of Java, An overview of Java, Data types, variables and arrays, Operators, Control statements- Introducing classes ,A closer look at methods and classes, Inheritance, Packages and interfaces.

UNIT 2

Exception handling, Multithreaded Programming, Enumeration, Autotoxins, I/O, Applets

UNIT 3

Networking, Event handling, Swings.

UNIT 4

String handling, Collection framework, Introduction to J2EE, Java servlet, Java server pages (JSP) and HTML, JDBC objects.

REFERENCES:

1. The complete reference Java – 7th Edition – Herbert Schildt – Tata Mcgraw hill Edition.

2. The complete reference J2EE – Jem Keogh – Tata Mcgraw hill Edition.

3. Object Oriented Programming with Java- M T Somashekara, D S Guru and K S Manjunatha.

4. The Complete Reference 7th Edition Herbert Schiidt

5. Introduction to Java Programming – E Balaguruswamy

6. Head First Java – 2nd Edition

7. Core Java- Horst Mann, C S –8th Edition-Cornell.

8. Core Servelet and Java Server pages- Hall, M-Brown L

MULTIMEDIA **3:1:0**

Course Code:CSD210

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand various file formats for audio, video and text media.

CO2. Develop various Multimedia Systems applicable in real time.

CO3. Design interactive multimedia software.

CO4. Apply various networking protocols for multimedia applications.

CO5. Develop understanding of technical aspect of Multimedia Systems

UNIT 1

Introduction to Multimedia (MM) Communication, Scope, Range, Feasibility and Challenges of MM Communication Key aspects of MM: Compression, Coding, Transmission and Replay.

UNIT 2

Types of Compression: Quantization, Coding as PCM, DPCM, ADPCM. Simple Encoder and Decoders based on PCM Samples. Introduction to Transform domain Compression. Introduction to Audio part of MPEG, Psychoacoustics

UNIT 3

Compression in Spatial Domain Algorithms for Data Compression in Transform Domain: DCT. Variable Length Coding, Huffman code. Variable Length Coding: Arithmetic Coding. Introduction to JPEG 2000 Standard, Encoders-Decoders based on this. Audio Compression and MPEG Audio

UNIT 4

Fundamental concepts of Video. MPEG Architecture Details: Audio-Video- Systems. Video Coding standard related to H.263 and H. 264. MPEG- 1, 2 Video. MPEG- 4 : Video. Streaming and Transport Issues: Multiplexing, Synchronization and File formats. Errors in MPEG and Error handling, Concealment. Buffer structures and Buffer Management

Introduction to MPEG-7 and MPEG-21., HDTV. Content based Image Retrievals and Digital Libraries.

References:

1. Fundamentals of Multimedia, 2nd Ed, Pearson, 2005, Ze-Nian Li and Mark Drew
2. Multimedia Communications., Pearson, 2005, Fred Halsall
3. Introduction to Data Compression, 3rd Ed, Morgan Kaufman (India Ed), 2005, Khalid Sayood
4. The DATA compression; The Complete Reference, 3rd Ed, Springer (India Ed), 2006, David Solomon
5. Multimedia foundations: A Core Concepts of for Digital Design, Vic Cost Ello
6. Multimedia: Making it work, 9th edition, Tay Vaughan

MICROCONTROLLERS **3:1:0**

Course Code:CSC210

Course Outcomes:

At the end of the course students will be able to:

CO1. Describe the architecture of 8051 microcontroller and write embedded program for 8051 microcontroller.

CO2. Design the interfacing for 8051 microcontroller.

CO3. Understand the concepts of ARM architecture.

CO4. Demonstrate the open source RTOS and solve the design issues for the same.

CO5. Select elements for an embedded systems tool.

CO6. Understand the concept and architecture of embedded systems

UNIT 1

Introduction, Numbering system and binary arithmetic,

UNIT 2

The 8051 Architecture, Basic assembly language programming concepts, Moving data,

UNIT 3

Logical operations, Arithmetic operations Jump and call instructions

UNIT 4

An 8051 Microcontroller design, Applications

References

1. "The 8051 Microcontroller", 3rd Edition, Thomson India edition, 2007, Kenneth Ayala
2. "Programming and customizing the 8051 microcontroller", Tata McGraw-Hill edition, 2006, Myke prick
3. "The 8051 Microcontroller and embedded systems", Pearson India, 2006, Muhammad Ali Mazidi & Janice Gillispie Mazidi,
4. Microcontroller and Embedded System, Mazidi, M A- Mazidi
5. Microcontroller: Architecture, Programming and application, Ayala, Kenneth

DISCRETE MATHEMATICS **3:1:0**

Course Code:CSA260

Course Outcomes:

At the end of the course students will be able to:

CO1. Construct simple mathematical proofs and possess the ability to verify them.
CO2. Have substantial experience to comprehend formal logical arguments .
CO3. skillfull in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.
CO4. Specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.
CO5. Apply basic counting techniques to solve combinatorial problems .
CO6. Use various techniques of mathematical induction (weak, strong and structural induction) to prove simple mathematical properties of a variety of discrete structures

UNIT 1

Set Theory: Sets and Subsets. Operations on sets, Countable and uncountable sets, The addition principal, the concept of probability.

Mathematical Logic: Propositions, Logical Connectives, Tautologies; Contradictions, Logical equivalence, Application to switching networks, Duality, Commentates NAND and NOR, Converse, Inverse and Contrapositive, Rules of inference.

UNIT 2

Open statements; Quantifiers, Logical Implication involving Quantifiers, Statements with more than one variable, Methods of proof and disproof, Mathematical Induction.

UNIT 3

Relations and Ordering: Cartesian products of sets, Relations, Paths in relations and digraphs, Operations on relations, Composition of relations, Properties of relations, Equivalence relations, Partial orders, Total Orders, External elements in posets, Lattices.

Functions: Functions, Types of functions, Composition of function, Invertible functions, Permutation Function.

UNIT 4

Fundamental principles of counting: Principles of inclusion and exclusion: The rule of sum and product, Permutations, combinations: The binomial theorem, combinations with repetition,

Ramsey number, the Catalan numbers, sterling number and bell numbers, Generalizations of principles, the pigeonhole principle, Derangements-Nothing is in its Right place, Rook polynomials, Arrangements with Forbidden positions.

References:

1. Discrete Mathematics by Dr. Chandrashekar S .
2. Discrete and combinational Mathematics by Ralph P. Grimaldi, 5th edition, Addison Wesley, 2004
3. Discrete mathematical structures by Kolman, Robert C Busby and Sharon., 6th Edition, Prentice Hall, 2008
4. Discrete Mathematics and Application by Kenneth H Rosen.
5. Discrete Mathematics by Norman L Biggs.

SIMULATION & MODELLING **3:1:0**

Course Code:CS/A/B/C/D300

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand the definition of simulation and how to develop and analyze a simulation model

CO2. Understand the fundamental logic, structure, components and management of simulation modeling

CO3. Demonstrate knowledge of how to use Arena

CO4. Build a simulation model with basic operations and inputs

CO5. Build a simulation model with detailed operations

CO6. Perform statistical analysis of output from terminating simulation

UNIT 1

Introduction, Simulation of prepursuit problem, A system & its model, Simulation of an inventory problem, The basic nature of simulation

Simulation of continuous systems: A chemical reactor, Numerical integration vs continuous system simulation, Selection of an integration formula, Runge Kutta integration formulas, simulation of a servo system, Simulation of a water reservoir system, Analog vs digital simulation

UNIT 2

Discrete system simulation

Fixed time-step vs event to event model, On simulating randomness, Generation of random numbers, Generation of non uniformly distributed random numbers, Monte Carlo computation vs stochastic simulation

UNIT 3

Simulation of queuing systems

Rudiments of queuing theory, simulation of single server queue, Simulation of two server queue, Simulation more general queues.

Simulation of PERT network

UNIT 4

Network model of a project, Analysis of an activity network, Critical path computation, Uncertainties in activity duration, Simulation of an activity network, Computer program for simulation, Resource allocation and cost considerations, Inventory control & forecasting Elements of inventory theory, More complex inventory models, simulation examples, Generation of Poisson & erlang variates, Forecasting & regression analysis

Design and Evaluation of Simulation Experiments

Length of simulation runs, Variance reduction techniques, Experimental layout, validation

References:

1. System Simulation with Digital Computer Narsingh Deo
2. System Simulation and Modeling - Sengutta
3. Computer Methods for solving Dynamic Seperation problems- C D Holland and A I Liapis.
4. Fundamentals of Modeling separation Process- C D Holand.
5. Process Modeling-M M Denn

OPERATIONS RESEARCH **3:1:0**

Course Code: CS A/B/C/D 310

Course Outcomes:

At the end of the course students will be able to:

CO1: Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.

CO2: Apply the concept of simplex method and its extensions to dual simplex algorithm.

CO3: Solve the problem of transporting the products from origins to destinations with least transportation cost.

CO4: Convert and solve the practical situations into non-linear programming problem.

CO5: Identify the resources required for a project and generate a plan and work schedule

UNIT 1

Introduction: formulation of LP problems, graphical solution of LP problems, General formulation of L P problems, Slack & Surplus variables, Standard form, Matrix form, Simplex method, Revised Simplex method, Dual simplex

UNIT 2

Assignment model, Transportation model, Game theory

Probability: Introduction, Basic terms of probability, The Addition law of probability, discrete & continuous, variables, random variables, probability distribution of random variables, Mean variance& standard deviation, Mathematical expectation of a random variable.

UNIT 3

Queuing theory

Introduction, queuing system, distribution, Kendall's Notation, Classification, model I (m/m/1).

UNIT 4

Project management by PERT CPM

Introduction, history, Applications, Basic steps, Network diagram representation, rules of drawing network diagram, labeling Fulkerson's I-J rule, Time estimates & Critical path, PERT, Resource allocation, Uses of PERT/CPM.

References:

1. Operations Research - S D Sharma
2. Operations Research - R K Gupta & D S Hira
3. Introduction to Operation research – Frederick S Hillier ,Gerald J and Liberman.
4. Operation research: An Introduction by Hamdy A Taha.
5. Operation research: Application and algorithm by Wayne L Winston.

MOBILE COMMUNICATION **3:1:0**

Course Code:CS A/B/C/D 320

Course Outcomes:

At the end of the course students will be able to:

CO1. Design a mobile cellular network

CO2. Optimize a radio channel system

CO3. Select the apt diversity scheme for a given wireless system to improve the performance.

CO4. Perform efficient spectral allocation using multiple access techniques such as CDMA, and OFDM.

CO5. Select the correct MAC protocol and routing algorithm for mobile ad-hoc networks.

CO6. Optimize the mobile ad-hoc network, MAC protocols and routing algorithms as per application.

UNIT 1

Introduction, Applications, History of wireless communication, reference model,
Wireless transmission, Frequencies for radio transmission, signals, Antennas, Signal propagation Multiplexing, Modulation, Spread spectrum

UNIT 2

Cellular Systems, Medium Access control, Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, Comparison.

UNIT 3

Telecommunications Systems, GSM, DECT, TETRA, UMS & IMT 2000
Satellite Systems, history, Applications, Basics, Classical TCP improvements, TCP over 2.5/3G wireless networks, performance enhancing proxies

UNIT 4

Support for mobility, File Systems World Wide Web, Wireless Application protocol

References:

1. Cellular and Mobile Communication- Krishna.
2. Cellular Mobile Communication – V S Bhagat
3. Cellular and Mobile Communication- V Jeyasri Arokiamary.
4. Wireless Communication and Networks – William Stallings.

5. Cellular Communication; A Comprehensive and practical guide- Nishith Tripathi and Jeffreyhreed.

C++ 2:0:2

Course Code:CSA250

Course Outcomes:

At the end of the course students will be able to:

CO1 . Understand the features of C++

CO2. Understand the relative merits of C++ as an object oriented programming language

CO3. Understand how to produce object-oriented software using C++

CO4. Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism

CO5 Understand advanced features of C++ specifically stream I/O, templates and operator overloading

Unit I

Quick overview of C : Expressions - Statements - Arrays and Null-Terminated Strings – Pointers - Functions – Structures, Unions, Enumerations and User-Defned Types – C Style Console I/O – File I/O -.

Unit II

An Overview of C++ - Classes and Objects – Arrays, Pointers, References, and the Dynamic Allocation Operators

Unit III

Function Overriding, Copy Constructors and Default Arguments – Operator Overloading - Inheritance – Virtual Functions and Polymorphism

Unit IV

Templates – Exception Handling - The C++ I/O System Basics

References :

1. The Complete Reference C++, 4th Edition, Tata-McGraw-Hill, 2003, Herbert Schildt
2. Object Oriented Programming with C++ , M T Somashekara, D S Guru, H S Nagendraswamy and K S Manjunatha
3. C++ Premier, 5th Edition. Stanley B Lippman
4. C++ Programming language, E Balaguruswamy
5. The C++ programming language, 4th Edition, Bjarne Stroustrup

PATTERN RECOGNITION **3:0:1**

Course Code:CAC230

Course Outcomes:

At the end of the course students will be able to:

C01. Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.

C02. Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.

C03. Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.

C04. Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

C05. Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

UNIT 1

Machine perception, pattern recognition systems, Design Cycle, Learning and adaption, models of Pattern recognition

UNIT 2

Bayesian Decision Theory

Introduction, Bayesian, Decision theory- Two category classification, classifiers-Two category case and multi category case, missing and noisy features.

UNIT 3

Nonparametric Techniques

Introduction, Density estimation, Parzen window, KN neighbor estimation, The nearest neighbor rule, Metrics and Nearest Neighbor Classification, Error analysis of nearest decision rule

UNIT 4

Introduction, Heirarchical clustering techniques, partitional clustering techniques Dimensionality reduction techniques Introduction, principle component analysis, Fisher Linear Dicriminant Analysis, Spectral clustering based dimensionality reduction

References:

1. Pattern Classification, 2nd edition, Wiley publications, R. O Duda, P.E. Hart and D G Stork,
2. Pattern Recognition and Image Analysis, Prentice Hall of India, Pvt Ltd, Earl Gose, Richard, Johnsonbaugh, Steve Jost
3. Pattern Recognition and machine Learning, Cristopher M Bishop,
4. Pattern Recognition (Blue Ant) – Willian Gibsom.
5. Pattern Recognition, 4th Edition- Sergios Theodoridis and Konstantios Koutroumbas

IMAGE PROCESSING **2:1:1**

Course Code:CS A/B/C/D 330

Course Outcomes:

At the end of the course students will be able to:

C01. Analyze general terminology of digital image processing.

C02. Examine various types of images, intensity transformations and spatial filtering.

C03. Develop Fourier transform for image processing in frequency domain.

C04. Evaluate the methodologies for image segmentation, restoration etc.

C05. Implement image process and analysis algorithms.

C06. Apply image processing algorithms in practical applications.

UNIT I

Introduction, digital image fundamentals

UNIT II

Image enhancement in the spatial domain, Image enhancement in the frequency domain

UNIT III

Image restoration, color image processing

UNIT IV

Wavelets and multi-resolution processing image compression

References:

1. Digital Image Processing-Rafel C.Gonzalez and Richard E Words.
2. The Image Processing hand Book- John C Cruss.
3. Fundamentals of Digital Image Processing- Anil K Jain.
4. Digital Image Processing –Jayaraman S.
5. Digital Image Processing- Sanjay M Shah Munesh Chandra Trivedi

SOFTWARE TESTING **3:0:1**

Course Code:CSC440

Course Outcomes:

At the end of the course students will be able to:

CO1.Check Various test processes and continuous quality improvement

CO2.Verify Types of errors and fault models

CO3.Check Methods of test generation from requirements

CO4.Check Behavior modeling using UML: Finite state machines (FSM)

CO5.Test generation from FSM models

CO6.Input space modeling using combinatorial designs

UNIT 1

Assessing Testing Capabilities and Competencies, Building a software Testing Environment: Building a software Testing Strategy, Establishing a Software Testing Methodology, Determining your Software Testing Techniques, Selecting and Installing Software Testing Tools.

UNIT 2

The Eleven-Step Testing Process: Eleven-Step Testing Process Overview, Step1: Access Project Management Development Estimate and status, Step2: Develop Test Plan, Step3: Requirement Phase Testing,

UNIT 3

Step4: Design Phase Testing, step 5: Requirement Phase Testing, Step6: Execute Test and Record Results,

UNIT 4

Step7: Acceptance Test Results Step8: Report Test Results, Step9: Testing Software Installing, Step10: Test Software Changes, Step11: Evaluate Test Effectiveness.

.

REFERENCES:

1. Effective Methods for Software Testing, William E. Perry, 2nd Edition 2003, Wiley
2. *Surviving the Top Challenges of Software Testing*, New York: Dorset House, 1997., Rice, Randall and Peery, William E.,
3. A practitioner's Guide to Software Test Design, By Lee Copelane.
4. The Art of Software Testing By Glenford Myers.
5. Testing Object System: Models, Patterns and Tools by Robert V Binder.

GRAPH THEORY **3:1:0**

Course Code:CSB270

Course Outcomes:

At the end of the course students will be able to:

CO1. Explain basic concepts in combinatorial graph theory

CO2. Define how graphs serve as models for many standard problems

CO3. Discuss the concept of graph, tree, Euler graph, cut set and Combinatorics.

CO4. See the applications of graphs in science, business and industry.

UNIT 1

Introduction to Graph theory: Basic terminologies—direst & undirect graphs, walks, paths & circuits, sub-graphs and complements, Graph Isomorphism, vertex degree and regular graphs,

UNIT 2

Konigsberg bridge problem & Euler graphs. Hamilton graphs & traveling salesman problem, planar graphs- definition & examples, Bipartite & Kuratowskis graphs, Euler's formula & detection of planarity, Dual of Planar graphs,

UNIT 3

Graph Coloring: Proper coloring & chromatic number of graphs, Chromatic polynomial, four color problems, Trees: Optimization & Matching: Trees; Definition & Properties, Rooted & binary rooted trees, ordered trees & trees sorting. Weighted trees & prefix codes

UNIT 4

Spanning trees, optimization, Networks, Cutset, Edge & Vertex connectivity of a graph, Max-flow Min-cut thermo and its applications, Matching theory and its applications

References:

1. Graph Theory, V.K Balakrishnan, Schaum Series, McGrawHill, 1997
2. Graph Theory, by Frank Harary, Westview Press, 1994.
3. Introduction to Graph Theory, Douglas B west.
4. Hand Book of Graph Theory, Jonathan L Gross and Jay Yellen.
5. Graph Theory with application to Engineering and Computer science, Narsingh Deo.

OOAD **2:1:1**

Course Code:CSB210

Course Outcomes

At the end of the course students will be able to:

CO1. Analyse, design, document the requirements through use case driven approach.

CO2.Identify, analyse, and model structural and behavioural concepts of the system.

CO3.Develop, and explore the conceptual model into various scenarios and applications.

CO4.Apply the concepts of architectural design for deploying the code for software**UNIT I**

Implementation of Object Oriented concepts using C++

UNIT II

Introduction, Object orientation, OO development, OO themes, OO modeling ,History. Modeling, Abstraction, Models .Class Modeling Object & class, Link & Association concepts, Generalization & Inheritance, sample Class Model, Navigation of class models. Advanced class modeling: advanced object & class concepts, Association end N ary Association, Aggregation, Abstract Classes, Multiple Inheritance, Meta Data, Reification, Constraints, Derived Data.

UNIT III

State modeling: Events, States, Transitions & Conditions, State Diagrams, State Diagram behavior. Advanced state modeling, interaction modeling.

UNIT IV

System design: Overview of System design, Estimating performance, making a Reuse plan, Breaking a System into Subsystems, Identifying concurrency, Allocation of subsystems, Management of Data Storage.

Reference:

1. Object Oriented Analysis and Design – Blaha, Rambaugh.

2. Object Oriented Analysis and Design with the Unified Process- W Satzinger, Robert B Jackson and Stephen D Burd.

3. Object Oriented Analysis and Design with application, 3rd edition- Grady Booch, Robert A Maksimchuk, Michael W Engel

4. Object Oriented Analysis and Design with application- Grady Booch.

PROBABILITY AND STATISTICS **3:1:0**

Course Code: CS A/B/C/D 340

Course Outcomes

At the end of the course students will be able to:

CO1. Apply probability theory to set up tree diagrams
CO2. Apply probability theory via Bayes' Rule
CO3. Describe the properties of discrete and continuous distribution functions
CO4. Use method of moments and moment generating functions
CO5. Assess the consistency, efficiency and unbiasedness of estimators
CO6. Apply method of maximum likelihood estimation
CO7. Apply the Central Limit Theorem
CO8. Use statistical tests in testing hypotheses on data

UNIT 1

Introduction, basic terminology, Interpretation of probability: Axioms of probability, Some elementary theorems, Conditional probability, Mathematical Exception

UNIT 2

Probability Distributions: Introduction, Discrete probability distributions continuous probability distributions, The expected value of a random variable Chebyshev's Theorem

UNIT 3

Sampling distributions, Populations and samples, Sampling distribution, The sampling distribution of the mean, sampling distributions of proportions, sampling distributions of mean, chi squared distribution, F distribution.

UNIT 4

Estimation and inference theory, introduction, point estimation, interval distribution, bayesian estimation, test of hypot, Introduction to ANOVA.

References:

1. Probability and Statistics: Bheeshma Rao
2. Probability and Statistics, 4th edition, Degroot, Schervish.
3. Probability and Statistics for Engineering and Science, 8th edition, Jay L Devore.
4. Probability and Statistics, Michael Akritas.

5. An Introduction to Probability and Statistics,3rd edition, Vijay K Rohatgi and A K MD Ehsanes Saleh.

DATA MINING **2:1:1**

Course Code:CSD230

Course Outcomes:

At the end of the course students will be able to:

CO1. Demonstrate an understanding of the importance of data mining and the principles of business intelligence

CO2. Organize and Prepare the data needed for data mining using pre preprocessing techniques

CO3. Perform exploratory analysis of the data to be used for mining.

CO4. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.

CO5. Define and apply metrics to measure the performance of various data mining algorithms.

UNIT 1

Introduction, what kind of patterns can be mined? which technologies are used? which kind of applications are targeted?, major issues in Data mining.

Getting to know your data: Data objects and attribute types, basic statistical description of data, Data Visualisation, Measuring Data similarity and dissimilarity.

UNIT 2

Data Preprocessing: data cleaning, Data integration, Data Reduction, Data transformation and Data Discretization

UNIT 3

Mining frequent patterns, Associations and correlations: Basic concepts, Frequent mining methods, pattern Evaluation methods, Pattern mining in Multilevel multi dimensional space, Decision tree induction.

UNIT 4

Cluster analysis, partioning methods, heirarchical methods, density based methods, grid based methods, evaluation of clustering.

References:

1. Data Mining: Concepts and Techniques, Third Edition, Jaiwei Han, Micheline Kamber, Jian Pei.

2. Learning Data Mining with Python, 2nd edition, Robert Layton.

3. Data Mining; The Text book, Charu C Aggarwal.

4. Data Mining, 4th edition: Practical Machine learning Tools and Techniques by Lan H Witten and Fibe Frank.

5. Introduction to Data Mining – Pang- Ning Tan and Micheal Steinbach

ARTIFICIAL INTELLIGENCE **3:1:0**

Course Code:CS A/B/C/D 350

Course Outcomes

CO 1. At the end of the course students will be able to:

CO 1. Create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.

CO 2. Know concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems

CO 3. Review the different stages of development of the AI field from human like behavior to Rational Agents.

CO4. Impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.

CO5. The basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of other topics such as minimal, resolution, etc. that play an important role in AI programs.

CO6. Introduce advanced topics of AI such as planning, Bayes networks, natural language processing and Cognitive Computing.

UNIT 1

AI problems, AI techniques, defining the problem as state space search, production systems, problem characteristics

Heuristic Search: Generate and test, hill climbing, BFS, Problem Reduction, Constraint Satisfaction, Means-End Analysis

UNIT 2

Knowledge Representation: Representations and mappings, approaches to knowledge representation

procedural v/s declarative knowledge, normal forms in predicate logic and clausal forms, non-monotonic reasoning

Declarative Representations: semantic nets, conceptual dependency, frames, scripts

UNIT 3

Game playing: minimax search procedure, adding alpha-beta cut offs

Planning: An Example Domain – the blocks world, Components, goal stack planning

UNIT 4

Expert systems: expert systems v/s conventional computers, expert system shells, explanation based learning.

Learning: Learning from observation - Inductive learning – Decision trees – Explanation based learning – Reinforcement Learning, Neural Networks, Introduction to Natural Language Processing.

References:

1.Artificial Intelligence, Third Edition, Elaine Rich, Kevin Knight, Shivashankar B Nair, Tata McGraw-Hill.

2. Introduction to Artificial Intelligence, Wolfgang Ertl.

3. Artificial Intelligence,2nd edition, Stuart Russel, peter Norvig.

4. Artificial Intelligence, Jeorge F Luger

5. Artificial Intelligence, Saroj kaushik

.NET TECHNOLOGIES **2:0:2**

Course Code:CSB280

Course Outcomes

At the end of the course students will be able to:

CO1. Design web applications using .NET
CO2. Use .NET controls in web applications.
CO3. Debug and deploy .NET web applications
CO4. Create database driven .NET web applications and web services

Unit 1

Benefits of .NET Framework, Architecture of .NET Framework 4.0, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET.

Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and Unboxing, Variables and Constants. Expression and Operators: Operator Precedence, Using the :: (Scope Resolution) Operator and Using the ***is*** and ***as*** Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.

Unit 2

Arrays and Strings: One Dimensional and Multidimensional Arrays, Jagged Arrays

Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs. Strings: Constructing Strings, Operating on Strings, Arrays of Strings, The String Class

Unit 3

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism/Overloading, Runtime Polymorphism/

Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.
Delegates: Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/finally statement, Checked and Unchecked Statements.

Unit 4

Introduction, Windows Forms, Life Cycle, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event- Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, MonthCalendor Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control ; Building an Multiple Document Interface (MDI) Application. Introduction to ADO.NET

References:

1. Programming in C# 4.0, Tata McGraw Hill, Hebert Shildt
2. C# with .net 4.0 by Andrew Troelsen
3. Programming in C# , 3rd Edition, E Balaguruswamy
4. The Complete Reference C#, Herbert Schildt.
5. The Complete Reference ASP.NET, Robert Standefer III

OBJECT ORIENTED MODELING AND DESIGN WITH UML 2:1:1

Course Code:CSA/B/C/D 360

Course Outcomes

At the end of the course students will be able to:

CO1. Design & Programming course is a unique course that teaches students how to use object-oriented techniques to build software.
CO2. Gathering requirements & end with implementation.
CO3. Analyze and design classes, their relationships to each other in order to build a model of the problem domain.
CO4. Use common UML diagrams throughout this process, such as use-case, class, activity & other diagrams.
CO5. Create The diagrams through a free tool.
CO6. Capture and manage requirements.

Unit I

INTRODUCTION : Object-Oriented Analysis and Design - Iterative, Evolutionary, and Agile. - Case Studies : The NextGen POS System - INCEPTION : Inception is Not the Requirements Phase – Evolutionary Requirements - Use Cases – Other Requirements:NextGen Example

Unit II

ELABORATION ITERATION 1: Basics – Domain Models – System Sequence Diagrams – Operation Contracts – Requirements to Design-Iteratively – Logical Architecture of UML Package Diagrams

Unit III

On to Object Design – UML Interaction Diagrams – UML class Diagrams - GRASP : Designing Objects with Responsibilities – Object Design Example with GRASP:NextGen POS system – Designing for Visibility – Mapping Designs to Code

Unit IV

ELABORATION ITERATION 2: UML Tools and UML as Blueprint – Quick Analysis Update: NextGen POS – Iteration 2: More Patterns – GRASP: More Objects with Responsibilities – applying GoF Design Patterns

Reference:

1. "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005, Craig Larman,
2. Advanced Object Oriented Analysis and Design using UML , James J Odell.
3. Object Oriented Analysis and Design , Mike O-Docherty.
4. Object Oriented Modeling and Design with UML, 2nd edition, Michael R Blaha, James R Rumbauh.
5. Object Oriented Systems and Analysis and Design using UML, Simon Bennetth, Steve McRovv and Ray Farmer.

ANDROID APPLICATION DEVELOPMENT **2:0:2**

Course Code:CSA/B/C/D 370

Course Outcomes

At the end of the course students will be able to:

CO1. Describe and compare different mobile application models/architectures and patterns.
CO2. Apply mobile application models/architectures and patterns to the development of a mobile software application.
CO3. Describe the components and structure of a mobile development framework (Google's Android Studio).
CO4. Apply a mobile development framework to the development of a mobile application.
CO5. Demonstrate advanced Java programming competency by developing a maintainable and efficient cloud based mobile application

Unit 1

Introduction to Android & Open Handset Alliance

Installation of Android Studio and other Development Environments like Gradle.

Understanding Android File System.

Creating First Android Application

Understanding Intent, Activity, Service, Content Providers, Broadcast Receivers.

Understanding Android Application, Manifests, Layouts, Drawables, Styles, Android Activity, View

Understanding Android XML based layout (Linear Layout, Relative Layout, Frame Layout).

Introduction to Android Life Cycle Events

initialization and Button Click Listeners.

Unit 2

Development of Simple app containing Dialog Box, Intents,Toast, Spinners, Listeners examples.

Android Listview / GridView and Adapters

Android Date Picker Dialog, Time Picker Dialog

Launching sub Activity

Building Custom ListView and Understanding Adapters in detail

Understanding SQLite database. Populating database.

Developing simple app by using SQLite database (insert, delete, update)

Unit 3

Working with web server basics

Background loading, AsyncTask , Using Threads

Developing simple app by downloading image from web and showing it in ImageView

Understanding Importance of External Libraries and demonstration of simple external library

Image lazy loading, Image loading in list view, grid view

Unit 4

Working with Google Maps

ViewPager

Introduction to fragment, add, remove, replace fragment

ViewPager

Side Navigation Drawer

Action bar/ Toolbar

ViewPager Adapter / Swipe View

References:

1. Android Programming for Beginners by John Horton.

2. Professional Android 4 application development by Reto Meir.

3. Android Book by Lan F Darwin.

4. Learning Android Building application for The Android Market by Marko Gargenta.

5. Programming Android Java programming for the new generation of Mobile Devises by Zigurd Mellieks

ADVANCED DATABASE MANAGEMENT SYSTEM **2:1:1**

Course Code:CS A/B/C/D 380

Course Outcomes

At the end of the course students will be able to:

CO1. Evaluate and Apply Advanced Database Development Techniques.

CO2. Evaluate Database Systems.

CO3. Administer Database Systems.

CO4. Design & Implement Advanced Database Systems.

Unit 1

Disk storage, Basic file Structures and hashing, indexing structures for files.

Algorithms for query optimization.

Unit 2

Physical database design and tuning, Introduction to transaction, Concurrency control techniques.

Concept for object databases, Object databases standard and design, database security.

Unit 3

Enhanced datamodels for advanced applications, distributed databases and client server architectures, Emerging database technologies and applications.

Unit 4

Definition of NoSQL, History of NoSQL and Different NoSQL products, NoSQL Basics. Exploring one among MongoDB/CouchDB/Cassandra along with Java/Ruby/Python interface : Interfacing and Interacting with NoSQL, NoSQL Storage Architecture, CRUD operations, Querying, Modifying and Managing NoSQL Datastores, Indexing and ordering datasets

References:

1. Fundamentals of Database System :5th Edition ,Navathe

2. Database Management System, Panneerselvam R.
3. Database Management System, Raghu Ramakrishnan and Johannes Gehrke.
4. Data Schemes: Models and algorithms (Advances in Database Systems), Charu C Aggarwal.
5. Multilevel secure Transaction Processing (Advances in Database system), Vijay Atluri and Sushin Jajodia.

COMPILER DESIGN **3:0:1**

Course Code:CS A/B/C/D 390

Course Outcomes

At the end of the course students will be able to:

CO1. Construct a parse tree, or explain why no parse tree exists, given a BNF grammar and a string over the appropriate alphabet.

CO2. Implement a lexical analyzer from a specification of a language's lexical rules.

CO3. Compute the FIRST set for a BNF grammar.

CO4. Compute the FOLLOW set for a BNF grammar.

CO5. Determine FIRST intersect FIRST constraint satisfaction - determine if a BNF grammar satisfies the constraint on intersection of FIRST sets required for single-symbol-lookahead, top-down, lookahead parsing ()

CO6. Determine FIRST intersect FOLLOW constraint satisfaction - determine if a BNF grammar satisfies the constraint on intersection of FIRST and FOLLOW sets required for single-symbol-lookahead, top-down, lookahead parsing ()

Unit-1

Introduction, Classification of grammars. Context free grammars. Deterministic finite state automata (DFA) Non-DFA.

Lexical analysis :Language processors; The structure of a Compiler; The evolution Of programming languages; The science of building a Compiler; Applications of compiler technology; Programming language basics. Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

Unit-2

SyntaxAnalysis

Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing; Bottom-up Parsing.

Introduction to LR Parsing: Simple LR; More powerful LR parsers (excluding Efficient construction and compaction of parsing tables) ; Using ambiguous grammars; Parser Generators.

Unit-3

Intermediate Code Generation

Variants of syntax trees; Three-address code; Translation of expressions; Control flow; Back patching; Switch-statements; Procedure calls.

Run-Time Environments

Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection.

Unit-4

Code Generation

Issues in the design of Code Generator; The Target Language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator

Code optimization. Folding, redundant sub-expression evaluation. Optimization within iterative loops.

References:

1. Compilers Principles, Techniques and Tools, 2nd Edition, Addison-Wesley, 2007, Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman

2."The Theory and Practice of Compiler Writing". McGraw Hill, New York, 1985, Tremblay, et. al

3. Principles, Techniques and Tools of Compilers.- Allen I Holob.

4. Elements of Compiler Design.- Meduna

5. Compiler Design - K Muneeswaran.

OPEN ELECTIVES **2:0:2**

OP1: COMPUTER FUNDAMENTALS

Course Code: PHC/CHC/BCC/BTC/BOC/MAC/SWC/KAC/ENC/MCC/ZOC 640

Course Outcomes:

At the end of the course students will be able to:

CO1. Use technology ethically, safely, securely, and legally.
CO2. Identify and analyze computer hardware, software, and network components.
CO3. Design basic business web pages using current HTML/CSS coding standards.
CO4. Install, configure, and remove software and hardware.
CO5. Use systems development, word-processing, spreadsheet, and presentation software to solve basic information systems problems.

UNIT 1

INTRODUCTION

Computer, Characteristic of Computer, History of Computer, Components of Computer

Key Factors of Computers: Hardware, Software - types of Software (Application and system), forms of software (firmware, shareware, freeware), Translator - Assembler, Compiler and Interpreters. Computer Application – Business, Scientific, Entertainment and educational.

CLASSIFICATION OF COMPUTERS

Mode of operations – Analog, Digital and hybrid Computers

Size and capabilities – Micro, Mini, Main frame and Super computer

UNIT 2

MEMORY UNITS

Primary memory - RAM, ROM, PROM, EPROM, EEPROM, Flash memory

Secondary memory – Magnetic disk (Hard disk, Zip disk, Jaz disk, Super disk)

Optical disk (CD, CD – R, CD – RW, DVD), Magneto-optical disk device

COMPUTER PERIPHERALS DEVICES AND INTERFACES

Input devices – Working principle of Keyboard and mouse, Functional capabilities of Scanner, Digital Camera, OMR, OCR, touch pad, touch screen. Output Devices – Monitor, Printer, Plotter and projector.

Processors, Classification of Processors on speed, Motherboard, Power Supply, I/O Ports and its Maintenance

PROGRAMMING LANGUAGES

Machine, Assembly language and High Level Language

UNIT 3

Introduction to Windows, Elements of Word Processing, Spread Sheet, Presentations .

Nudi/Baraha.

UNIT 4: INTERNET

Basics of Internet: www, HTTP, DNS, IP address, Email, Web browsers, Search Engines

HTML: Introduction to HTML, CSS

E-Commerce: Introduction, Types, Advantages of e-commerce, Applications, survey on popular e-commerce sites

E-governance, Introduction to Cyber Ethics

References:

1. Computer Fundamentals (6th Edition) – Rajaraman.
2. Computer's Today – Suresh K Basandra.
3. Computer Fundamentals-P K Sinha
4. Computer System Architecture (3rd Edition) PHI-2002. Chapters 3.3 & 3.4- Morris Mano,
5. Digital Principles and application (4th Edition) – Malvino Leach, Tata Mc Graw-Hill Edition
6. Computer System Architecture (3rd Edition) – Morris Mano, PHI
7. Microsoft office 365-Katherine Murray.
8. Microsoft office 2016- Nita Rutkosky, Denise Seguin, Audrey Rutkosky Roggenkamp
9. The Complete reference HTML by Herbert Schildt
10. Learn to program HTML and CSS for beginners
11. HTML black book –Steven Holzner.

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA

ESTD-1964

SYLLABUS

2017-2020

M.VOC. FOOD PROCESSING & ENGINEERING

Plant Manager

Scheme of Instruction For M. Voc. (Food Processing & Engineering)								
General Education Component								
(L-Lecture; T-Tutorial; P-Practical/Practice) (1 Credit = 15 Hrs)								
Semesters	**Paper No.**	**Title**	**L:T:P**	**Theory Hours**	**Tutorial Hours**	**Practical Hours**	**Total Hours**	**Total Credits**
Sem I	MFA 510	Food Chemistry	2:0:1	30	0	15	45	3
	MFA 520	Food and Nutrition	2:0:1	30	0	15	45	3
								06
SemII	MFB 510	Food Microbiology	2:0:1	30	0	15	45	3
	MFB 520	Biostatistics	2:0:1	30	0	15	45	3
								06
SemIII	MFC 510	Information Communication Technology	2:0:1	30	0	15	45	3
	MFC 520	EDP	2:0:1	30	0	15	45	3
								06
SemIV	MFD 510	Food Marketing	2:0:1	30	0	15	45	3
	MFD 520	Food Standards, Regulatory Affairs and IPR Issues	2:0:1	30	0	15	45	3
								06

General Component MFA 510 Semester - I

Sl. No.	Food Chemistry	Hrs
1.	Introduction to food chemistry, its role in processing and food formulations,	1
2.	Moisture in foods: Role and type of water in foods, Functional properties of water, role of water in food spoilage, Water activity and sorption isotherm, Molecular mobility and food stability.	2
3.	Dispersed systems of foods: Physicochemical aspects of food dispersion system: a) Sol b) gel c) foam d) emulsions.	1
4.	Carbohydrates: Functional characteristics of different carbohydrates. Maillard reaction, caramelization, methods to control non enzymatic reactions. Starch and Dietary fibres, Functional properties of polysaccharides, natural vegetable gums, carbohydrate composition of various natural foods.	5
5.	Proteins in foods: Protein content and composition in various foods- cereal grains, legumes and oilseed proteins, proteins of meat, milk, egg and fish. Functional properties of proteins in foods – water and oil binding, foaming, gelation, emulsification. Effect of processing on functional properties of proteins-heat processing alkali treatments, chilling, freezing, dehydration and radiations. Unconventional sources of proteins- SCP fish protein concentrates, leaf proteins	5
6.	Lipids in foods: Role and use of lipids /fat, occurrence, fat group classification, Physicochemical aspects of fatty acids in natural foods, hydrolysis, reversion,. Chemical aspects of lipolysis, autooxidation, antioxidants, Technology of fat and oil processing: Refining, Hydrogenations, Inter etherification, Safety use of oils and fats in food formulation.	5
7.	Vitamins and minerals, Dietary sources, requirements, Allowances, Enrichment, Restorations, Fortifications, Losses of vitamins and minerals, Optimization and retention of vitamins and minerals	2
8.	Enzymes in food industry, Carbohydrases (Amylases, cellulases, pectinases,) Proteases, Lipases and oxidases in food processing.	2
8.	Chemistry of food flavour: definitions of flavour, Flavourmatics / flavouring compounds, Sensory assessment of flavour, Technology for flavour retention.	2

9.	Food additives: Buffer systems/ salts / Acids, Chelating agents and sequestrants, Antioxidants, Antimicrobial agents, Non-nutritive and low calorie sweetners, Stabilizer and thickeners,	2
10.	Food colours, natural and synthetic, Regulatory aspects –Natural and synthetic permitted food colours.	1
11.	Food toxicants – anti nutritional factors and their occurrence, effects and methods of elimination or inactivation- protease inhibitors, lectins, lathyrogens, phytates and flatulence factors.	2
12.	Food Contaminants, Pesticidal residues – permitted limits. Toxicology and public health.	2

Sl. No.	**Practical**	**Hrs**
1.	Determination of moisture content of foods using different methods	1
2.	Determination of crude proteins by microkjeldahl method	2
3.	Determination of crude fat by soxlet method	2
4.	Determination of acid value, saponification value and iodine number of fat/ oil	2
5.	Determination of minerals and acid insoluble ash and estimation of Calcium and phosperus	3
6.	Assay of amylases, papain and lipases	2
7.	Detection of common food adulterants	2
8.	Determination of food colors	1

MODEL QUESTION PAPER

CODE NO: **Semester - I**

Food Chemistry

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

I. Write short notes for the following(any 5): **(5x2=10)**

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------
6. ----------

PART-B

II. Answer any 4 of the following: **(4x5=20)**

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------

PART –C

III.Answer any 4 of the following: **(4x10=40) IV.**

1. ----------
2. ----------
3. ----------
4. ----------
5. ----------

I SEMESTER PRACTICAL EXAMINATION

INFORMATION AND COMMUNICATION TECHNOLOGY

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Determination of moisture content of foods using different methods
2. Determination of crude proteins by microkjeldahl method
3. Determination of crude fat by soxlet method
4. Determination of acid value, saponification value and iodine number of fat/ oil
5. Determination of minerals and acid insoluble ash and estimation of Calcium and phosperus
6. Assay of amylases, papain and lipases
7. Detection of common food adulterants
8. Determination of food colors

Plant Manager

General Component Semester - I

MFA 520

Sl. no.	Food and Nutrition	Hrs
1.	Introduction to Food: Definition, classification and constituents of food : Carbohydrates, Fats , Proteins ,Fat soluble vitamins-A, D, E and K , Water soluble vitamins – Thiamin, Riboflavin, Niacin, Pyridoxine, Folate, Vitamin B12 and Vitamin C, Minerals – Calcium, Iron, Zinc, Iodine and Flourine.	3
2.	Food Design: Nutritive values of cereals, pulses, oil seeds, fruits, vegetables, fish, meat and eggs.	2
3.	Functions of food, Effect of deficiency & overconsumption of dietary sources on health, Basic Food Groups, Recommended dietary Allowance (RDA), Food guide pyramid, Dietary fibers, Functions of water in body. Balanced Diet: Concept of Balanced Diet: Definition, food groups used in planning balanced diets.	5
4.	Traditional and contemporary methods of food processing and quality evaluation of food products	3
5.	Nutrition: Basic terms used in Nutrition, relationship between food, health and nutrition, Bioavailability of nutrients. Basal Metabolic Rate (BMR). Protein quality, Dietary allowances and standards for different age groups: Adult man/woman, Preschool children, Adolescent children, pregnant woman. Geriatric nutrition, Nutrition for athletes	10
6.	Digestion and absorption of carbohydrates, proteins and fats. Factors influencing the sensory acceptability and digestion of foods	1
7.	Food Design: Nutritive values of cereals, pulses, oil seeds, fruits, vegetables, fish, meat and eggs. Nutrient composition of foods and Energy calculations	4
8	Antinutritional factors: Sources and harmful effects of anti vitamins (e.g.: avidin, dicoumarol), Natural toxicants, (e.g.: Lathyrus sativa).Food adultrants- structure and harmfull effects of - Butter yellow, lead chromate and malachite green.	2

Sl. no.	Practical	Hrs

1.	Sensory acceptability of food products: Physical Attributes (Appearance, color, texture, taste and overall acceptansibility). Texture measurement of food products by instrumental methods. Preparation of food labelling. Formulation for foods for target groups (weaning, pre-school children, geriatric, therapeutic foods etc.). Processing of spices for traditional products. Storage and shelf determination.	15

MODEL QUESTION PAPER

CODE NO: **Semester - I**

Food and Nutrition

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

V. Write short notes for the following(any 5): **(5x2=10)**

7. ----------
8. ----------
9. ----------
10. ----------
11. ----------
12. ----------

PART-B

VI.Answer any 4 of the following: **(4x5=20)**

6. ----------
7. ----------
8. ----------
9. ----------
10. ----------

PART –C

VII.Answer any 4 of the following: **(4x10=40)**

VIII.

6. ----------
7. ----------
8. ----------
9. ----------
10. ----------

I SEMESTER PRACTICAL EXAMINATION

Food and Nutrition

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Sensory acceptability of food products: Physical Attributes (Appearance, color, texture, taste and overall acceptansibility).
2. Texture measurement of food products by instrumental methods.
3. Preparation of food labelling.
4. Formulation for foods for target groups (weaning, pre-school children, geriatric, therapeutic foods etc.).
5. Processing of spices for traditional products.
6. Storage and shelf determination.

General Component MFB 510Semester - II

Sl. no.	Food Microbiology	Hrs
1.	Microbiology: Introduction, historical developments in food microbiology; prokaryotes and eukaryotes; Microscope; classification & morphology of microbes; Techniques of pure culture; Bacteriology of air & water; classification of microorganisms-a brief account; sources of microorganisms in foods; microbial growth, growth curve; Thermal inactivation of microbes; Concept, determination & importance of TDT, F, Z & D values; Factors affecting heat resistance; Pasteurization and sterilization. factors affecting growth-intrinsic and extrinsic factors controlling growth of microorganisms. Microbiology of various food stuffs.-Cereals, legumes, oilseeds, fruits & vegetables, Milk and their processed products	8
2.	Disinfection & disinfectants; Energy metabolism of aerobic & anaerobic microbes	4
3.	Effect of food preservatives, heating process, irradiation, low temperature storage, chemical preservatives and high-pressure processing on the microbiology of foods; control of water activity and microbial growth	
4.	Foods microbiology and public health: food poisoning, types of food poisonings, important featuresetc; bacterial agents of food borne illness, food poisoning by *Clostridium, Salmonella, E. coli, Bacillus, Staphylococcus* etc.; non-bacterial agents of food borne illness: poisonous algae, and fungi-a brief account**.**	5
5.	Food spoilage and microbes of milk, fruits, vegetables and various plant products, spoilage of canned foods; methods of isolation and detection of microorganisms or their products in food; conventional methods; rapid methods,retention of microbes, (newer techniques)-immunological methods; fluorescent, anti body, radioimmunoassay, principles of ELISA, PCR (Polymerase chain reactions**)**	8
6.	Indicators microorganisms; microbiological criteria of foods and their significance; the HACCP system and food safety used in controlling microbiological hazards, applications of hurdle	4
	technology for controlling microbial growth.	

7.	Microbiology of Fermented foods:, Cereals, Vinegar, Oriental foods, Alcoholic beverages. Food poisoning and microbial toxins, standards for different foods. Food borne intoxicants and myco toxins	4
8.	Microbiology of milk & milk products like cheese, butter, ice cream, and milk powder etc	4
9.	Microbiology of fruits & vegetable and products like jam, jelly, sauce, juice; etc	4
10.	Microbiology of cereal & cereal products like bread, biscuits, confectionary etc	4

Sl. no.	**Practical**	**Hrs**
1.	Equipments used in microbiology laboratory, study of microscope, observation of microbial slides, preparation and sterilization of media, methods of sterilization, staining techniques, effects of environmental factors on growth of microorganisms, **Assignment**-microbiological analysis of market samples- milk & milk products, fresh & processed fruits and vegetables, Cereal & bakery products	45

MODEL QUESTION PAPER

CODE NO: **Semester - II**

Food Microbiology

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

IX.Write short notes for the following(any 5): **(5x2=10)**

13. ----------
14. ----------
15. ----------
16. ----------
17. ----------
18. ----------

PART-B

X. Answer any 4 of the following: **(4x5=20)**

11. ----------
12. ----------
13. ----------
14. ----------
15. ----------

PART –C

XI.Answer any 4 of the following: **(4x10=40) XII.**

11. ----------
12. ----------
13. ----------
14. ----------
15. ----------

II SEMESTER PRACTICAL EXAMINATION

Food Microbiology

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Equipments used in microbiology laboratory, study of microscope, observation of microbial slides, preparation and sterilization of media, methods of sterilization, staining techniques, effects of environmental factors on growth of microorganisms,
2. Assignment-microbiological analysis of market samples- milk & milk products, fresh & processed fruits and vegetables, Cereal & bakery products

General Component Semester - IIMFB 520

Sl. no.	Biostatistics	Hrs
1.	Statistical concepts: Data structure, sampling methods, collection, classification and tabulation of data, graphical and diagrammatic representation, histogram, frequency polygon, frequency curve, bar graph, pie chart etc.	4
2.	Measure of Central Frequency: Mean, median, mode.	2
3.	Measure of dispersion of data: Range, semi-interquartile range, mean deviation, standard deviation, standard error, coefficient of variation, confidence limits.	5
4.	Types of distribution of data: Normal, Binomial, Poisson.	7
5.	Z-test, t-test, ANOVA, multiple comparisons, LSD and DMRT, Chi-square test.	4

6.	Regression estimate, correlation coefficient.	4
7.	Experimental designs, data transformation.	4

Sl. no.	**Practical**	**Hrs**
1.	Analytical Problems / calculations	15

MODEL QUESTION PAPER

CODE NO: Semester - II

Biostatistcs

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XIII.Write short notes for the following(any 5): **(5x2=10)**

19. ----------
20. ----------
21. ----------
22. ----------
23. ----------
24. ----------

PART-B

XIV.Answer any 4 of the following: **(4x5=20)**

16. ----------
17. ----------
18. ----------
19. ----------
20. ----------

PART –C

XV.Answer any 4 of the following: **(4x10=40)**

XVI.

16. ----------
17. ----------
18. ----------
19. ----------
20. ----------

II SEMESTER PRACTICAL EXAMINATION

Biostatistics

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1.Analytical Problems / calculations

General Component Semester – IIIMFC 510

Sl. no.	Information Communication Technology	Hrs
1	The humanitarian supply chain – Definition, system of organizations, people, technology, activities, information and resources involved in moving a product or service from supplier to customer	5
2	Technology framework – Front-end services, Middleware services and Infrastructure services: Supporting the food assistance supply chain; Mapping technologies; Web portals	5
3	Mobile technologies - Combining hand-held and wireless communications technologies	5
4	Beneficiary identification - Challenges in food assistance to ensure that assistance goes to the right beneficiaries	5
5	ICT in emergencies – Requirement inputs of Food assistance interventions during emergencies	5
6	Linking the humanitarian supply chain - Ways in which WFP uses technology and technological techniques to fulfill its role as the provider of food assistance in development and emergencies	5

Sl. no.	Practical	Hrs
1.	Identification of software related to Food Processing and Engineering	3
2.	Practicing the use of software	6
3.	Requirement development for Food Processing Software	6

MODEL QUESTION PAPER

CODE NO: Semester – III

Information Communication Technology

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XVII.Write short notes for the following(any 5): **(5x2=10)**

25. ----------
26. ----------
27. ----------
28. ----------
29. ----------
30. ----------

PART-B

XVIII.Answer any 4 of the following: **(4x5=20)**

21. ----------
22. ----------
23. ----------
24. ----------
25. ----------

PART –C

XIX.Answer any 4 of the following: **(4x10=40)**

XX.

21. ----------
22. ----------
23. ----------
24. ----------
25. ----------

II SEMESTER PRACTICAL EXAMINATION

Information Communication Technology

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

I. Identification of software related to Food Processing and Engineering.
II. Practicing the use of software.
III. Requirement development for Food Processing Software

General Component Semester - III MFC 520

Sl. no.	EDP	Hrs
1	Need for EDP, Entrepreneurship and enterprise – Concept, definition and characteristics with special reference to Food and allied areas of the Indian scenario.	2
2	Entrepreneurial development – objectives, evaluation and the existing experience, soft skill for entrepreneurship	2
3	Functions and classification of Entrepreneur and supporting institution and schemes by the National and International agencies Factors influencing entrepreneurship groups	3
4	Gender equality in Entrepreneurship, Women Entrepreneurship, selection of enterprising men and women. The short comings for women entrepreneurship and remedial majors	3
5	Identifying products, services and enterprise establishmentSWAT Analysis	1
6	Institution working for promotion of entrepreneurship in the country such as NSIC, NIMSME, NIESBUD, KVIC/KVIB etc. And also National Financial Institutions such as banks, corporations and Agro industry projects	5
7	Identification of potential areas of food processing and regions for SMES, appraisal implementation, monitoring and evaluation, Globalization and the emerging business / entrepreneurial environment, business plan format for tiny and small enterprises, planning small scale units	5
8	Training the identified entrepreneurs, Investment analysis, Risk analysis and probable approach for successful entrepreneurship, cost benefit analysis, assessing financial viability of the project, market survey tools and market management	3
9	Network establishment for food chain, corporate and social responsibility	2
10	Communication skills, listing and noting down, project preparation and presentation skills, field dairy maintenance, upgradation of skills and knowledge on the contemporary food processing technology, public private partners	4

Sl. no.	Practical	Hrs
1	Different methods to identify potential entrepreneurs – men and women from both rural and urban areas	2
2	Selection of enterprise best suited for men and women, identification of business opportunities and financial processing sector	1
3	Selection and identification of enterprise based on local/regional – financial support, resources	3
4	Training on communication skills for development of enterprise by the entrepreneur	2
5	Market survey and identification of potential food processing entrepreneurships	3
6	Preparation of project reports, business plan and feasibility report	2
7	Presentation of the project proposed and documentation	2
1	Visit to Industries / Research Institutions	4
2	Project	8
3	Internship	12

MODEL QUESTION PAPER

CODE NO: Semester – III

EDP

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XXI.Write short notes for the following(any 5): **(5x2=10)**

31. ----------
32. ----------
33. ----------
34. ----------
35. ----------
36. ----------

PART-B

XXII.Answer any 4 of the following: **(4x5=20)**

26. ----------
27. ----------
28. ----------
29. ----------
30.----------

PART –C

XXIII.Answer any 4 of the following: **(4x10=40)**

XXIV.

26. ----------
27. ----------
28. ----------
29. ----------
30. ----------

III SEMESTER PRACTICAL EXAMINATION

EDP

PRACTICAL

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

I. Different methods to identify potential entrepreneurs – men and women from both rural and urban areas
II. Selection of enterprise best suited for men and women, identification of business opportunities and financial processing sector
III. Selection and identification of enterprise based on local/regional – financial support, resources
IV. Training on communication skills for development of enterprise by the entrepreneur
V. Market survey and identification of potential food processing entrepreneurships
VI. Preparation of project reports, business plan and feasibility report
VII. Presentation of the project proposed and documentation
VIII. Visit to Industries / Research Institutions
IX. Project
X. Internship

General Component Semester – IV MFD 510

Sl. No.	Food Marketing	Hrs
1.	Food Marketing: Definition, meaning, characteristics of rural and urban marketing	3
2.	Opportunities and challenges marketing food products by small scale entrepreneurs	2
3.	Rural marketing segmentation, rural consumer behavior, changing trends in rural consumer selection and decision, marketing process and influential factors, marketing needs for export products.	5
4.	Urban marketing segmentation, urban consumer behavior, changing trends in urban consumer selection and decision, marketing process and influential factors	5
5.	Product design, innovativeness presentation, services, prices, method of pricing, network for sourcing raw materials and distribution of products in both rural and urban area.	4
6.	Designing advertisement, campaign, sales promotion, choice of media, techniques, personal selling and publicity	4
7.	Online Marketing: Target population, product packing, distribution through courier and other mode of transportation.	3
8.	Food packaging, labelling for consumer acceptability	2
9.	Relevant of marketing information system, market research in accessing consumer behavior	2

Sl. No.	Practical	Hrs
1.	Regulatory aspects and food hygiene and safety for packing and marketing of food products. Costing of food products.	15
	Visit to marketing federation, cooperatives APMCs and other marketing organization and institution for familiarization of marketing strategy, handling and transportation of fresh package products, perishable goods and self stable and transport table. Financial management, securing financial support, advancing the products for marketing, bulk and retail sales, recalling the products recovery of advances.	

MODEL QUESTION PAPER

CODE NO: Semester – IV

Food Marketing

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XXV.Write short notes for the following(any 5): **(5x2=10)**

37. ----------
38. ----------
39. ----------
40. ----------
41. ----------
42. ----------

PART-B

XXVI.Answer any 4 of the following: **(4x5=20)**

31. ----------
32. ----------
33. ----------
34. ----------
35. ----------

PART –C

XXVII. Answer any 4 of the following: **(4x10=40)**

31. ----------
32. ----------
33. ----------
34. ----------
35. ----------

IV SEMESTER PRACTICAL EXAMINATION

PRACTICAL

Food Marketing

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1.Regulatory aspects and food hygiene and safety for packing and marketing of food products. Costing of food products

2.Visit to marketing federation, cooperatives APMCs and other marketing organization and institution for familiarization ofmarketing strategy, handling and transportation of fresh package products, perishable goods and self stable and transport table.

3.Financial management, securing financial support, advancing the products for marketing, bulk and retail sales, recalling the products recovery of advances.

Plant Manager

General Component Semester – IV MFD 520

Sl. No.	Food Standards, Regulatory Affairs and IPR Issues	Hrs
1.	Introduction to concepts of food quality, food safety, food quality assurance and food quality management; objectives, importance and functions of quality control, Current challenges to food safety	3
2.	Principles of food quality assurance, total quality management (TQM) –good manufacturing/management practices, good hygienic practices, good lab practices, general awareness and role of management practices in quality control	3
3.	Microbial quality control: determination of microorganisms in foods by cultural, microscopic, physical, chemical methods. Statistical quality control in food industry Food adulteration, nature of adulterants, methods of evaluation of food adulterants and toxic constituents	3
4.	Food safety management, applications of HACCP in food safety, concept of food trace ability for food safety, Food safety and Standards Act 2006: salient provision and prospects	3
5.	Role of national and international regulatory agencies, Bureau of Indian Standards (BIS), AGMARK, Food Safety and Standards Authority of India (FSSAI)	3
6.	Introduction to WTO agreements: SPS and TBT agreements, Codex Alimentarious Commission ,, International organization for standards (ISO) and its standards for food quality and safety (ISO 9000 series, ISO 22000, ISO 15161,ISO 14000)	5
7.	Food safety in USA, USFDA, Legislation in Europe: Directives of the official journal of the EU, council regulations, food legislation in UK. Regulating methods for food analysis, case studies. Enforcers of Food Laws Approval Process for Food Additives ,Nutritional Labeling	5
8.	Concept of property, rights, duties and their correlation; History and evaluation of IPR; Copyrights and related rights. Distinction among Various forms of IPR. Patent rights/protection and procedure; Infringement or violation; Remedies against infringement; Indian Patent Act 1970 and TRIPS; Geographical indication and Industrial design	5
Sl. No.	**Practical**	**Hrs**
1.	Study of food regulations in various countries ; study of nutritional labeling of packaged food items by visiting food market, Visit the websites of FSSAI, BIS, AGMARK, ISO, Codex Alimentarius Commission , USFDA Study of patent law in India and the procedure for grant of patent in India	15

MODEL QUESTION PAPER

CODE NO: Semester – IV

Food Standards, Regulatory Affairs and IPR Issues

TIME: 3 hrs **Max marks: 70**

Instructions: Draw neat and labeled diagram wherever necessary.

PART-A

XXVIII. Write short notes for the following(any 5): (5x2=10)

43. ----------
44. ----------
45. ----------
46. ----------
47. ----------
48. ----------

PART-B

XXIX.Answer any 4 of the following: (4x5=20)

36. ----------
37. ----------
38. ----------
39. ----------
40. ----------

PART –C

XXX.Answer any 4 of the following: (4x10=40)

36. ----------
37. ----------
38. ----------
39. ----------
40. ----------

IV SEMESTER PRACTICAL EXAMINATION

PRACTICAL

Food Standards, Regulatory Affairs and IPR Issues

SCHEME OF EXAMINATION

DURATION: 3 Hours

Maximum Marks: 70

Practical proper: 60

Record marks: 10

NOTE :- Candidates are required to submit the records duly signed by the teacher-in charge and certified by the Head of the Department

1. Study of food regulations in various countries ;

2.study of nutritional labeling of packaged food items by visiting food market, Visit the websites of FSSAI, BIS, AGMARK, ISO, Codex Alimentarius Commission , USFDA

3.Study of patent law in India and the procedure for grant of patent in India

Plant Manager

M.Voc (Food Processing and Engineering) Syllabus		
1st -M.Voc **NSQF Level: 8 – Semester I & II** **Sub Sector: Fruits & Vegetables** **Job Role: Head of Production**		
UNIT I		
Post Harvest Management of Fruits		
S.No	**THEORY**	**Hrs**
1.	General Introduction of fruits-citrus, tropical and subtropical, pome, stone, soft, and berry fruits, melons and watermelons	1
2.	Importance and scope of post harvest management of fruits, Morphology, structure and composition of fruits	2
3.	Maturity Indices and standards for standards for selected fruits, methods of maturity determination	2
4.	Post-harvest physiological and biochemical changes in fruits; ripening of climacteric and non-climacteric fruits	2
5.	Harvesting and handling of important fruits. Harvesting tools; field heat removal/precooling of fruits. Sorting and grading at farm and cluster level; factors affecting post harvest losses	2
6.	Nature of post harvest deterioration; physiological change- physical damage; chemical injury-pathological decay; identification of diseases and disorders in fruit-nutritional disorders, respiratory disorders, temperature disorders and miscellaneous disorders. Classification of diseases and diseases organisms, types of diseases and agents of diseases in fruits.	4
7.	Pre-cooling of fruits and cold storage, zero energy cool chamber	3
8.	Shelf life enhancement- permitted chemicals for ripening, wax coating	3
9.	Storage practices: Refrigerated storage, modified atmospheric storage-novel MAP gases and their role, novel MAP applications, Applying high oxygen MAP; MAP of minimally processed fruits; controlled atmosphere storage/ultra low oxygen storage of fruits, recent advances in CAP and MAP	9
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Familiarization of various fruits available in India and categorization of fruits used for pulping	3
2.	Studies on morphological features of some of the fruits	3
3.	Studies on maturity indices; Studies on harvesting of fruits	3
4.	Studies on permitted chemicals for ripening and enhancing the shelf life of fruits	3
5.	Studies on regulations of ripening of banana and mango	3
6.	Studies on physiological disorders like chilling injury of certain fruits	3
7.	Studies on pre cooling and storage of fruits and vegetables	3
8.	Demonstration on wax coating on apples, citrus and Mango	3
9.	Studies on various storage systems and structures;	3
10.	Studies on pre packaging of whole and cut vegetables	3
11.	MAP of minimally processed fruits & vegetables	3
12.	Visit to commercial packaging houses for mango, banana, pomegranate, grapes	3
13.	Visit to Controlled Atmospheric packaging centres	4
14.	Visit to commercial storage structures for onion and potato	4
15.	Visit to multi chamber cold storages for fruits and vegetables	4
16.	Visit to Fruit Orchards -Observations on Pruning, orchard Hygiene, Irrigation, Manuring, Insect Pests, Pathological Spoilages, Pre-harvest spray schedules to	4

	control pathological spoilages and insect infestation	
17.	Visit to Fruit Orchards - Studies on Causes for pre and post harvest losses. Spoilage factors, post harvest field operations including methods to reduce the post harvest losses	4
	TOTAL	**56**
UNIT II		
Technology for processing of Fruit Pulp		
S.No	**THEORY**	**Hrs**
1.	Process of receiving, ripening, checking raw material quality, sorting, washing, cutting/slicing, deseeding/destining, pulping, precooking/pasteurization, sterilizing, aseptic packaging or canning, retort pouching, sampling for quality analysis and storing	2
2.	Machineries and tools used for the fruit pulping process such as fruit washer, peeler, slicer, fruit pulper, steam jacketed kettles, packaging machines etc	2
3.	Quality assessment of packaging materials	2
4.	Enzymes in quality and processing of tropical and sub tropical fruits	3
5.	Non thermal processing methods-ultra violet light, high pressure processing, ultrasound, ozone application, irradiation, pulsed electric field	7
6.	Introduction, canning machineries, various steps involved in canning of fruit pulp, syrup preparation, pretreatment for canning operation	7
7.	Canning of various fruits, process flow diagram for canning, filling, exhausting, sealing and processing operations	5
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Canning of mango pulp	5
2.	Canning of tomato pulp	5
3.	Preservation of tomato pulp by chemical preservation method	5
4.	Preservation of banana pulp by freezing method	5
5.	Canning of mango slices in syrup	5
6.	Canning of pineapple slices in syrup	5
7.	Canning of banana slices in syrup	5
8.	Visit to fruit processing units and collection of data on wastes and by products	5
9.	Visit to Aseptic packing units for fruit pulps & concentrates	8
10.	Visit to the pilot plants of CFTRI & DFRL Mysore	8
	TOTAL	**56**
UNIT III		
Food Quality and Food Microbiology		
S.No	**THEORY**	**Hrs**
1.	Introduction – definition, historical development and significance of food microbiology; Microscope; Classification & morphology of microbes; Techniques of pure culture; Bacteriology of air & water; Anti-microbial agents – physical & chemical – mechanism & action	3
2.	Sources of Contamination: Air, Water, Soil, Sewage, Post processing Contamination. Intrinsic &extrinsic factors influencing the growth of Microorganisms in foods	3
3.	Disinfection & disinfectants; Energy metabolism of aerobic & anaerobic microbes; Thermal inactivation of microbes; Concept, determination & importance of TDT, F, Z & D values; Factors affecting heat resistance; Pasteurization and sterilization	4
4.	Microbiology of Fruits and vegetables and their products like jam, jelly, sauce, juice/pulp	3
5.	Food Quality aspects of Fruits & vegetables; Introduction, Quality principles, Quality enhancement model. Application of quality enhancement model	3
6.	Food Waste Treatment : Liquid waste, Solid waste vessel containers & wrapping	3

	waste, Hazardous waste .Quality and Safety of Frozen Foods: Fruits, Vegetable	
7.	Measuring and Controlling Devices: Role of transducers measurements in food processing; Humidity, Turbidity and Color, Food & Process temperature controller and indicators. Statistical Quality Control for food Industry : Food Quality System, Fundamentals, Process control implementing quality control program, six sigma, RSM	4
8.	Food additives – preservatives, antioxidants, sequestrates, surface active agents, stabilizers and thickeners, bleaching and maturing agents, starch modifies, buffers, acids, alkalis, food colors, artificial sweeteners, nutritional additives, flavoring agents.	5
	TOTAL	**28**
	PRACTICALS	3
1.	Determination of firmness of fruits	3
2.	Determination of moisture content	3
3.	Titratable acidity estimation	3
4.	Estimation of SO2 in food sample	3
5.	Estimation of sodium benzoate in food sample	3
6.	Estimation of polyphenol and polyphenol oxidase	3
7.	Estimation of Reducing sugar, Non-reducing and total sugars	3
8.	Determination of organic acid content	3
9.	Ascorbic acid estimation	3
10.	Determination of pH in food products	3
11.	Determination of total Ash	3
12.	Determination of total soluble solids	3
13.	Estimation of ash content	3
14.	Estimation of crude fibre	3
15.	Estimation of pectin	3
16.	Flow process chart of food plant Waste utilization processes, various treatment for waste disposal analysis of cleaners & sanitizers, CIP Cleaning	11
	TOTAL	**56**
UNIT IV		
Food Safety, Hygiene and Sanitation for Processing of Fruit Pulp		
S.No	**THEORY**	**Hrs**
1.	Food safety, hygiene and sanitation for processing of fruit pulp: food safety standards and regulations for fruit pulp, definition of hygiene, hygiene practices and its importance at every stage of fruit pulp processing at industrial level; personal hygiene requirements; physical, chemical and biological hazards and methods for prevention of various hazards; CIP and COP methods and procedures, GHP, GMP and HACCP; waste management-pre and post production.	14
2.	Microbiological aspect of Food; types of food microbes, causes of food spoilage, types of food spoilage/deterioration, criteria to check the food spoilage, need for food preservation, different types of food preservation methods, method of assessing the quality of products based on physical parameters	14
	TOTAL	**28**
S.No	**PRACTICALS**	**Hrs**
1.	Clean and maintenance of work area using appropriate sanitizers, ensure the work area safe and hygienic for fruit processing, disposal of waste material as per SOPs and industrial requirement	8
2.	Check the working and performance of machineries and tools for fruit pulp process, clean the machineries and tools used with recommended sanitizer, to place the necessary tools required for the process, to attend minor repair, faults of all machineries if required.	8
3.	Dissembling and assembling of machineries used in fruit pulp industry (Fruit mill, crusher etc)	8
4.	Demonstration of CIP and COP methods of cleaning the machines with approved	8

	sanitizers	
5.	Visit to industry to learn about GHP, GMP, HACCP	12
6.	Visit to industry to learn about waste management pre and post production	12
	TOTAL	**56**
S.No	**UNIT V**	**Hrs**
Plant Design, Plant Economics and Plant Management		
1.	Food Industry management- location of plant land and building requirements, plant capacity, plant and machinery requirement, building and plant layout, utilities, byproducts, waste, energy and safety audit, manpower requirements	5
2.	Introduction to economics: Meaning, scope, and contribution to business decisions. Analysis of Demand: Law of demand, Utility function, Rate of commodity substitution, Maximization of utility, Demand functions, Indifference curve analysis, Substitution and income effects. Market demand and demand elasticities: concept of market demand, price and income elasticities of demand, importance of elasticity. Demand forecasting: causes and techniques of demand forecasting	6
3.	Analysis of supply and market equilibrium: Law of supply, price elasticity of supply, equilibrium of demand and supply. Theory of the Farm: Production function, returns to scale, Optimizing behavior, Input demands, Cost functions, Profit maximization, economics & diseconomies of scale, break even analysis. Market structures perfect competition: Profit maximization and equilibrium of firm and industry, Short run and long run supply curves; Price and output determination, practical applications	6
4.	Plant maintenance program; Role of maintenance staff and plant operators, Preventive maintenance; Guidelines for good maintenance & safety precautions; Lubrication & lubricants; Work place improvement through '5S'. Hygiene and sanitation requirement in food processing and fermentation industries; CIP methods, sanitizing & disinfestation, pest control in food processing; storage and service areas	6
5.	Supply chain management for fruits	5
	TOTAL	**28**
PRACTICALS		
1.	Visit to industry to learn the management system	16
2.	Visit to Fruit & Vegetable Processing Industries. Preparation of a Business Plan for setting up fruit & vegetable processing unit	40
	TOTAL	**56**

VI	**Hands on Training in Fruit Pulp Processing Industry and submission of report**	120
	TOTAL	**540**

Model Curriculum

Plant Manager

SECTOR: FOOD PROCESSING

SUB-SECTOR: FRUIT & VEGETABLE, FOOD GRAIN MILLING (INCLUDING OILSEEDS), DAIRY PRODUCTS, MEAT & POULTRY, FISH & SEAFOOD, BREAD & BAKERY, ALCOHOLIC BEVERAGES, AERATED WATER/ SOFT DRINKS, SOYA FOOD, PACKAGED FOOD

OCCUPATION: PROCESSING REF ID: FIC/Q9004, V1.0

NSQF LEVEL: 9


Skill India
FICSI
N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape
Certificate
CURRICULUM COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL
STANDARDS
is hereby issued by the
FOOD INDUSTRY CAPACITY AND SKILL INITIATIVE (FICSI)
for the
MODEL CURRICULUM
Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Plant Manager'
QP No. 'FIC/Q9004, Version 1.0, NSQF Level 9'
Date of Issuance: March 30, 2018
Valid up to: March 30, 2019
* Valid up to the next review date of the Qualification Pack
Authorised Signatory
(Food Industry Capacity and Skill Initiative)

TABLE OF CONTENTS

Plant Manager

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Plant Manager", in the "Food Processing" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Plant Manager**		
Qualification Pack Name & Reference ID. ID	FIC/Q9004, v1.0		
Version No.	1.0	**Version Update Date**	30/03/2016
Pre-requisites to Training	Preferably Class 12 and 6-7 years' experience in a food processing unit		
Training Outcomes	**After completing this programme, participants will be able to:** Daily management of food processing unit Coordination of food processing unit operations including production planning, managing human resources, supply chain, production operation, maintenance, quality assurance, storage and distribution of finished products.		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "Plant Manager" Qualification Pack issued by "Food Industry Capacity and Skill Initiative".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction to the training program** **Theory Duration** (hh:mm) 00:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	Introduce each other and build rapport with fellow participants and the trainer.	White board/Chart papers, marker
2	**Overview of the "Plant Manager" Role** **Theory Duration** (hh:mm) 01:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Understanding the roles and responsibilities of plant manager Awareness of the nature and availability of job opportunities	Laptop/computer white board, marker, projector, chart papers
3	**Introduction to the Food Processing Industry** **Theory Duration** (hh:mm) 01:30 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code**	Define food processing List the various sub sectors of food processing industry	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual
4	**Introduction to food processing process** **Theory Duration** (hh:mm) 02:00 **Practical Duration** (hh:mm)	List the common machineries used in food processing Explain the process of testing food for accepted quality standards Demonstrate the test for checking the quality of food Describe the procedure for processing various food	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	04:00 **Corresponding NOS Code**	Identify different equipment used in food industry	
5	**Organizational standards and norms** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 02:00 **Corresponding NOS Code**	State the roles and responsibilities of a plant manager State how to conduct yourself at the workplace State the personal hygiene and sanitation guidelines State the food safety hygiene standards to follow in a work environment	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual
6	**Lead operations of a food processing unit** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 11:40 **Corresponding NOS Code** FIC/N9017	• Develop operational plans for the operation of food processing unit that is consistent with the objectives and goals of organisation, and to produce quantity and quality products • Develop operational plan that is flexible and complements supply chain, inventory, human resource, production, maintenance, quality and logistics management of production unit • Develop operational plan to improve output in all areas of functions with the objective to reduce overall cost, and to produce quantity and quality products • Develop operational plan considering national and international regulatory requirements, health and safety, food safety and hygiene requirements on process and product(s), and to maintain safe and environmental compliant workplace • Develop objectives and set demanding but achievable targets for operation function managers, and assign clear responsibilities with expected targets/performance • Provide direction and professional expertise to all function managers to achieve organisation goals • Monitor and control the operational plan to achieve its overall objectives	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Evaluate the implemented operational plan periodically, analyze performance data, identify areas for improvement and recommend changes • Monitor performance of managers and employees to ensure that departmental and individual objectives are achieved within scheduled timelines and budget • Design new work processes, procedures, systems, structures and roles for any changes implemented in the organisation to achieve organizational goal and regulatory requirements • Review and ensure implemented changes are effective and meet the requirements of the organization • Maintain professionalism, tact, diplomacy, sensitivity, diversity and equality, and lead food processing unit to achieve organisation objectives and goals • Ensure that work arrangements, resources and business processes respond to different needs, abilities and values • Develop and implement new business strategies for improving processes and procedures to improve performance • Develop a leadership style and apply them appropriately for managers to follow the lead willingly to achieve organisation targets and goals • Communicate clearly the organisation vision, values and goals to employees, make managers understand and commit their expertise to achieve organisation goals • Lead managers of all operation functions, link operational plans and drive managers towards achieving organisation vision, objectives and goals • Lead managers through difficulties, challenges and conflicts • Conduct meetings with managers regularly and effectively, encourage them to share their views, provide guidance and support to overcome process issues and lead to achieve organisation goal	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Encourage managers to take lead in their own areas of expertise, take own decisions in their area of function, and provide recognitions when they are successful • Lead the managers and organisation successfully through difficulties and challenges • Design processes with achievable targets and realistic timeline, proper resource allocation, with defined process responsibilities to manage food processing operation based on organizational goals • Develop processes that are effective and sustainable, implement and ensure it is followed, review its effectiveness and make necessary changes if required • Develop process measures that are affordable, and provide enough information and required training for managers and employees to manage the process • Review and understand resource requirements for process and allocate necessary resources to all functional areas • Develop systems to link all function processes, and encourage function heads and employees to interact across the organisation to form a complete system • Establish effective methods to review the quality of work and product, and improve the process • Focus attention on issues that are critical to achieve results, provide solutions and guidance to overcome the issues that affect the process • Identify issues and trends and recognize their impact upon current and future work, work out solutions and implementation plan to overcome and utilize latest trends to achieve long term goals of the organisation • Develop policies and procedures for any change in organisation goal, organisation structure PC31. set responsibilities for managers, set and prioritize objectives for change, clearly communicate change and make the managers understand their responsibilities and commitment	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Implement change, identify and deal with obstacles to change, and support managers and employees through the change process • Brief managers on their responsibilities and make them understand their role, objectives for their area and the overall organisation, and expected performance • Monitor progress and performance quality of the managers on regular basis against the level of expected performance and provide prompt and constructive feedback PC35. support managers in identifying and dealing with problems and unforeseen events • Identify gaps and performance issues, discuss the causes and recommend solutions to improve performance of mangers and their team • Monitor performance, analyze employee strength and weakness, and make changes in their tasks/responsibilities • Review performance and update work plans in their area, monitor and conduct review meetings on regular basis, recognize successful completion of work or work activities by function manager(s) and their teams • Motivate managers to complete expected target and any additional work allocated and provide additional support and resources to complete work	
7	**Ensure proper production and operation management** **Theory Duration** (hh:mm) 08:00 **Practical Duration** (hh:mm) 12:00 **Corresponding NOS Code** FIC/N9018	Update self with an understanding of the goals of the organisation and forecast/requirements of the sales and marketing manager, with the knowledge of production method and process, plant capacity, resource availability, plan products and quantity to be produced Monitor and regulate supply chain management which includes sourcing and procurement, conversion of raw materials to finished products, all logistics activities, coordination and collaboration with suppliers,	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook ,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		intermediaries, third party service providers, and customers, to integrate supply and demand management within and across companies Monitor and regulate inventory process to meet the production requirement of the organisation, review current procurement procedures, analyze benefits and risks that may impact the procurement of supplies, implement plans and methods to improve and provide solutions to resolve any immediate problems Evaluate current storage methods and identify ways of improving the storage of supplies to provide better fit with supply chain strategy During production process, coordinate production activities with procurement, maintenance, and quality control function to obtain optimum production and efficient utilization of human resources, machines and equipment Make adjustments/revise/reschedule production schedules and priorities in case of breakdown down of equipment/issues with physical or human resource/ urgent orders/unforeseen issues or any operational problems Direct production activities and establish production priorities to produce quantity and quality products within the operation budget Review and analyze human resource, production, quality control, maintenance, and operational reports to identify reason for nonconformance/ non-compliance to organisation and regulatory standards for product and process, develop and implement operating methods and procedures to eliminate problems and improve product and process quality Monitor storage and distribution of products to and from the plant/processing unit warehouse, ensure storage and distribution norms and procedures like palletizing, stacking height, labeling, fefo etc are followed	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		Establish systems to collect and assess information on performance of all functions, analyze data and evaluate performance of departments and organisation, through knowledge and understanding identify reasons for problems and low performance Establish and implement methods and procedures for improvement, ensure implemented methods deliver expected result, and identify opportunities to improve organization performance Read financial responsibilities, compile available financial information, evaluate the cost, benefits and risks of the current budget, and estimate financial requirements for operation of food processing unit Consult with department managers the objectives and associated plans, discuss and identify priorities and develop a realistic master budget for food processing operation, communicate the final proposed budget with all managers Submit the proposed master budget with clear proposals to the management for approval, assist them to evaluate the budget, negotiate with clarity and strong reasoning and get the budget approved Evaluate, analyze and allocate budget to departments of food processing operation, allocate budget to each department managers with expectations and targets, provide required ongoing support and resources Establish systems to monitor and evaluate performance against delegated budgets and the master budget and put contingency plans in place Identify reason for significant variances between budget and actual expenditure, discuss with managers, provide solutions and ensure immediate corrective action is taken In case of unforeseen situation/emergency/shortage,	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		identify any additional financial needs, prepare provisional budget, negotiate and get it approved by the management, delegate provisional budget to respective managers, monitor and control expenditure Encourage managers to identify ways of reducing expenditure, analyze and pursue potential ideas, implement those in all areas of function Review the financial performance of managers regularly, and identify improvement opportunities and ensure it is implemented, provide information to the management on the financial performance of the operation management Determine human resource requirement including contingencies to achieve organisation goal, organize interview, hiring and training of new employees through human resources manager Ensure that all employees receive appropriate training on job duties, corporate policies and applicable regulations Oversee and direct the activities of subordinate managers, provide coaching and mentoring, and conduct evaluations of all Discuss with managers of operation function and identify resource requirement for their area, analyze, estimate and approve resources, monitor effective use of those resources Ensure compliance of all employees with organization policy, procedures and applicable regulations Conduct meetings to address grievances, to resolve or effect settlements within the scope of authority, and refer unresolved grievances for management-union negotiations Take personnel actions, such as promotions, transfers, discharges or disciplinary measures, within the scope of authority Update self with knowledge of quality management system, legal and regulatory requirements, environmental issues related to the	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		organisation, process and products produced Ensure system, plan and resources are in place to assure food products produced in the organisation meet the organisation standards, national and international regulations Implement procedure, standards and specifications to meet quality goals of the organisation, co-ordinate departments and provide support to implement food safety system like HACCP in the organisation Evaluate records of quality of product and process to assess the effectiveness of quality system followed in the organisation, review and revise the quality system through quality assurance manager and implement changes Organize training for employees to update on latest developments/systems/ tools and techniques in quality management system and evaluate their competency to fulfill organisation goals Encourage employees of all functions to take personal responsibility for achieving quality standards of product and process and address or report/address any non-conformance Monitor process and product quality against target and plan, identify and assess risks of shortfalls in the quality of processes and products/services and take immediate corrective action to address risks Direct and coordinate implementation of quality system such as ISO, HACCP, etc. in the organisation though quality manager Ensure managers responsible for organizational processes understand the requirements of quality system, establish their roles in implementation of quality system in their functional areas, enhance their confidence and commitment to quality by providing continuous support Encourage and support department heads and employees for quality	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		audit process to obtain accreditation, certifications to a standard or a mark of quality, monitor quality audit process, review results and take immediate corrective action through concerned managers Identify the environmental impact related to the resources, process and products produced in the organisation such as air/water/noise pollution, effluent treatment, waste disposal etc, identify risks to the environment, consult with experts and identify opportunities to improve environmental performance Set and implement policies and procedures through mangers, monitor to ensure its efficiency and effectiveness and make changes as required to meet the regulatory requirements	
8	**Manage new projects and ensure compliance to regulatory requirements** **Theory Duration** (hh:mm) 07:00 **Practical Duration** (hh:mm) 09:00 **Corresponding NOS Code** FIC/N9019	Implement new project/business plans of the organisation for introducing new products or for improving processes, procedures and performance Map or perform comparative study of the project with the current project/product to understand the ways proposed project fits with the overall vision, objectives and plans of the organization Read the key objectives and scope of the proposed project, prepare resource requirement for implementation of new project, negotiate with clarity and strong reasoning and get approval from superiors/management Consult with experts and managers and prepare realistic and thorough plan to implement the project successfully, prepare project report considering all possibilities Submit the project report to the superiors/management, discuss plan, consider suggestions and recommendations and make necessary changes where necessary, take approval of final plan brief project team managers on the project plan and their roles and responsibilities, start implementation of project and provide ongoing	Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, logbooks, internal audit register, food safety manual, quality policy etc.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		support, encouragement and information for successful completion Monitor, control and review project plan during each stage of implementation Provide sufficient resources to deal with contingencies and to manage any potential risks Inform the management/superiors of the developments in the project on regular basis, discuss progress and problems, take approval for any changes in project plan Complete project within agreed level of resources, meeting all legal and regulatory requirements, share the success with the project team members, recognize and reward their contribution Update self with understanding of national and international food safety regulations and standards related to the food processing units, process and products produced in the organisation Ensure effective policies and procedures are in place in the organization to meet to legal and regulatory requirements Ensure regulatory standards set by the organisation for products are stringent in context of the national and international legal requirements Ensure managers of all functional area have a clear understanding of the policies and procedures on food regulatory standards Organize training for all employees on policies and procedures on food regulatory standards and the importance of following regulations Monitor and ensure relevant legal and regulatory requirements pertaining to food proces sing units and products produced in the organisation are followed and met Identify reasons for non-compliance, review and revise the policies and procedures in consultation with quality and regulatory affairs manager to correct and overcome failures, provide support to all managers to implement corrective actions for the organisation and	

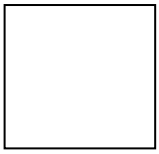
Sr. No.	Module	Key Learning Outcomes	Equipment Required
		products to comply with regulatory standards Update self with understanding of health and safety requirements, and food safety, hygiene and sanitation requirements for the organisation and products produced Ensure that the organisation has written policy and procedures on health and safety, food safety, hygiene and sanitation, and those are clearly communicated to all employees of the organisation, and are put into practice and followed Implement a system for identifying hazards and assessing risk in food processing and products and set procedures to control and prevent them Implement system for GMP, HACCP, FIFO/FEFO, product recall, etc., organize training to the employees on health and safety, food safety, hygiene and sanitation for effective implementation of the systems, allocate required resources for implementation, and ensure those are followed by all employees Ensure systems are in place for effective monitoring, measuring and reporting on the performance of health and safety system Evaluate the existing systems and procedures, consult with mangers and experts and identify methods to reduce risks/improve control measure Ensure health and safety policies are practiced across the organisation, effectively monitored, reviewed and revised at regular intervals to meet the changes in national and international regulations	
9	**Professional and Core Skills** **Theory Duration** (hh:mm) 03:00 **Practical Duration** (hh:mm) 05:00	Undertake a self-assessment test Identify personal strengths and weaknesses Plan and schedule the work order and manage time effectively to complete the tasks assigned Prevent potential problems from occurring	Laptop, white/black board, marker, chart papers, projector ,Trainer's guide, Student manual

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Corresponding NOS Code	Resolve issues and problems using acquired knowledge and realize the importance of decision making Identify potential problems and make sound and timely decision Improve your reading skills State the importance of listening	
10	**IT Skills** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 07:00 **Corresponding NOS Code**	Identify parts of the computer Use the computer keyboard effectively to type Use computer applications effectively to record day-to-day activities Use the word processor effectively Use the spreadsheet application effectively Use the computer to document day-to-day activities	Laptop, white/black board, marker, chart papers, projector, Trainer's guide, Student manual
11	**Field Visits** **Theory Duration** (hh:mm) 04:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code**	Observe the factory location, layout and safety aspects of food processing Observe the storage facilities for raw materials and finished products Observe the various machineries used in process Observe the various machineries used in process Observe the cleaning methods and processes followed to maintain the process machineries and tools Observe the raw materials used and their storage procedures Observe the packaging and storage processes of raw material and finished product Observe the post-production cleaning and maintenance process followed in the industry	All the tools and equipment listed above must be available at the site of field visit
12	**Revision** **Theory Duration** (hh:mm) 02:00 **Practical Duration** (hh:mm) 02:00 **Corresponding NOS Code**	Revised the knowledge gained so far	All the tools and equipment listed above must be available at the time of revision
13	**Evaluation**	Assess the knowledge and skills acquired by the participants	All the tools and equipment listed above

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Theory Duration (hh:mm) 08:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code**		must be available for evaluation
14	**On-the-job Training** **Theory Duration** (hh:mm) 30:00 **Practical Duration** (hh:mm) 65:00 **Corresponding NOS Code**	Apply the skills and knowledge acquired in the training program in the field	All the tools and equipment listed above must be available on the site at the time of OJT
	Total Duration 240:00 **Theory Duration 88:00** **Practical Duration 152:00**	**Unique Equipment Required**: Laptop, white board, marker, chart papers, projector, trainer's guide and student handbook, protective gloves, head caps, aprons, safety goggles, safety boots, mouth masks, sanitizer, safety manual	

Grand Total Course Duration: **240Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **SSC: Food Industry Capacity and Skill Initiative)***



Trainer Prerequisites for Job role: "Plant Manager" mapped to Qualification Pack: "FIC/Q9004, v1.0"

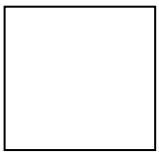
Sr. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "FIC/Q9004", Version 1.0
2	**Personal Attributes**	An aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training, and pre/post work to ensure competent, employable candidates at the end of the training. Strong communication skills, ability to work as part of a team; a passion for quality and for developing others; well-organized and focused, eager to learn and keep oneself updated with the latest in the mentioned fields.
3	**Minimum Educational Qualifications**	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 9-10 years of hands on experience in a food industry
4a	**Domain Certification**	Certified for Job Role: "Plant Manager" mapped to QP: "FIC/Q9004, v1.0". Minimum accepted score is 80%
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted SCORE IS 80 % as per FICSI guidelines.
5	**Experience**	M.Sc/M.Tech/ME in Food Technology or Food Engineering with 7-8 years of hands on experience in a food industry B.Sc (home Sc) /B.Tech/BE in Food Technology or Food Engineering with 9-10 years of hands on experience in a food industry

Annexure: Assessment Criteria

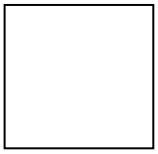
Assessment Criteria	
Job Role	Plant Manager
Qualification Pack	FIC/Q9004, v1.0
Sector Skill Council	Food Processing

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training canter based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% (overall) in every QP
6	The marks are allocated PC wise; however, every NOS will carry a weight age in the total marks allocated to the specific QP

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. FIC/N9017: Lead Operations of a food processing unit	PC1. Develop operational plans for the operation of food processing unit that is consistent with the objectives and goals of organisation, and to produce quantity and quality products	100	3	1	2
	PC2. Develop operational plan that is flexible and complements supply chain, inventory, human resource, production, maintenance, quality and logistics management of production unit		2.5	1	1.5
	PC3. Develop operational plan to improve output in all areas of functions with the objective to reduce overall cost, and to produce quantity and quality products		2.5	0.5	2
	PC4. Develop operational plan considering national and international regulatory requirements, health and safety, food safety and hygiene requirements on process and product(s), and to maintain safe and environmental compliant workplace		2.5	1	1.5



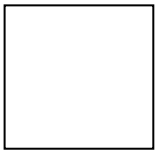
Assessable Outcome	Assessment Criteria	Total Mark (600)	Marks Allocation Out Of	Theory	Skills Practical
	PC5. Develop objectives and set demanding but achievable targets for operation function managers, and assign clear responsibilities with expected targets/performance		3	1	2
	PC6. Provide direction and professional expertise to all function managers to achieve organisation goal		2.5	1	1.5
	PC7. Monitor and control the operational plan to achieve its overall objectives		2.5	0.5	2
	PC8. Evaluate the implemented operational plan periodically, analyze performance data, identify areas for improvement and recommend changes		2.5	1	1.5
	PC9. Monitor performance of managers and employees to ensure that departmental and individual objectives are achieved within scheduled timelines and budget		3	1	2
	PC10. Design new work processes, procedures, systems, structures and roles for any changes implemented in the organisation to achieve organizational goal and regulatory requirements		2.5	1	1.5
	PC11. Review and ensure implemented changes are effective and meets the requirements of the organisation		2.5	1	1.5
	PC12. Maintain professionalism, tact, diplomacy, sensitivity, diversity and equality, and lead food processing unit to achieve organisation objectives and goals		2.5	1	1.5
	PC13. Ensure that work arrangements, resources and business processes respond to different needs, abilities and values		2.5	0.5	2
	PC14. Develop and implement new business strategies for improving processes and procedures to improve performance		2.5	1	1.5
	PC15. Develop a leadership style and apply them appropriately for managers to follow the lead willingly to achieve organisation targets and goals		2.5	1	1.5
	PC16. Communicate clearly the organisation vision, values and goals to employees, make managers understand and commit their expertise to achieve organisation goals		2.5	0.5	2



Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC17. Lead managers of all operation functions, link operational plans and drive managers towards achieving organisation vision, objectives and goals		3	1	2
	PC18. Lead managers through difficulties, challenges and conflicts		2.5	1	1.5
	PC19. Conduct meetings with managers regularly and effectively, encourage them to share their views, provide guidance and support to overcome process issues and lead to achieve organisation goal		2.5	0.5	2
	PC20. Encourage managers to take lead in their own areas of expertise, take own decisions in their area of function, and provide recognitions when they are successful		2.5	1	1.5
	PC21. Lead the managers and organisation successfully through difficulties and challenges		3	1	2
	PC22. Design processes with achievable targets and realistic timeline, proper resource allocation, with defined process responsibilities to manage food processing operation based on organizational goals		2.5	1	1.5
	PC23. Develop processes that are effective and sustainable, implement and ensure it is followed, review its effectiveness and make necessary changes if required		2.5	1	1.5
	PC24. Develop process measures that are affordable, and provide enough information and required training for managers and employees to manage the process		2.5	0.5	2
	PC25. Review and understand resource requirements for process and allocate necessary resources to all functional areas		2.5	1	1.5
	PC26. Develop systems to link all function processes, and encourage function heads and employees to interact across the organisation to form a complete system		2.5	0.5	2
	PC27. Establish effective methods to review the quality of work and product, and improve the process		2.5	0.5	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC28. Focus attention on issues that are critical to achieve results, provide solutions and guidance to overcome the issues that affect the process		2.5	1	1.5
	PC29. Identify issues and trends and recognize their impact upon current and future work, work out solutions and implementation plan to overcome and utilize latest trends to achieve long term goals of the organisation		3	1	2
	PC30. Develop policies and procedures for any change in organisation goal, organisation structure		2.5	1	1.5
	PC31. Set responsibilities for managers, set and prioritize objectives for change, clearly communicate change and make the managers understand their responsibilities and commitment		2.5	1	1.5
	PC32. Implement change, identify and deal with obstacles to change, and support managers and employees through the change process		2.5	1	1.5
	PC33. Brief managers on their responsibilities and make them understand their role, objectives for their area and the overall organisation, and expected performance		2	1	1
	PC34. Monitor progress and performance quality of the managers on regular basis against the level of expected performance and provide prompt and constructive feedback		3	1	2
	PC35. Support managers in identifying and dealing with problems and unforeseen events		2.5	1	1.5
	PC36. Identify gaps and performance issues, discuss the causes and recommend solutions to improve performance of mangers and their team		3	1	2
	PC37. Monitor performance, analyze employee strength and weakness, and make changes in their tasks/responsibilities		2.5	1	1.5
	PC38. Review performance and update work plans in their area, monitor and conduct review meetings on regular basis, recognize successful completion of work or work activities by function manager(s) and their teams		2.5	1	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC39. Motivate managers to complete expected target and any additional work allocated and provide additional support and resources to complete work		2	1	1
			100	**35**	**65**
2. FIC/N9018: Ensure proper production and proper management	PC1. Update self with an understanding of the goals of the organisation and forecast/requirements of the sales & marketing manager, with the knowledge on production method and process, plant capacity, resource availability, plan products and quantity to be produced	**100**	2	1	1
	PC2. Monitor and regulate supply chain management which include sourcing and procurement, conversion of raw materials to finished products, all logistics activities, coordination and collaboration with suppliers, intermediaries, third-party service providers, and customers, to integrates supply and demand management within and across companies		3	0.5	2.5
	PC3. Monitor and regulate inventory process to meet the production requirement of the organisation, review current procurement procedures, analyze benefits and risks that may impact the procurement of supplies, implement plans and methods to improve, provide solutions to resolve any immediate problems		3	1	2
	PC4. Evaluate current storage methods, identifying ways of improving the storage of supplies to provide better fit with supply chain strategy		3	1	2
	PC5. During production process, coordinate production activities with procurement, maintenance, and quality control function to obtain optimum production and efficient utilization of human resources, machines and equipment		1.5	0.5	1
	PC6. Make adjustments/revise/reschedule production schedules and priorities in case of breakdown down of equipment/issues with physical or human resource/ urgent		1.5	0.5	1



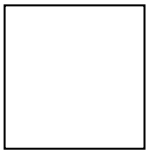
Assessable Outcome	Assessment Criteria	Total Mark (600)	Marks Allocation Out Of	Theory	Skills Practical
	orders/unforeseen issues or any operational problems				
	PC7. Direct production activities and establish production priorities to produce quantity and quality products within the operation budget		3	1	2
	PC8. Review and analyze human resource, production, quality control, maintenance, and operational reports to identify reason for non-conformance/ noncompliance to organisation and regulatory standards for product and process, develop and implement operating methods and procedures to eliminate problems and improve product and process quality		3	1	2
	PC9. Monitor storage and distribution of products to and from the plant/processing unit warehouse, ensure storage and distribution norms and procedures like palletizing, stacking height, labeling, FEFO etc are followed		3	0.5	2.5
	PC10. Establish systems to collect and assess information on performance of all functions, analyze data and evaluate performance of departments and organisation, through knowledge and understanding identify reasons for problems and low performance		1.5	1	0.5
	PC11. Establish and implement methods and procedures for improvement, ensure implemented methods deliver expected result, and identify opportunities to improve organization performance		1.5	1	0.5
	PC12. Read financial responsibilities, compile available financial information, evaluate the cost, benefits and risks of the current budget, and estimate financial requirements for operation of food processing unit		3	1.5	1.5
	PC13. Consult with department managers the objectives and associated plans, discuss and identify priorities and develop a realistic master budget for food processing operation, communicate the final proposed budget with all managers		3	1	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC14. Submit the proposed master budget with clear proposals to the management for approval, assist them to evaluate the budget, negotiate with clarity and strong reasoning and get the budget approved		2.5	1	1.5
	PC15. Evaluate, analyze and allocate budget to departments of food processing operation, allocate budget to each department managers with expectations and targets, provide required ongoing support and resources		3	1	2
	PC16. Establish systems to monitor and evaluate performance against delegated budgets and the master budget and put contingency plans in place		2.5	1	1.5
	PC17. Identify reason for significant variances between budget and actual expenditure, discuss with managers, provide solutions and ensure immediate corrective action is taken		2.5	1	1.5
	PC18. In case of unforeseen situation/emergency/shortage, identify any additional financial needs, prepare provisional budget, negotiate and get it approved by the management, delegate provisional budget to respective managers, monitor and control expenditure		3	1	2
	PC19. Encourage managers to identify ways of reducing expenditure, analyze and pursue potential ideas, implement those in all areas of function		2.5	1	1.5
	PC20. Review the financial performance of managers regularly, and identify improvement opportunities and ensure it is implemented, provide information to the management on the financial performance of the operation management		2.5	1	1.5
	PC21. Determine human resource requirement including contingencies to achieve organisation goal, organize interview, hiring and training of new employees through human resources manager		3	1	2
	PC22 Ensure that all employees receives appropriate training on job duties,		2.5	1	1.5

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	corporate policies and applicable regulations				
	PC23 Oversee and direct the activities of subordinate managers, provide coaching and mentoring, and conduct evaluations of all		2.5	1	1.5
	PC24 Discuss with managers of operation function and identify resource requirement for their area, analyze, estimate and approve resources, monitor effective use of those resources		3	1	2
	PC25 Ensure compliance of all employees with organization policy, procedures and applicable regulations		2.5	1	1.5
	PC26 Conduct meetings to address grievances, to resolve or effect settlements within the scope of authority, and refer unresolved grievances for management-union negotiations		2.5	0.5	2
	PC27 Take personnel actions, such as promotions, transfers, discharges or disciplinary measures, within the scope of authority		3	1	2
	PC28 Update self with knolwdge of quality management system, legal and regulatory requirements, environmental issues related to the organisation, process and products produced		2.5	0.5	2
	PC29 Ensure system, plan and resources are in place to assure food products produced in the organisation meet the organisation standards, national and international regulations		3	1	2
	PC30 Implement procedure, standards and specifications to meet quality goals of the organisation, coordinate departments and provide support to implement food safety system like HACCP in the organisation		3	1	2
	PC31 Evaluate records on quality of product and process to assess the effectiveness of quality system followed in the organisation, review and revise the quality system through quality assurance manager and implement changes		2.5	1	1.5
	PC32 Organize training for employees to update on latest		2.5	0.5	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	developments/systems/ tools and techniques in quality management system and evaluate their competency to fulfill organisation goals				
	PC33 Encourage employees of all functions to take personal responsibility for achieving quality standards of product and process and to address or report/address any non-conformance		2.5	1	1.5
	PC34 Monitor process and product quality against target and plan, identify and assess risks of shortfalls in the quality of processes and products/services and take immediate corrective action to address risks		3	1	2
	PC35 Direct and coordinate implementation of quality system like ISO, HACCP etc in the organisation though quality manager		3	1	2
	PC36 Ensure managers responsible for organizational processes understand the requirements of quality system, establish their roles in implementation of quality system in their functional areas, enhance their confidence and commitment to quality by providing continuous support		3	1	2
	PC37 Encourage and support department heads and employees for quality audit process to obtaining accreditation, certifications to a standard or a mark of quality, monitor quality audit process, review results and take immediate corrective action through concerned managers		2.5	1	1.5
	PC38 Identify the environmental impact related to the resources, process and products produced in the organisation like air/water/noise pollution, effluent treatment, waste disposal etc, identify risks to the environment, consult with experts and identify opportunities to improve environmental performance		1.5	0.5	1
	PC39 Set and implement policies and procedures through mangers, monitor to ensure its efficiency and effectiveness and make changes as required to meet the regulatory requirements		1.5	0.5	1
			100	**35**	**65**

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
3. FIC/N9019: Manage new projects and implement health and safety system in food processing unit	PC1. Implement new project/business plans of the organisation for introducing new products or for improving processes, procedures and performance	100	3	1	2
	PC2. Map or perform comparative study of theprojectwiththecurrent project/product to understand the ways proposed project fits with the overall vision, objectives and plans of the organisation		4	1	3
	PC3. Read the key objectives and scope of the proposed project, prepare resource requirement for implementation of new project, negotiate with clarity and strong reasoning and get approved from superiors/management		5	2	3
	PC4. Consult with experts and managers and prepare realistic and thorough plan to implement the project successfully, prepare project report considering all possibilities		4	1.5	2.5
	PC5. Submit the project repot to the superiors/management, discuss plan, consider suggestions and recommendations and make necessary changes where necessary, take approval of final plan		4	1.5	2.5
	PC6. Brief project team managers on the project plan and their roles responsibilities, start implementation of project and provide ongoing support, encouragement and information for successful completion		5	2	3
	PC7. Monitor, control and review project plan during each stage of implementation		4	1.5	2.5
	PC8. Provide sufficient resources to deal with contingencies and to manage any potential risks		4	1.5	2.5
	PC9. Inform the management/superiors of the developments in the project on regular basis, discuss progress and problems, take approval for any changes in project plan		4	1.5	2.5
	PC10. Complete project within agreed level of resources meeting all legal and regulatory requirements, share the success with the project team		4	1.5	2.5



Assessable Outcome	Assessment Criteria	Total Mark (600)	Marks Allocation Out Of	Theory	Skills Practical
	members, recognize and reward their contribution				
	PC11. Read national and international food safety regulations and standards related to the food processing units, process and products produced in the organisation		3	1.5	2.5
	PC12. Ensure effective policies and procedures are in place in the organization to meet to legal and regulatory requirements		5	2	3
	PC13. Ensure regulatory standards set by the organisation for products are stringent than the national and international legal requirements		4	1.5	2.5
	PC14. Ensure managers of all functional area have a clear understanding of the policies and procedures on food regulatory standards		4	1.5	2.5
	PC15. Organize training for all employees on policies and procedures on food regulatory standards and the importance of following regulations		4	1	3
	PC16. Monitor and ensure relevant legal and regulatory requirements pertaining to food processing units and products produced in the organisation are followed and met		5	2	3
	PC17. Identify reasons for noncompliance, review and revise the policies and procedures in consultation with quality and regulatory affairs manager to correct and overcome failures, provide support to all managers to implement corrective actions for the organisation and products to comply with regulatory standards		5	2	3
	PC18. Read the health and safety requirements, and food safety, hygiene and sanitation requirements for the organization and products produced		3	1	2
	PC19. Ensure that the organisation has written policy and procedures on health and safety, food safety, hygiene and sanitation, and those are clearly communicated to all employees of the organisation, and are put into practice and being followed		4	1	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC20. Implement system for identifying hazards and assessing risk in food processing and products, set procedures to control and prevent them		4	1	3
	PC21. implement system for GMP, HACCP, FIFO/FEFO, product recall etc, organize training to the employees on health and safety, food safety, hygiene and sanitation for effective implementation of the systems, allocate required resources for implementation, and ensure those are followed by all employees		5	2	3
	PC22.Ensure systems are in place for effective monitoring, measuring and reporting on the performance of health and safety system		4	1	3
	PC23. Evaluate the existing systems and procedures, consult with mangers and experts and identify method to reduce risks/improve control measure		4	1	3
	PC24. Ensure health and safety policies are practiced across the organisation, effectively monitored, reviewed and revised at regular intervals to meet the changes in national and international regulations		4	1	3
	Total		**100**	**35**	**65**
	Grand Total	**300**	**300**	**200**	**100**
	Percentage Weightage		**100**	**60%**	**40%**
	Minimum Pass% to qualify (aggregate):			**70%**	

eÉ J¸ï J¸ï ªÀÄºÁ«zÁå¦ÃoÀ

eÉ J¸ï J¸ï PÀÁ¯ÉÃeï ¥sÁgï «ÄªÉÄ£ï

(¸ÁéAiÀÄvÀÛ)

©.J£ï. gÀ¸ÉÛ, ªÉÊ¸ÀÆgÀÄ – 570 025

PÀ£ÀßqÀ ¸ÁßvÀPÉÆÃvÀÛgÀ «¨sÁUÀ

¥ÀoÀå- ¥ÁoÀåPÀæªÀÄ ¥ÀjÃPÉë AiÉÆÃd£É

ZÁ¬Ä¸ï DzsÁjvÀ AiÉÆÃd£É (©J¸ï-¹Jf¦)

2018-19

Programe Outcomes

PO1: Demonstrate critical reading, writing, and thinking skills. Write well-developed, focussed and effective paragraphs, which support a clear thesis statement, and demonstrate competence in Standard Kannada usage.
PO2: Get the opportunity to opt for career in the field of social media
PO3: Helps to pursue reserach work at M.phil and Doctoral level
PO4: Help to communicate effectively and fluently at various occassions
PO5: Analyse and interpret text written in Dravidian Language.
PO6: Learn to write logical and informative papers
PO7: Imbibe good ethics explored in the works of great writers.
PO8: Learn to participate effectively in debates, group discussions, seminars.

Programe Specific Outcomes

PSO 1: Equipped to work efficiently in various positions of Social Media.
PSO 2: Good communicative leads to huge career opportunitis
PSO 3: Able enough to work as researcher in the field of Kannada Literature and other Dravidian Languages
PSO 4: Capable to work as teachers, trainers and Faculthy of Kannada.
PSO 5: Learn to interpret text with attention to ambiguity, complexity and aesthetic value

ZÀjvÉæ ªÀÄvÀÄÛ ¸ÀA±ÉÆÃzsÀ£É(¹©J¸ïJ¸ï-¹Jf¦)

ªÉÆzÀ®£ÉAiÀÄ ZÀvÀÄgï ªÀiÁ¸À

¥ÀoÀå¥ÀĸÀÛPÀUÀ¼À ªÀiÁ£ÀzÀAqÀ ¥ÀæªÀiÁtPÀ C£ÀĸÀgÀuÉ

¥ÀwæPÉ ¸ÀASÉå	¥ÀwæPÉAiÀÄ ºÉ¸ÀgÀÄ	PÉærmï «£Áå¸À	PÉærmïUÀ¼ÀÄ	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼ÀÄ ªÁgÀPÉÌ		¥ÀjÃPÁë CªÀ¢ü(UÀAmÉUÀ¼À°è)	¥ÀjÃPÁë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	CzsÀå¬Ä£À				
	ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)								
1	¥ÁæaãÀ PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀA¥À- DzÀå¥ÀgÀ ¸ÀAUÀæºÀ (KNA 050)	3:1	4	3	2	3	70	30	100
2	¥ÁæaãÀ PÀ£ÀßqÀ ¸Á»vÀå ¸ÀAPÀ®£É (KNA 020)	2:1	3	2	2	3	70	30	100
3	PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ (KNA 030)	3:1	4	3	2	3	70	30	100
4	«ªÀıÁð ¹zÁÞAvÀ (KNA 040)	2:1	3	2	2	3	70	30	100
5	ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core) ವಿದ್ಯಾರ್ಥಿ ಈ ಕೆಳಗಿನ ಯಾವುದಾದರೂ ಒಂದು ವಿಷಯವನ್ನು ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡು ಮುಂದಿನ ಮೂರು ಚತುರ್ಮಾಸಗಳಲ್ಲಿಯೂ ಅದೇ ವಿಷಯವನ್ನು ಮುಂದುವರಿಸತಕ್ಕದ್ದು								
5.1	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಭಾಷಾ «eÁÕ£ÀzÀ ªÀÄÆ®vÀvÀéUÀ¼ÀÄ (KNA 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À eÁ£À¥ÀzÀ ¸Á»vÀå ¥ÀjZÀAiÀÄ (KNA 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ CzsÀåAiÀÄ£À: PÀ£ÁðlPÀ ¸ÁA¸ÀÌöÈwPÀ ZÀjvÉæ (KNA 210)	3:1	4	3	2	3	70	30	100

JgÀqÀ£ÉAiÀÄ ZÀvÀÄ¸ÀìªÀiÁ¸À

¥ÀoÀå¥ÀæPÀæªÀÄ ªÀÄvÀÄÛ ¥ÀjÃPÁë ¤AiÀÄªÀiÁªÀ½UÀ¼ÀÄ

¥ÀwæPÉ ¸ÀASÉå	¥ÀwæPÉAiÀÄ ²Ã¶ðPÉ	PÉærmï «£Áå¸À	PÉærmïUÀ¼ÀÄ	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼ÀÄ ªÁgÀPÉÌ		¥ÀjÃPÁë CªÀ¢ü (UÀAmÉUÀ¼À°è)	¥ÀjÃPÁë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	læAiÀÄÄmÉÆÃjAiÀÄ¯ï				
	ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)								
1	ªÀÄzsÀåPÁ° £À PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀzÀå (KNB 010)	3:1	4	3	2	3	70	30	100
2	ªÀÄzsÀåPÁ° £À PÀ£ÀßqÀ ¸Á»vÀå: UÀzÀå (KNB 020)	2:1	3	2	2	3	70	30	100
3	ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ (KNB 030)	2:1	3	2	2	3	70	30	100
4	PÀ£ÀßqÀ «ªÀÄ±Éð : DAiÀÄÝ PÀÈwUÀ¼ÀÄ (KNB 040)	3:1	4	3	2	3	70	30	100
5	ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Soft core) PÉÆlÖ ¥ÀwæPÉUÀ¼À°è «zÁåyðAiÀÄÄ» AzÉÆ DAiÀÄ̧ ªÀiÁr PÉÆArqÀ ¥ÀwæPÉAiÀÄ£ÀÄß F ZÀvÀÄ¸ÀìªÀiÁ¸ÀzÀ°è CzsÀåAiÀÄ£À ªÀiÁqÀvÀPÀÌzÀÄÝ								
5.1	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ªÁåPÀgÀtUÀ¼À vËQ®PÀ ¸ÀAzÀ¨sÀð (KNB 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À d£À¥ÀzÀ ¸ÀA¸ÀÌøw CzsÀåAiÀÄ£À (KNB 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ CzsÀåAiÀÄ£À: PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ-13 £ÉÃ ±ÀvÀªÀiÁ£ÀzÀªÀgÉUÉ (KNB 210)	3:1	4	3	2	3	70	30	100
6	ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯಗಳು (Special Soft core) «zÁåyðUÀ¼ÀÄ F ZÀvÀÄ¸ÀìªÀiÁ¸ÀzÀ°è FUÀ ¤ÃqÀ¯ÁVgÀÄªÀ ಒಂದು ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯವನ್ನು DAiÀÄ̧ ªÀiÁr CzsÀåAiÀÄ£À ªÀiÁqÀvÀPÀÌzÀÄÝ								
6.1	PÀ£ÀßqÀ ¸À¸ÀÌøw avÀæuÉ (DAiÀÄÝ PÀÈwUÀ¼ÀÄ) (KNB 220)	3:1	4	3	2	3	70	30	100
6.2	ªÀÄ»¼É ¸ÀAªÉÃzÀ£É- ¸Á»vÀå (DAiÀÄÝ PÀÈwUÀ¼ÀÄ) (KNB 220)	3:1	4	3	2	3	70	30	100

ªÀÄÆgÀ£ÉAiÀÄ ZÀvÀÄ¸ÀìªÀÄ

¥ÀoÀå¥ÀæªÀiÁtªÀÄvÀÄÛ ¥ÀjÃPÉëAiÀÄ «£Áå¸À

¥ÀwæPÉ ¸ÀASÉå	¥ÀwæPÉAiÀÄ ²Ã¶ðPÉ	PÉæÃrmï «£Áå¸À	PÉæÃrmïUÀ¼À ¸ÀASÉå	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼ÀÄ ªÁgÀPÉÌ		¥ÀjÃPÉëAiÀÄ CªÀ¢(UÀAmÉUÀ¼À°è)	¥ÀjÃPÉë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	¸ÀégÀÆ¥ÀtÂ				
	ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)								
1	vË¯ÀÄ¤PÀ ¸Á»vÀå: ¥ÀoÀå: ªÀiÁ¥ÀPÀ ªÀÄvÀÄÛ ¸ÀA PÀ (KNC 050)	2:1	3	2	2	3	70	30	100
2	Dz sÀÄ¤PÀPÀ£ÀßqÀ ¸Á»vÀå £É (KNC 020)	2:1	3	2	2	3	70	30	100
3	¨sÁgÀwÃAiÀÄ PÁªÀå ªÀÄÄ«ÄÃªÀÄA¸É (KNC 030)	2:1	3	2	2	3	70	30	100
4	¸ÀA±ÉÆÃzsÀ£Á «zsÁ£À ªÀÄvÀÄÛ UÀæAxÀ ¸ÀA (KNC 040)	2:1	3	2	2	3	70	30	100
5	G¥À¥ÀæzsÁ£À ವಿಷಯಗಳು (Soft core) PÉÆnÖgÀÄªÀ ¥ÀwæPÉUÀ¼À°è «zÁåyðAiÀÄÄ AiÀiÁªÀÅzÁzÀgÀÆ MAzÀÄ ¥ÀwæPÉAiÀÄ£ÀÄß DAiÉÄÌ ªÀiÁqÀ¨ÉÃPÀÄ								
5.1	ಭಾಷಾ ವಿಜ್ಞಾನ ಅಧ್ಯಯನ ಉಪಭಾಷಾ ವಿಜ್ಞಾನ (PÉëÃvÀæ) (KNC 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À PÉëÃvÀæ PÁAiÀÄð ªÀÄvÀÄÛ (KNC 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ CzsÀåAiÀÄ£À ±Á¸À£ÀUÀ¼ÀÄ DAiÉÄÌ ¥ÀoÀåUÀ¼ÀÄ (KNC 210)	3:1	4	3	2	3	70	30	100
6	ªÀÄÄPÀÛ LaÒPÀ (Open Elective)								
6.1	ಕನ್ನಡ ಭಾಷೆ ಸಾಹಿತ್ಯ (¥ÁæaãÀ ªÀÄzsÀåPÁ°Ã£À ªÀÄvÀÄÛ DzsÀÄ¤PÀ) (KNC 530)	3:1	4	3	2	3	70	30	100

£ÁÖPÀ²PÀëtzÀ ÀÌÉÆÃ¸À

¥ÀæxÀ¥ÁoÀåPÀæªÀÄ ªÀÄvÀÄÛ¥ÀjÃPÉëAiÀÄ «£Áå¸À

¥ÀwæPÉ ¸ÀASÉå	¥ÀwæPÉAiÀÄ ²Ã¶ðPÉ	PÉærmï «£Áå¸À	PÉærmïUÀ¼ÀÄ	¨ÉÆÃzsÀ£Á UÀAmÉUÀ¼ÀÄ ªÁgÀPÉÌ		¥ÀjÃPÉëAiÀÄ CªÀ¢ü (UÀAmÉUÀ¼ÀÄ)	¥ÀjÃPÉë CAPÀUÀ¼ÀÄ	DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À CAPÀUÀ¼ÀÄ	MlÄÖ CAPÀUÀ¼ÀÄ
				G¥À£Áå¸À	vÉÆqÀV¹PÉÆ¼ÀÄîªÀÅzÀÄ				
	ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)								
1	DzsÀÄ¤PÀ PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀæzsÁ£À PÀ«UÀ¼ÀÄ PÀÈwUÀ¼ÀÄ (KND 050)	2:1	3	2	2	3	70	30	100
2	¥Á±ÁÑvÀå PÁªÀåªÀÄÄ ªÀÄvÀÄÛ ¸ÉÆ (KND 020)	2:1	3	2	2	3	70	30	100
3	¸ÀA¸ÀÌøvÀ PÁªÀå ²PÀë (KND 030)	2:1	3	2	2	3	70	30	100
4	C©ü£ÀAiÀÄ PÀ¯É (KND 040)	1:2	3	1	4	3	70	30	100
5	G¥À¥ÀæzsÁ£À ವಿಷಯಗಳು (Soft core) PÉÆnÖgÀÄªÀ ¥ÀwæPÉUÀ¼À°è AiÀiÁªÀÅzÁzÀgÀÆ MAzÀ£ÀÄß DAiÉÄÌ ªÀiÁrPÉÆ¼ÀîvÀPÀÌzÀÄÝ								
5.1	ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ಭಾಷಾಸ್ವರೂಪ : ಆಯ್ದ ಪಠ್ಯಗಳು (KND 210)	3:1	4	3	2	3	70	30	100
5.2	eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À PÀ£ÀßqÀ d£À¥ÀzÀ ¸Á»vÀå (DAiÀÄÝ ¥ÀoÀåUÀ¼ÀÄ) (KND 210)	3:1	4	3	2	3	70	30	100
5.3	ZÀjvÉæ CzsÀåAiÀÄ£À PÀ£ÀßqÀ £ÁqÀÄ ¸ÀA¸ÀÌøw (DAiÀÄÝ ¥ÀoÀåUÀ¼ÀÄ) (KND 210)	3:1	4	3	2	3	70	30	100

ಪ್ರಧಾನ ವಿಷಯ	: 52 PÉærmï
ಉಪಪ್ರಧಾನ ವಿಷಯ	: 16 PÉærmï
ವಿಶೇಷ ಉಪಪ್ರಧಾನ ವಿಷಯ	: 04 PÉærmï
ªÀÄÄPÀÛ LaÒPÀ	: 04 PÉærmï
MlÄÖ	: 76 PÉærmï

vÉÆqÀV¹PÉÆ¼ÀÄîªÀÅzÀÄ ªÀÄvÀÄÛ ¥ÁæAiÉÆÃVPÀ ZÀlÄªÀnPÉUÀ¼ÀÄ

DAiÀiÁ ¥ÀwæPÉUÀ½UÉ C£ÀÄUÀÄtªÁV F PÉÆ¼ÀUÉ ¥ÁæAiÉÆÃVPÀ C¨sÁå¸ÀUÀ¼À£ÀÄß ¥ÀwæPÉAiÀÄ MAzÀ¨sÁUÀªÁV gÀÆ¦¸À¯ÁUÀÄªÀÅzÀÄ

1. ಪದ್ಯ ಓದುವ ಕ್ರಮ, ಅರ್ಥೈಸುವ ಕ್ರಮ, ವಿಶ್ಲೇಷಣೆ ಮತ್ತು ವಿಮರ್ಶೆ
2. ಭಾವಸ್ವಾರಸ್ಯ, ಸಂಭಾಷಣಾ ಕೌಶಲ, ಸನ್ನಿವೇಶಗಳ ಪರಿಚಯ
3. ವಸ್ತು, ಪಾತ್ರ, ಭಾಷೆ ಬಳಕೆ, ರಚನೆ, ತಂತ್ರಗಾರಿಕೆ

ªÉÄzÀ®£ÉAiÀÄ ZÀvÀÄxÀð ¸ÉÄ«ÄøÀÖgï (2017)

¥ÀoÀåªÀಿಷಯಗಳು (Hard Core)

KNA 050: ¥ÀvÀæ-1 ¥ÁæaãÀ PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀA¥À (3:1=4 PÉærrmï)

Course Outcome

CO1: Study in depth Adipurana
CO2: Understand the characteristic feature of Adipurana
CO3: Learn in details with examples Pampa Poet's writings
CO4: Understand in depth about Pampa

¥À¥À »£É߯ÉAiÀÄ ªÀiÁ»w PÀÈwUÀ¼ÀÄ

¥ÀA¥À DzÀ¥ÀÄgÁt ¸ÀAUÀæºÀ (¸ÀA) J¯ï. UÀÄAqÀ¥Àà ¥ÀæPÁgÀ¸ÀAUÀ ªÉÄʸÀÆgÀÄ «.«., ªÉÄʸÀÆgÀÄ

¥ÀÆgÀPÀ NzÀÄ PÀÈwUÀ¼ÀÄ

1. £ÁqÉÆÃd ¥À¥À : ªÀÄÄ½AiÀÄ wªÀÄä¥ÀàAiÀÄå
2. ¥À¥ÀMAzÀÄ CzÀåAiÀÄ£À : f.J¸ï.²ªÀgÀÄzÀæ¥Àà
3. ¥À¥À¤ÃªÀ ÅªÀÄÄRUÀ¼ÀÄ : ¹.¦. ಕೃಷ್ಣಕುಮಾರ್
4. PÀ£ÀßqÀ ¸Á»vÀå «±ÀèPÉÆÃ±À : ¹.¦. ¹zÀÝAiÀÄå
5. ªÀÄvÉÛªÀÄvÉÛ ¥À¥À : f.JZï. £ÁAiÀÄPÀ
6. DzÀ¥ÀÄgÁt ¢Ã¦PÉ : ¥À. £ÁUÀgÁdAiÀÄå vÀ¸ÀÄ ±ÁªÀÄgÁAiÀÄ

KNA 020: ¥ÀvÀæ-2 ¥ÁæaãÀ PÀ£ÀßqÀ ¸Á»vÀå À»£É߯É (2:1=3 PÉærrmï)

Course Outcome

CO1: Identify the details of ashtadasha Varnane
CO2: Deliberate the classification and characteristics of Kannada Jaina Puraana, Ramayana, Mahabarartha
CO3: Study in depth Boudha, Jaina, Shaiva and Vaidika
CO4: Understand the classification and characteristics of Champu Kavya

1. ¸Á»vÀå À»£É߯ÉAiÀÄ gÀªÀÄ ÀCA±ÀUÀ¼ÀÄ : ಕಾಡು, ಕಡಲು, ಪರ್ವತ, ಅಷ್ಟಾದಶ ವರ್ಣನೆಗಳು ªÀÄÄAvÁzÀªÀÅUÀ¼À¤ß UÀÄgÀÄw¹PÉÆAqÀÄ CzÀgÀ ªÀÄÆ®PÀ ¸Á»vÀå
2. ««zsÀ PÁ®WÀlÖzÀ ¸ÁªÀiÁfPÀ ªÀÄvÀÄÛgÁdQÃAiÀÄ ¹ÜwUÀ¼ÀÄ ಹಾಗೂ ವಿಶೇಷವಾಗಿ ಬಾದಾಮಿ ಚಾಲುಕ್ಯರು, ಗಂಗರು, ರಾಷ್ಟ್ರಕೂಟರ ಕಾಲದ ಕನ್ನಡ ಸಾಹಿತ್ಯ, ಹೊಯ್ಸಳರ ಕಾಲದ ಚಂಪೂ PÀÈwUÀ¼ÀÄ- EªÀÅUÀ¼À »£É߯ÉAiÀÄ CzsÀåAiÀÄ ¸Á»vÀå¥ÀgÀA¥ÀgÉ
3. zsÁ«ÄðPÀ »£É߯É: ¨ËzÀÞ eÉÊ£À ªÉÊ¢PÀ ±ÉÊªÀ zsÀªÀÄðUÀ¼À »£É߯ÉAiÀÄ CzsÀåAiÀÄ ¸Á»vÀå ¥ÀgÀA¥ÀgÉ
4. ¸ÀA¸ÀÌøvÀ ¥ÁæPÀÈvÀ ಭಾಷಾ ¸Á»vÀåUÀ¼À ¥Àæ¨sÁªÀ ¥ÀæªÀÄÄR ÀUÀ¼À »£É߯É F »£É߯ÉAiÀÄ CzsÀåAiÀÄ ±Á¸ÀÛçUÀ¼ÀÄ, PÀ£ÀßqÀ eÉÊ£À ¥ÀÄgÁt UÀ¼ÀÄ, gÁªÀiÁAiÀÄt UÀ¼ÀÄ, ªÀÄºÁ¨sÁgÀvÀUÀ¼ÀÄ

¥ÀgÁªÀÄ±Àð£ÀUÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀCzsÀåAiÀÄ£À ¸À¸ÀÜÉAiÀÄ PÀ£ÀßqÀ ¸Á»vÀåZÀjvÉæ ¸À¥ÀÄ UÀ¼ÀÄ 1, 2 ªÀÄvÀÄÛ 3
2. ¸ÀªÀÄUÀæPÀ£ÀßqÀ ¸Á»vÀåZÀjvÉæ ¸À¥ÀÄ UÀ¼ÀÄ, ¨ÉAUÀ¼ÀÆgÀÄ «±Àé«zÁå®AiÀÄ
3. PÀ£ÀßqÀ£Á¸Àz ÀåÄõÀåUÀ¼ÀÄ : ².ZÉ£ÀߪÀÄÄðÀ
4. PÀ£ÁðI PÀ ¸À¸ÀÌöwvÀ ¸ÀªÉÃPÉë : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
5. PÀ£ÀßqÀ±Á¸À£ÀUÀ¼À ¸ÁA¸ÀÌöwPÀCzsÀåAiÀÄ£À : JA. azÁ£ÀAzÀªÀÄÆwð
6. eÉÊ£ÀzsÀªÀÄð : «ÄÃð CuÁÚgÁAiÀÄ
7. ¨sÁgÀvÀÃAiÀÄ ¸À¸ÀÌöw : (¸À) ಅ.ನ. ಕೃಷ್ಣರಾಯ
8. PÀ£ÁðI PÀ¥ÀgÀ¥ÀgÉ : ¨sÁUÀ1 ªÀÄvÀÄÛ2, PÀ£ÀßqÀªÀÄvÀÄÛ¸À¸ÀÌöw E¯ÁSÉ
9. ZÀ¥ÀÆ ¸Á»vÀå : ¦. «. £ÁgÁAiÀÄt
10. PÀ£ÁðI PÀ ¸Á»vÀåCPÁqÉ«ÄAiÀÄ PÀ£ÀßqÀ ¸Á»vÀå¥ÀÄ£Àgï ªÀÄÄ¢ævÀ ªÀiÁ®AiÀÄ ¸À¥ÀÄ UÀ¼ÀÄ
11. PÀ£ÀßqÀ ¸Á»vÀåZÁj wæPÀ ¨É¼ÀªÀtÂUÉ(ªÀÄzsÀåPÁ®) : ¹.«ÃgÀtÚ

KNA 030: ¥ÀwæPÉ3 PÀ£ÀßqÀbÀAzÀ¸ÀìCzsÀåAiÀÄ£À(3:1=4 PÉærrmï)

Course Outcome

CO1: Specify in details with examples Chandassu
CO2: Learn the details of Sonnet
CO3: Learn the characteristics of 'Praasa'
CO4: Understand in depth 'Kanda'

1. ಅ) ಛಂದಸ್ಸಿನ ಉಗಮ, ನಿಷ್ಪತ್ತಿ ಮತ್ತು ಪ್ರಯೋಜನ
   D) ªÀÄðUÀ, ªÀiÁvÁæUÀt ªÀÄvÀÄÛCA±ÀUÀtUÀ¼À ¸ÀgÀ¼À¥ÀjZÀ
   E) AiÀÄwAiÀÄ ¸ÀgÀ¼À¥ÀjªÀÄvÀÄÛ¥ÀæAiÉÆÃUÀ
2. C) ¥ÁæÀ ¸ÀgÀ¼À¥Àj ¥ÀæsÉÃzÀªÀÄvÀÄÛ¥ÀæAiÉÆÃUÀ
   D) SÁAqÀPÀ£ÁðI PÀUÀ¼À ¸ÀgÀ¼À¥ÀjZÀ
   E) PÀAzÀ¥ÀzÀåUÀ¼À ªÀÄvÀÄÛ¸ÀgÀ¼À¥ÀjZÀ
3. C) wæ¥À¢AiÀÄ®PÀët ªÀÄvÀÄÛ¥ÀæsÉÃzÀUÀ¼ÀÄ
   ಆ) ಷಟ್ಪದಿಯ ಮೂಲ, ಲಕ್ಷಣ ಮತ್ತು ಪ್ರಭೇದಗಳು
   E) ¸ÁAUÀvÀå ªÀÄÆ® ªÀÄvÀÄÛ®PÀët
4. ಅ) ಹೊಸಗನ್ನಡ ಛಂದಸ್ಸು : ತತ್ತ್ವಗಳು, ಪರಿಭಾಷೆ
   D) ¸ÀgÀ¼ÀgÀUÀ¼ÉAiÀÄ ªÀÄÆ® ªÀÄvÀÄÛ¸ÀgÀ¼À¥ÀjZÀ
   E) ¸Á£ÉmïªÀÄÆ® ªÀÄvÀÄÛ¸ÀgÀ¼À¥ÀjZÀ

¥ÀgÁªÀÄ±Àð£ÀUÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀbÀAzÀ¸ÀìA¥ÀÄl : (¸À) J¯ï §¸ÀªÀgÁdÄ
2. PÀ£ÀßqÀPÉÊr ¸À¥ÀÄl 1 ¨sÁUÀ2 : ªÉÄÊ¸ÀÆgÀÄ «±Àé«zÁå®AiÀÄ
3. dAiÀÄzÁªÀÄ£ï : (¸À) JZï.r. ªÉÄ®t PÀgï
4. PÀ£ÀßqÀbÀAzÉÆÃ«PÁ¸À : r.J¸ï. PÀgÀÌ
5. ¸ÀªÀiÁ£ÉÆÃPÀ£À : wÃ£À²æÃ

6. PÀÀªÀåÀbÀAzÀ¸ÀÄßgÀÆ¥À : n.«. ªÉAPÀmÁZÀ®±Á¹ÛçÃ
7. ¦ÃoÀPÉUÀ¼ÀÄ, ¨ÉÆR£ÀUÀ¼ÀÄ : r.J¯ï. £ÀgÀ¹AºÁZÁgïï
8. PÀÀªÀåÀbÀAzÀ¸ÉÆÃ«ºÁgÀ : n.«. ªÉAPÀmÁZÀ®±Á¹ÛçÃ
9. bÀAzÉÆÃUÀw : ಸೇಡಿಯಾಪು ಕೃಷ್ಣಭಟ್ಟ
10. PÀÀªÀåÀbÀAzÀ¸ÀÄ : ¸ÉÃ AiÀiÁ¥ÀÄ ಕೃಷ್ಣಭಟ್ಟ
11. ºÉÆ¸ÀUÀÀªÀåÀPÀÀvÉAiÀÄ bÀAzÀ¸ÀÄ : PÉ. £ÁgÁAiÀÄt ¥ÀgÉÆÃzï
12. ¨ÉgÀªÀÄAiÀÄ bÀAzÀ¸Àì¥ÀzÀ : ¥ÀæsÉÆÃ. PÀ®PÀÀÄ
13. bÀAzÉÆÃvÀgÀAUÀ : JA. azÁ£ÀAzÀªÀÄÆwð
14. ಹೊಸಗನ್ನಡ ಕವಿತೆಯ ಮೇಲೆ ಇಂಗ್ಲಿಷ್ ಕಾವ್ಯದ ಪ್ರಭಾವ : J¸ï. C£ÀAvÀ£ÁgÁAiÀÄt
15. The Commonness in the Meters of the Dravidian Languages : S.Subrahmanyan
16. A Study of Metre : T.S. Omond
17. Metre, Rhyme and Free verse : G.S. Fraser

KNA 040: ¥ÀwæPÉ-4 «ªÀÄ±ÉðAiÀÄ CzsÀåAiÀÄ£À (2:1=3 PÉærrmïUÀ¼ÀÄ)

Course Outcome

CO1: Identify the classification and characteristics of Practical Criticism
CO2: Write down the details of Post-Colonial criticism
CO3: Deliberate the classification and characteristics of Marxian criticism
CO4: Understand in depth Preface to Lyrical Ballads

1. (C) Preface to Lyrical Ballads : W. Wordsworth
   (D) Literature & Pshychology : Carl Jung. S
2. (C) ¥ÁæAiÉÆÃVPÀ «ªÀÄ±ÉðUÀ¼ÀÄ, ¸ÀégÀÆ¥À ªÀÄvÀÄÛ
   (D) ªÀ¸ÁºÀvÀÄ Dzs£ÀPÀPÁ«ªÀ±ÀðÀ (£ÀªÀåªÁzÀAiÀÄ, £ÀªÀåªÁzÀvÀ§AqÁAiÀÄ)
3. (ಅ) ರೂಪನಿಷ್ಠ ವಿಮರ್ಶೆ, ಮಾಕ್ಸ್‌ವಾದಿ ªÁ¢ «ªÀÄ±ÉðÉ, ¹ÛçÃªÁ¢ «ªÀÄ±ÉðÉ
4. (C) ªÀ¸ÁºÀvÀå- ªÀ¸ÁºÀvÉåÃvÀgÀ«ªÀÄ±ÉðÉ

¥ÀgÁªÀÄ±ÀðUÀæAxÀUÀ¼ÀÄ

1. ¥Á±ÁÑvÀåPÁªÀå «ÄªÀiÁA¸É : «.JA. E£ÁªÀÄzÁgï
2. ¸Á»vÀå«ªÀÄ±ÉðAiÀÄ vÀvÀéUÀ¼ÀÄ : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä (¸À.±ÀjÃ¥s JZï.n)
3. ಇಂಗ್ಲಿಷ್ ಭಾಷೆಯಲ್ಲಿ ಆಧುನಿಕ ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆ : ಎಲ್.ಎಸ್. ಶೇಷಗಿರಿರಾವ್
4. ¥ÀæwÃw Ä : Vj r ØUÉÆÃ« AzÀgÁdÄ
5. PÁªÀåvÀvÀé aAvÀ£À : f.J¸ï. ²ªÀgÀÄzÀæAiÀÄå
6. ¸Á»vÀå«ªÀÄ±ÉðÉ : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï
7. ವಿಮರ್ಶೆಯ ಪರಿಭಾಷೆ : ಓ.ಎಲ್. ನಾಗಭೂಷಣಸ್ವಾಮಿ
8. «ªÀÄ±ÉðAiÀÄ vÀvÀéUÀ¼ÀÄ «zsÁ£ÀUÀ¼ÀÄ : (¸À) «.PÀÈ UÉÆÃPÁPï & PÀ®PÀÀÄ
9. ¥ÁæAiÉÆÃVPÀ «ªÀÄ±ÉðÉ : (¸À) f.J¸ï. ²ªÀgÀÄzÀæAiÀÄå, J£ï.J¸ï. ®PÀëöäãÁgÁAiÀÄt ¨sÀlÖ
10. NzÀÄUÀgÀ ªÀÄvÀÄÛ NzÀÄ«PÉ : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï
11. ªÀ¸ÁºÀvÉåÃvÀgÀ aAvÀ£É : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï

12. ¹ëµÁ ÁzÀ : ¸ÀÄ«ÄvÁæ ¨ÁÄ©.J£ï
13. Literary Criticism – A Short History : W.K.Wimsatt & Cleanth Brooks
14. Contemporary Criticism : (Ed) Sethuraman V S

G¥ÀàÀÆ£Àವಿಷಯಗಳು (Soft Core)

KNA 210: ¥ÀwæPÉ 5.1 ಭಾಷಾ ವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು (3:1=4 PÉæwïÜ)

Course Outcome

CO1: Identify the details of Lanugage
CO2: Understand the characteristics of Phonetics
CO3: Learn in details with examples Bashe mattu Baraha
CO4: Write down in details with examples Morphology

1. ಭಾಷೆ: ªÁSÁå£ÀUÀ¼ÀÄ ®PÀëtUÀ¼ÀÄ, ¸ÀégÀÆ¥À; ಭಾಷಾ ವಿಜ್ಞಾನದ ಸ್ವರೂಪ- ªÁå¦Û ಪ್ರಯೋಜನಗಳು, ಭಾಷೆಯ GUÀªÀÄ ¹zÁÞAvÀUÀ¼ÀÄ, ಭಾಷೆಗಳ ವರ್ಗೀಕರಣ zÀæªÁqÀ ¨sÁµÉUÀ¼ÀÄ ಭಾರತೀಯ ಭಾಷೆಗಳ ªÀVÃðPÀgÀt
2. zÀé- G¥Àà zÀé : ªÁåSÉå ¸ÀégÀÆ¥À ; zÀé«eÁÕ£À ±ÁSÉUÀ¼ÀÄ, zÀéªÀiÁ : ªÁåSÉå ¸ÀégÀÆ¥À zÀéªÀiÁ ¤tðAiÀÄzÀ vÀvÀéUÀ¼ÀÄ
3. DPÀÈwªÀiÁ : ªÁåSÉå ¸ÀégÀÆ¥À ªÁå¦Û- DPÀÈwªÀiÁ ¤tðAiÀÄ £ÉêÀÄ vÀvÀéUÀ¼ÀÄ, DPÀÈwªÀiÁzÀ §UÉUÀ¼ÀÄ
4. ಭಾಷಿಕ ಬದಲಾವಣೆ ; ಭಾಷಿಕ ಸ್ವೀಕರಣ, ಭಾಷೆ ಮತ್ತು ಬರಹ

¥ÀgÁªÀÄ±Àð£ÀPÀÈwUÀ¼ÀÄ

1. ªÀÄð£ÁvÀäPÀ ªÁå¸À : JZï.J¸ï. ©½Äj
2. ಭಾಷಾವಿಜ್ಞಾ£ÀzÀ ªÀÄÆ®vÀvÀéUÀ¼ÀÄ : JA. azÁ£ÀAzÀªÀÄÆwð
3. ಭಾಷೆ ಮತ್ತು ಭಾಷಾವಿಜ್ಞಾನ : PÉ.PÉÃ¥ÀÄÖUËqÀ
4. ಸಾಮಾನ್ಯ ಭಾಷಾವಿಜ್ಞಾನ : PÉ.PÉÃ¥ÀÄÖUËqÀ
5. ಆಧುನಿಕ ವರ್ಣನಾತ್ಮಕ ಭಾಷಾವಿಜ್ಞಾನ : gÁeÉÃ±ÀégÀ ªÀÄ°èÃ±ÀégÀAiÀÄå
6. ಭಾಷೆ : (¸À) PÉ¸. £ÁgÁAiÀÄt
7. Language : Leonard Bloomfield
8. Language : Edward Sapir
9. A Course in Modern Linguistics : C.F. Hackett
10. Modern Linguistics : S Potter
11. Introduction to theoretical Linguistics : J. Lyons
12. Historical Linguistics An Introduction : W.P. Lehmann

KNA 210: ¥ÀwæPÉ 5.2 eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À: eÁ£À¥ÀzÀ ¸Á»vÀå ªÀÄvÀÄÛ CzsÀåAiÀÄ£À

Course Outcome

CO1: understood the knowledge of Kannada Folklore
CO2: Students must learn the Ancient and Present styles of Kannada Folklore
CO3: Helps the students to undertake Research in the field of Kannada Folklore
CO4: understood the importance of Kannada Folklore

1. d£À¥ÀzÀ– eÁ£À¥ÀzÀ: ªÁåSÁå£À, ¸ÀégÀÆ¥À, ªÁå¦Û, ªÀÄºÀvÀé ; Dç¤ªÁ¸À (§ÄqÀPÀlÄÖ), ªÀÄÆ®¤ªÁ¹, ªÉÊ¢PÀ, C£ÁUÀjPÀ, eÁ£À¥ÀzÀ ªÀÄvÀÄÛ eÁ£À¥ÀzÀ ªÀÄvÀÄÛ Evg˸À«eÁÕ£ÀUÀ¼ÀÄ, eÁ£À¥ÀzÀ ªÀÄvÀÄÛ zÉñÀ ªÁåz, d£À¥ÀzÀ ¸Á»vÀå ªÀÄºÀvÀé, ಶಿಷ್ಟ ಮತ್ತು ಜನಪದ ಸಾಹಿತ್ಯ

2. d£À¥ÀzÀ vÀvÀé PÀ¯ÁPÀ ªÀiÁ¯Á ¥À, d£À¥ÀzÀ ªÀÄ ÁPÁ ªÀi d£À¥ÀzÀ PÀ¸ÉUÀ¼ÀÄ – Eª ÀÅUÀ¼À ¸ÀégÀÆ¥À, ®PÀët, »£É¯É ¥À¸ÀgÀ

3. d£À¥ÀzÀ UÁzÉ – d£À¥ÀzÀ MUÀ, MqÀ¥À, zÀ vÀPÀ¼É Lw º ÀÅ¥À Áq À¥ÀÄgÁt Eª ÀÅUÀ¼À ¸ÀégÀÆ¥À, ®PÀët, »£É¯É ¥À¸ÀgÀ

4. d£À¥ÀzÀ PÀ¯ÉUÀ¼ÀÄ : ¸ÀégÀÆ¥À – PÀ¯ÉvÀAvÀæ ªÀÄvÀÄÛ ªÀÄÆ®UÀ¼À UÀ¼ÀÄ – PÀ¯ÉUÀ¼ÀÄ zÀ¥À ±Á¹ÛçÃAiÀÄ zÀ¥ÀPÀgÀuÉUÀ¼ÀÄ PÀ¯ÉUÀ¼ÀÄ zÀ¥ÀPÀgÀuÉUÀ¼ÀÄ

¥ÀgÁªÀÄ±Àð£ÀPÀÈwUÀ¼ÀÄ

1. eÁ£À¥ÀzÀ vÀvÀé±Á¸ÀÛç	: (¸À) CgÀ«AzÀ ªÀiÁ®UÀwÛ
2. eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À	: zÉdUË
3. d£À¥ÀzÀ ¥ÀÄgÁt UÀ¼ÀÄ	: gÁUË
4. eÁ£À¥ÀzÀ	: f.±À. ¥ÀgÀªÀÄ ²ªÀAiÀÄå
5. eÁ£À¥ÀzÀ ¸ÀégÀÆ¥À	: ºÁªÀiÁ £ÁAiÀÄPÀ
6. ¨sÁgÀwÃAiÀÄ eÁ£À¥ÀzÀ ¸À«ÄÃPÉë	: zÉÃUÁð ¨sÀUÀªÀwï C£ÀÄ: PÉ.ªÀÄgÀÄ¼À zÀ¥À
7. ¨sÁgÀwÃAiÀÄ ¥ÀgÀ¥ÀgÉ º ÁUÀÆ ¸Á»vÀå ªÀÄÆ®UÀ¼ÀÄ	: zÉÃUÁð ¨sÀUÀªÀwï C£ÀÄ: ©.J. «ªÉÃPÀgÊ
8. £ÀªÀÄä UÁzÉUÀ¼ÀÄ	: gÁUË
9. d£À¥ÀzÀ PÀ ªÀiÁUÀ¼ÀUÀ¼ÀÄ	: ».².gÁªÀÄZÀAzÀæ±ÉÃRgÀ
10. d£À¥ÀzÀ DI UÀ¼ÀÄ	: PÀ£ÁðI PÀ eÁ£À¥ÀzÀ AiÀÄPÀëUÁ£À CPÁqÉ«Ä
11. eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À– ¸ÀA¥ÀÄl w º Á¸À	: £À. vÀªÀÄä¥Àà ªÀiÁgï
12. eÁ£À¥ÀzÀ PÉ®ª Àå ªÀÄÄR UÀ¼ÀÄ	: f.±À. ¥ÀgÀªÀÄ ²ªÀAiÀÄå
13. d£À¥ÀzÀ ¸Á»vÀå gÀÆ¥ÀUÀ¼ÀÄ	: gÁUË
14. eÁ£À¥ÀzÀ ¥À±Éß±À	: ZÀAzÀæ±ÉÃRgÀ PÀA¨ÁgÀ
15. eÁ£À¥ÀzÀ ¸ÀªÀiÁªÀ±À	: (¸À) f.±À. ¥ÀgÀªÀÄ ²ªÀAiÀÄå
16. eÁ£À¥ÀzÀ ªÁ»¤	: zÉ. dªÀgÉÃUËqÀ
17. zÀQët PÀ£ÁðI PÀ d£À¥ÀzÀ ¥ÀzÀågÀÆUÀ¼ÀÄ	: f.±À. ¥ÀgÀªÀÄ ²ªÀAiÀÄå
18. eÁ£À¥ÀzÀ ¸À«ÄÃPÉë	: CA§½PÉ »jAiÀÄt Ú
19. PÀ£ÁðI PÀ eÁ£À¥ÀzÀ	: (¸À) f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
20. eÁ£À¥ÀzÀ ªÀÄºÀ® ¨sÀvÀvÀvÀé±Á¸ÀÛç	: zÉªÉÃAzÀæPÀĪÀiÁgÀ ºÀPÁj
21. PÀ£ÀßqÀ eÁ£À¥ÀzÀ: PÉ®ª Àå ªÀÄÄR UÀ¼ÀÄ	: n.J¸ï. ¸ÀwåzsÀ
22. eÁ£À¥ÀzÀ: ªÉÊeÁÕ¤PÀ PÀ¯ÉUÀ¼ÀÄ	: ¹.¹.J.¥É
23. zÁæ«qÀ eÁ£À¥ÀzÀ	: (¸À) JZï. eÉ®PÀëöäÃUËqÀ
24. ªÀÄ É£ÁqÀÄ eÁ£À¥ÀzÀ	: (¸À) JZï. eÉ®PÀëöäÃUËqÀ
25. eÁ£À¥ÀzÀ ¸Á»vÀå zÀ±À£À ¸À¥ÀÄ UÀ¼ÀÄ	: PÀ£ÁðI PÀ «±ÀézÁå®AiÀÄ, zsÁgÀªÁqÀ
26. eÁ£À¥ÀzÀ «« zsÀ ªÀÄÄR UÀ¼ÀÄ	: (¸À) ¥ÉæÃªÀiÁ ªÀPÀÛ¯ÉÃ UÉ
27. ¸ÉÆÃ¯ÁwPÀ eÁ£À¥ÀzÀ	: CA§½PÉ »jAiÀÄt Ú
28. Folklore and Folk life	: Ed. Richard M Dorson
29. The study of Folklore	: Ed: Alan Dundes
30. Folklore Genres	: Dass Ben Amos
31. The Folktale	: Stith Thompson

32. Current Trends in Folklore : Jawaharlal Handoo
33. Story Performance and Event : Richard Bauman

KNA 210 : ¥ÀwæPÉ 5.3 ZÁjwæPÀ ¸ÀAzÀ»ðAiÀÄ°è PÀ£ÁðlPÀ ¸ÀA¸ÀÌøwAiÀÄ CzsÀåAiÀÄ£À

Course Outcome

CO1: Understood the Concept of Culture and Kannada-Karnataka culture
CO2: Learn the History of Kannada Literature
CO3: Understood the relationship between historical events and Kannada Literature from 9th to 14th Century.
CO4: understood the importance of Kannada Culure

1. ¸ÀA¸ÀÌøw JAzÀgÉãÀÄ? PÀ£ÁðlPÀ ¸ÀA¸ÀÌøwAiÀÄ CzsÀåAiÀÄ£ÀzÀ ªÀiÁ£ÀzÀAqÀ ¸Á¢ ªÀÄvÀÄÛ PÀ£ÁðlPÀzÀ ¥ÁæaãÀvÉ – zÉÃgÉÆÃA ªÀiÁ£ÀvÉ ªÀÄvÀÄÛ CªÀÄÄ¸À¼ÀÄ ¥ÀoÀå
2. PÀzÀA§gÀÄ: ªÀÄAiÀÄÆgÀªÀªÀÄð, PÁPÀÄvÀìªÀªÀÄð;
ಗಂಗರು: ದುರ್ವಿನೀತ, ಶ್ರೀಪುರುಷÀ
¨ÁzÁ«ÄAiÀÄ ZÁ®ÄPÀågÀÄ: E¥ÀÄä ¥ÀÄ®PÉÃ², E¥ÀÄä «PÀæªÀiÁ¢vÀå
3. ರಾಷ್ಟ್ರಕೂಟರು: ಮುಮ್ಮಡಿ ಗೋವಿಂದ, ಅಮೋಘವರ್ಷ ನೃಪತುಂಗ, ಮುಮ್ಮಡಿ ಕೃಷ್ಣ
PÀÄåtzÀ ZÁ®ÄPÀågÀÄ: E¥ÀÄä vÉÊ®¥À, E¥ÀÄä dAiÀÄ¹AºÀ, DgÀªÉÄAiÀÄ «PÀæªÀiÁ¢vÀå
ºÉÆAiÀÄì¼ÀgÀÄ: ವಿಷ್ಣುವರ್ಧನ, ಇಮ್ಮಡಿ ಬಲ್ಲಾಳ
4. ವಿಜಯನಗರ: ಇಮ್ಮಡಿ ದೇವರಾಯ, ಕೃಷ್ಣದೇವರಾಯ; ಮೈಸೂರು ಒಡೆಯರು, ಚಿಕ್ಕದೇವರಾಯ, ಮುಮ್ಮಡಿ ಕೃಷ್ಣರಾಜ

2, 3 ªÀÄvÀÄÛ 4£ÉÃ WÀlPÀUÀ¼À°è DAiÀÄ gÁdgÀ PÁ®zÀ gÁdQÃAiÀÄ, zsÁ«ÄðPÀ, ¸ÁªÀiÁfPÀ ¸ÀA¸ÀÌøwPÀ ¨É¼ÀªÀtÂUÉUÀ¼À£ÀÄß C¨sÁå¸À ªÀiÁqÀ¯ÁUÀÄªÀÅzÀÄ. gÁdQÃAiÀÄ JAzÀgÉ ZÁjwæPÀ «ªÀgÀUÀ¼ÀÄ; zsÁ«ÄðPÀ JAzÀgÉ Ëzï, eÉÊ£À ªÀÄvÀÄÛ PÀ«ÄðPÀ ªÀÄvÀzÀ «ªÀgÀUÀ¼ÀÄ, ¸ÁªÀiÁfPÀ ¸ÀA¸ÀÌøwPÀ ºÁUÀÆ DqÀ½vÀzÀ£ÀÄß ¸ÀÆa¸ÀÄªÀ DvÀäPÀ°ºÀzÀ ¥Àæ¨sÀÄvÀéUÀ¼À£ÀÄß, zÉÃ¸ÀzÀ ¸ÁªÀiÁfPÀ ªÀÄÄR®è

¥ÀgÁªÀÄ±ÀðPÀ UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÁðlPÀ ¸ÀA¸ÀÌøwAiÀÄ 1,2,3,4,5 : PÀ£ÀßqÀ ¥ÀæPÁ±ÀPÀ ¸ÀA¸ÀÜ, ªÉÄÊ¸ÀÆgÀÄ
2. PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw ¸ÀªÀÄÄzÀæ : JZï. w¥ÉàgÀÄzÁæ¸Áé«Ä
3. PÀ£ÁðlPÀ±Á¸À£ÀUÀ¼À ¸ÀA¸ÀÌøwPÀ CzsÀåAiÀÄ£À : JA. azÁ£ÀAzÀªÀÄÆwð
4. ªÀiÁUÀð 1, 2, 3 : JA.JA. PÀ®§ÄVð
5. PÀ£ÁðlPÀzÀ CgÀ¸ÀÄ ªÀÄ£ÉvÀ£ÀUÀ¼ÀÄ : J£ï. ®Qëöä£ÁgÁAiÀÄt gÁªï ªÀÄvÀÄÛ Dgï.J¸ï. ¥ÀAZÀªÀÄÄR
6. PÀ£ÁðlPÀ Ewº Á¸À : JA. «. ಕೃಷ್ಣರಾವ್ ಮತ್ತು ಕೇಶವಭಟ್ಟ
7. PÀ£ÁðlPÀ ¥ÀgÀA¥ÀgÉ 1, 2 : PÀ£ÁðlPÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw E¯ÁSÉ
8. PÀ£ÁðlPÀ ZÀjvÉæ : PÀ£ÁðlPÀ «±Àé«zÁå®AiÀÄ, ºÀA¦
9. ವಿಷಯ ವಿಶ್ವಕೋಶ : ಕರ್ನಾಟಕ : PÀ£ÀßqÀ ¥ÀæPÁ±ÀPÀ ¸ÀA¸ÀÜ
10. Karnataka Darshana : R.R. Diwakar
11. The Heritage of Karnataka : R.S. Mugali
12. A History of south India : K.A. Nilakntha Shastry
13. Early History of Deccan I & II : Yazdani
14. Administration and Social Life Under Vijaynagar : T.V. Mahlingam

JgÀqÀ£ÉAiÀÄ ZÀvÀÄ¸ÀìªÀÄ

ಪ್ರಧಾನ ವಿಷಯUÀ¼ÀÄ (Hard core)

KNB 010: ¥ÀwæPÉ-1 ªÀÄzsÀåPÁ® PÀ£ÀßqÀ ¸Á»vÀå-ªÀZÀ£À ¸Á»vÀå (3:1=4 PÉærmï)

Course Outcome

CO1: Specify in depth Vachanas' of Jedara Dasimayya
CO2: Understand the characteristics of Vachanas' of Basavanna
CO3: Specify in details with examples Vachanas' of Akkamahadevi
CO4: Deliberate the details of Vachanas' of Ambigara Chowdayya

»£ÉßÉ¯ÉAiÀÄ¢£À ¸Á«ÄAiÀÄ PÀ¸ÀÄ¸ÀÄvÀPÀÌ ÃªÀÄ ªÀZÀ£ÀPÁzÀgÉÆ®£ÀÀ ¸ÀgÀÆ¥À
eÉÃqÀgÀ zÁ¹ªÀÄAiÀÄå §¸ÀªÀtÚ CPÀÌªÀÄºÁzÉÃ«, CA©UÀgÀ ZËqÀAiÀÄå - F £Á®ÌgÀ ªÀÄ¢
ªÀZÀ£ÀUÀ¼À »£ÉßÉ ªÀÄvÀÄÛ ¸ÀÜ½ ªÀÄºÀvÀé

1. eÉÃqÀgÀ zÁ¹ªÀÄAiÀÄå£À ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀå¢AzÀ ªÀZÀ£ÀUÀ¼ÀÄ)

721, 722, 742, 744, 764, 765, 768, 774, 785, 793, 799, 801, 808, 810, 818, 831, 838, 841, 853, 862, 866, 878, 880, 884, 893

2. §¸ÀªÀtÚ£À ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀå¢AzÀ ªÀZÀ£ÀUÀ¼ÀÄ)

26, 29, 34, 59, 62, 83, 92, 93, 97, 115, 129, 130, 155, 161, 183, 208, 212, 223, 235, 241, 291, 436, 438, 447, 557,

CPÀÌªÀÄºÁzÉÃ«AiÀÄ ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀå¢AzÀ ªÀZÀ£ÀUÀ¼ÀÄ)

28, 33, 52, 95, 125, 143, 163, 196, 268, 290, 303, 307, 321, 330, 340, 364, 365, 398, 411, 412, 413, 419, 426, 429, 432

3. CA©UÀgÀ ZËqÀAiÀÄå£À ªÀZÀ£ÀUÀ¼ÀÄ (DAiÀÄÝ ¥ÀoÀå¢AzÀ ªÀZÀ£ÀUÀ¼ÀÄ)

6, 7, 9, 17, 25, 27, 35, 53, 54, 79, 88, 106, 110, 139, 157, 158, 169, 187, 189, 242, 243, 244, 245, 247, 252

¥ÀoÀåªÀ¸ÀÄÛ :

1. ¸ÀªÀÄUÀæ ªÀZÀ£À ¸ÀA¥ÀÄl 2 : (¸ÀA) J¸ï. «zÁå±ÀAPÀgÀ, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw EFÁSÉ ¨ÉAUÀ¼ÀÆgÀÄ
2. §¸ÀªÀtÚ£ÀªÀgÀ ªÀZÀ£À ¸ÀA¥ÀÄl : (¸ÀA) JA.JA. PÀ®§ÄVð, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw EFÁSÉ ¨ÉAUÀ¼ÀÆgÀÄ
3. ²ªÀ±ÀgÀuÉAiÀÄgÀ ªÀZÀ£À ¸ÀA¥ÀÄl : (¸ÀA) «ÃgÀAÚgÁd£ÀgÀ, PÀ£ÀßqÀ ¥ÀÄ¸ÀÛPÀ ¥Áæ¢üPÁgÀ ¨ÉAUÀ¼ÀÆgÀÄ
4. ¸ÀªÀÄUÀæ ªÀZÀ£À ¸ÀA¥ÀÄl 1: (¸ÀA) JA.JA. PÀ®§ÄVð, PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw EFÁSÉ ¨ÉAUÀ¼ÀÆgÀÄ

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. ªÀZÀ£À¸ÁägÀ	: JA.Dgï. ²æÃ¤ªÁ¸ÀªÀÄÆwð
2. ªÀZÀ£Á§ÄgÀ¸ÀÄ	: gÀ.gÁ. ¢ªÁPÀgÀ
3. ಬಸವಣ್ಣನವರ ಷಟ್ಸ್ಥಲದ ವಚನಗಳು	: J¯ï. §¸ÀªÀgÁdÄ
4. §¸ÀªÀ£ÀªÀgÀ ªÀZÀ£ÀªÀÄÆ°PÀ¸ÀA¥ÀÄl 1 ªÀÄvÀÄÛ 2	: J¯ï. §¸ÀªÀgÁdÄ
5. §¸ÀªÀ£ÀªÀgÀ ªÀZÀ£ÀUÀ¼ÀÄ	: ¥sÀ.UÀÄ. ºÀ¼ÀPÀnÖ
6. ¨sÀQÛ sÀAqÁj §¸ÀªÀ£ÀªÀgÀÄ	: JA.Dgï. ²æÃ¤ªÁ¸ÀªÀÄÆwð
7. ±ÀgÀt gÀ£ÀßgÀ ¸ÁªÀiÁfPÀ ¸Á»vÀå	: JZï. wªÉÄäÃ±ÀUËqÀ
8. §¸ÀªÉÆÃvÀÛgÀ ªÀZÀ£À¸ÀA¥ÀÄl	: JZï. wªÉÄäÃ±ÀUËqÀ
9. CPÀÌ£À ªÀZÀ£À aAvÀ£À	: C£ÀÄ¥ÀªÀiÁ ¸ÀUÀgÀ
10. Sri Basaveswara and His contemporaries	: A R Jayaram
11. The thoughts of Basava	: N K Sanakalmath
12. Hand book of Veerashavism	: S C Nadimath
13. Speaking of Siva	: A.K. Ramanujan

KNB 020: ¥ÀoÀå-2 ªÀÄzsÀåPÁ°Ã£À PÀ£ÀßqÀ ¸Á»vÀåzÀ »£É߯É (2:1=3 PÉærqïì)

Course Outcome

CO1: Deliberate in depth Religios background of Medival Kannada Lieterature
CO2: Identify in details with examples Political background of Medival Kannada Lieterature
CO3: Identify the characteristics of Kinds of Medival Kannada Lieterature
CO4: Deliberate in depth Influence of Dravidian Languages on Medival Kannada Lieterature

1. gÁdQÃAiÀÄ »£É߯É: PÀ¯Áåt ZÁ®ÄPÀågÀÄ ¤Ãr¸Àå ¸Á»vÀå¥ÉÆÃµÀuÉ- ಪೋಷಣೆ, ºÉÆAiÀÄìgÀÄ ¤ÃrzÀ eÉÊ£À- ವೈಷ್ಣವ ಸಾಹಿತ್ಯ ಪೋಷಣೆ, PÀQÁðAiÀÄ ªÀZÀ£ÁAzÉÆÃ®£À JzÀÄj¹zÀ ¥ÀæwPÀÆ® gÁdQÃAiÀÄ ¸ÀAzÀ¨sÀð - ಪ್ರತಿಭಟನೆ, ಸಮಾನತೆಯ ಘೋಷಣೆ; «dAiÀÄ£ÀUÀgÀzÀ CgÀ¸ÀgÀ PÁ®zÀ ªÉÊPÀ - «ÃgÀ±ÉÊªÀzÀ ¸ÀÆÛUÀ¼À¥ÀÄ£ÀgÀÄvÁÜ£À
2. ಧಾರ್ಮಿಕ ಹಿನ್ನೆಲೆ : ಶೈವ, ವೀರಶೈವ, ವೈಷ್ಣವ, ಜೈನ ಧರ್ಮಗಳು: ಸ್ವರೂಪ¸À¹ÃÝAvÀ, ¸ÁzsÀ£É, eÉÊ£À zsÀªÀÄð JzÀÄj¹zÀ DvÀAPÀUÀ¼ÀÄ: ªÉÊPÀzsÀªÀÄðzÀ ¥ÀÄ£ÀgÀÄvÀÛ£À
3. ªÀZÀ£À gÀUÀ¼É ¸Á»vÀåUÀ¼À£ÀÄß ¸ÀªÀÄÈzÀÞ PÀ°¸ÀÄ®ÄUÀ¼ÀÄ: gÀUÀ¼Éಷಟ್ಪದಿ ಕೃತಿಗಳಲ್ಲಿ ಬಂದ ಕರ್ನಾಟಕದ ಧಾರ್ಮಿಕ ಪುರುಷರ ಚರಿತ್ರೆ : ಭಾಗವತ - ¨sÀQÛ ¸Á»vÀå ¥ÀÄ£ÀgÀÄvÀÜ£À, QÃvÀð£À ¸Á»vÀå ¸ÀªÀÄÈzÀÞ PÀ°¸ÉÃUÀ¼ÀÄ
4. ಕನ್ನಡ ಭಾಷೆ- ¸Á»vÀå ªÉÄÃ¯É vÀ«Ä¼À, vÉ®ÄUÀÄ, ¸ÀA¸ÀÌøvÀ sÁµÉ- ¸Á»vÀåUÀ¼À ©ÃjzÀ ¥Àæ¨sÁªÀ¥ÀjuÁªÀÄ ¸ÀA§AzsÀ

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀ CzsÀåAiÀÄ£À ¸ÀA¸ÉÜAiÀÄ PÀ£ÀßqÀ ZÀjvÉæ ¸ÀA¥ÀÄl UÀ¼ÀÄ 1, 2 ªÀÄvÀÄÛ 3
2. ¸ÀªÀÄUÀæ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ ¸ÀA¥ÀÄl UÀ¼ÀÄ, ¨ÉAUÀ¼ÀÆgÀÄ «±Àé«zÁå®AiÀÄ

3. PÀªÀiÁ¤ £ÀzÀ ±À§ÝPÉÆÃ±ÀUÀ¼ÀÄ	: ².ZÉ£Àß¥Àà ªÀÄoÀ
4. PÀ£ÀßqÀ PÀ«¸ÀA¸Àäw ¸ÀA¥ÀÄlUÀ¼ÀÄ	: JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
5. PÀªÀiÁ±ÀAiÀÄ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøvÀ PÀ«UÀ¼ÀÄ	: JA. azÁ£ÀAzÀªÀÄÆwð
6. eÉÊ£À ¸Á»vÀå	: «Ä ð CuÁÚgÁAiÀÄ
7. ¨sÁgÀwÃAiÀÄ ¸ÀA¸Àäw	: (ಸಂ) ಅ.ನ. ಕೃಷ್ಣರಾಯ
8. PÀ£ÀßqÀ PÀ¥ÀÄgÁtªÀÄ	: ¨sÀUÀ1 ªÀÄvÀÄ2
9. ZÀ¥ÀÆ ¸Á»vÀå	: ¦. «. £ÁgÁAiÀÄt
10. PÀ£ÀßqÀ PÀ¸Á»vÀåCPÁqÉ«ÄAiÀÄ PÀªÀiÁ ¸Á»vÀå¥ÀæPÀgÀ ªÀÄvÀÄÛ ªÀiÁ£ÀªÀ ¸À¥ÀÄl UÀ¼ÀÄ	
11. ºÀjzÁ¸À ¸Á»vÀå	: Dgï. J¸ï. ¥ÀAZÀªÀÄÄT
12. ªÀZÀ£À ¸Á»vÀå ¸ÁgÀ	: JA.Dgï. ²æÃ¤ªÁ¸ÀªÀÄÆwð

KNB 030: ಪತ್ರಿಕೆ: ೩ ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ (2:1=3 PÉærmï)

Course Outcome

CO1: Learn the details of Dravidian Lingustics
CO2: Specify in depth Dravida
CO3: Specify in details with examples Dravidian Phonetics
CO4: Identify in details with examples Dravidian Morphology

1. ದ್ರಾವಿಡ ಪದದ ನಿಷ್ಪತ್ತಿ – ದ್ರಾವಿಡ ಭಾಷೆಗಳ ಸಂಖ್ಯೆ, ಸ್ವರೂಪ ಮತ್ತು ವರ್ಗೀಕರಣ
2. ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನದ ಇತಿಹಾಸ - ¸ÀégÀ«eÁÕ¤AiÀÄ «ZÁgÀ – zÁæväqÀ zsÀé¤ªÀiÁUÀ¼ÀÄ ZÀjvÉæ – Pï, Zï, mï, ¥ï. ¾ï, ¿ï
3. DPÀÈwªÀiÁUÀ¼ÀÄ CzsÀåAiÀÄ£À: ¸ÀªÀð£ÁªÀÄ, ºÀAUÀªÀÄ ZÀ£ÀÀ «¨sÀQÛ ¸ÀASÁåªÁZÀPÀUÀ¼ÀÄ ¸ÀASÉå¥ÀjZÀAiÀÄ, ZÀjvÉæ QæAiÀiÁ¥ÀæPÀÈwUÀ¼ÀÄ PÀÈzÀAvÀ ¥ÀævÀåAiÀÄUÀ¼ÀÄ
4. ಭಾಷಾವಿಜ್ಞಾನದ ದೃಷ್ಟಿಯಿಂದ ಮುಖವಾದ zÀPÉë¥ÀÀ¥ÀæzÉñÀUÀ¼À ºÁ¸À

¥ÀgÁªÀÄ±Àð£ÀPÀÈwUÀ¼ÀÄ

1. ಭಾಷಾವಿಜ್ಞಾನದ ಮೂಲತತ್ತ್ವಗಳು	: azÁ£ÀAzÀªÀÄÆwð. JA
2. ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ	: º À¥À£ÁUÀgÁd AiÀiÁ
3. zÁæväqÀ ¸ÀASÁåªÁZÀPÀUÀ¼ÀÄ	: º À¥À£ÁUÀgÁd AiÀiÁ
4. ದ್ರಾವಿಡ ಭಾಷಾವ್ಯಾಸಂಗ	: ¸ÀUÀÄuÉÃ±À ªÀÄ¹zÀ¼ÀÄÛ ªÀÄoÀ
5. ದ್ರಾವಿಡ ಭಾಷೆಗಳು	: ¸ÀUÀÄuÉÃ±À ªÀÄ¹zÀ¼ÀÄÛ ªÀÄoÀ
6. ಕನ್ನಡ ಭಾಷಾವ್ಯಾಸಂಗ	: ¸ÀUÀÄuÉÃ±À ªÀÄ¹zÀ¼ÀÄÛ ªÀÄoÀ
7. D¯ÉÆÃPÀ	: JZï.J¸ï. ©½AiÀÄ
8. ಕನ್ನಡ ಭಾಷೆಯ ರೂಪರೇಷೆಗಳು	: «ºÀAiÀÄ ªÀiÁqÀ¯ï
9. ಕನ್ನಡ ಭಾಷೆಯ ಸಂಕ್ಷಿ¥ÀÛ ZÀjvÉæ	: r.J£ï. ±ÀAPÀgÀ¨sÀl
10. PÀªÀiÁ¨sಾಷೆಯ ಚರಿತ್ರೆ	: ¥ÀæºÉèÃPÀëÃPÀ ºÀ
11. ಕನ್ನಡ ಭಾಷೆಯ ಸ್ವರೂಪ	: ಕೆ.ಎಂ. ಕೃಷ್ಣರಾವ್
12. ಐತಿಹಾಸಿಕ ಭಾಷಾವಿಜ್ಞಾನ	: eÉ¸ï. PÀÄ2
13. ವರ್ಣನಾತ್ಮಕ ಭಾಷಾವಿಜ್ಞಾನ	: eÉ¸ï. PÀÄ2
14. ದ್ರಾವಿಡ ಭಾಷೆಗಳ ತೌಲನಿಕ ಅಧ್ಯಯನ	: n. ªÀÄ ÂiÀÄ£ï
15. ತಮಿಳು ಭಾಷಾಚರಿತ್ರೆ	: n. ªÀÄ ÂiÀÄ£ï
16. ತೌಲನಿಕ ದ್ರಾವಿಡ ಭಾಷಾವಿಜ್ಞಾನ ಪರಿಚಯ	: PÉ PÀ¥ÉÃUËqÀ
17. ಸಂಕ್ಷಿಪ್ತ ಕನ್ನಡ ಭಾಷಾ ಚರಿತ್ರೆ	: ಎಂ.ಎಚ್. ಕೃಷ್ಣಯ್ಯ

18. A Comparative Grammar of the Dravidian Languages : R. Caldwell
19. History of Kannada Language : R Narasimahacharaya
20. Collected Papers on Dravidian Lingusistics : T. Burrow
21. Dravidian Comparative Phonology – A sketch : M.B. Emeneau
22. Dravidian Nouns : S.V. Shanmugam
23. Dravidian Verb Morphology : P.S. Subramanyam

KNB 040: ¥ÀwæPÉ 4 PÀ£ÀßqÀ «ªÀıÉð - ¥ÀoÀå: DAiÀÄÝ ¯ÉÃR£ÀUÀ¼ÀÄ (3:1=4 PÉærrmï)

Course Outcome

CO1: Identify in depth Feminism
CO2: Write down in details with examples Modern Criticism
CO3: Identify the characteristics of Protest Literature
CO4: Specify the classification and characteristics of Kannada Criticism

DzsÀ¤PÀ PÀ£ÀßqÀ «ªÀıÉðAiÀÄ ¸ÀégÀÆ¥À ªÀÄvÀÄÛ «²µÀ×vÉUÀ¼À£ÀÄß w½zÀÄPÉƼÀÄîªÀ GzÉÝñÀ¢AzÀ FUÀ¼À£ÀÄß DAiÀÄÝPÉƼÀî¯ÁVzÉ.

1 ªÀÄ»¼Á ¸ÀAªÉÃzÀ£É: PÀªÀÄ¯Á ºÀA¥À£À
2 PÁ¼ÉÃd: ºÉÆ¸À ¸Á»vÀå ªÀÄvÀÄÛ ºÉÆ¸À zÀȶÖ
3 ¤gÀAd£À: ¥Àæ§AzsÀ ¸Á»vÀåzÀ UÀwvÀÄÛPÀÛ UÀ¼ÀÄ
4 ±ÀPÀgÁªÀÄ ¥ÉÃi: ¥Àæ¯ÁèAiÀÄ ¸ÁA¸ÀÌøwPÀ ºÉÆ¸À ºÀ¼À£ÀßqÀ ¸Á»vÀå
5 ZÀAzÀæ±ÉÃRgÀ PÀA¨ÁgÀ: ªÀiËTPÀ ¥ÀgÀA¥ÀgÉ ªÀÄvÀÄÛ ¸ÁgÀ¸ÀéwAiÀÄ ¸Á»vÀå
6 £ÁUÀgÁeï.r .Dgï. : PÁ¼ÉÃd PÀªÀÄ¯Á ¥À§Ä zÀ°vÀ£À ªÀÄvÀÄÛ ¸ÉÆÃ«Ä
7 §gÀUÀÆgÀ gÁªÀÄZÀAzÀæ¥Àà: §AqÁAiÀÄ ¸Á»vÀå ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw
8 zÉÃªÀAiÀÄå ºÀgÀªÉ: zÀ°vÀ ¸Á»vÀå: PÉ®ªÀÅ wPÀÌ¼ÁVvÀ£À£ÀÄß
9 «dAiÀÄ zÀ§â: ºÉÆ£ÀßªÀ¼À ªÀÄÄUÀÝvÉ ¥ÀæeÉÕ
10 CgÀ«AzÀ ªÀiÁ®UÀwÛ: ¹ÃªÀiÁzÀ ¸ÀA¸ÀÌøw ºÁUÀÆ zÀ°vÀ ¹ÃªÀiÁzÀ¤ªÉÃzÀ£É

¥ÀgÁªÀıÀð UÀæAxÀUÀ¼ÀÄ

1 VgÀrUÉÆÃ«AzÀgÁd : ¥Àæ¸ÁgÁAUÀ PÀ« ºÀA¦, 2003
2 ©. zÁªÉÆÃzÀgÀgÁªï : DAiÀÄÝ ¯ÉÃR£ÀUÀ¼ÀÄ ¥Àæ¸ÁgÁAUÀ ¸Á»vÀå¥ÀjµÀvÀÄ, 1992
3 gÀºÀªÀÄvï vÀjÃPÉgÉ(¸ÀA) : PÀ£ÀßqÀ ¸Á»vÀå «ªÀıÉð ¸ÀA¥ÀÅl PÀ«, ºÀA¦, 2001
4 gÀºÀªÀÄvï vÀjÃPÉgÉ(¸ÀA) : ªÀiÁvÀÄ vÀvÀÛ ¸À§UÉ PÀ«, ºÀA¦, 2005
5 ®PÀëöät PÉÆqÀ¸É(¸ÀA) : PÀ£ÀßqÀ «ªÀıÉð «ªÉÃPÀ ¸À»vÀå ¥ÀæPÁ±À£À, 2008
6 QÃwð£ÁxÀ PÀÄvÀðPÉÆÃn : AiÀÄÄUÀzsÀªÀÄð ªÀÄvÀÄÛ ¸Á»vÀå zÀ±Àð£À
7 CgÀ«AzÀ ªÀiÁ®UÀwÛ(¸ÀA) : ¹ÃªÀiÁwÃvÀ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉ ¸À¥ÀÛ UÀ¼ÀÄ

G¥ÀAiÉÆÃUÀ ವಿಷಯಗಳು (Soft Core)

KNB 210: ಪತ್ರಿಕೆ: ೫.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ: ಕನ್ನಡ ªÁåPÀgÀt UÀæAxÀUÀ¼À CzsÀåAiÀÄ£À

Course Outcome

CO1: Specify the classification and characteristics of Old Kannada Grammar and Works
CO2: Specify in details with examples Kannada Grammar
CO3: Identify in details with examples Samasa
CO4: Identify the classification and characteristics of Tense

F PÉ¼ÀPÀAqÀ «µÀAiÀÄUÀ¼À£ÀÄß ±À§ÝªÀÄtÂzÀ¥ÀðtzÀ DzsÀgÀzÀ ªÉÄÃ¯É ಅಭ್ಯಾಸ ಮಾಡಬೇಕು. ಇತರ ವ್ಯಾಕರಣಗಳ ಸೂತ್ರಗಳನ್ನು ಅನುಷಂಗಿಕವಾಗಿ ಪ್ರಸ್ತಾಪಿಸಬೇಕು.

1. ಹಳಗನ್ನಡ ವ್ಯಾಕರಣಗಳು : ಕರ್ತೃ, ಕಾಲ, ಸ್ವರೂಪ, ಸ್ಥಾನ, ವೈಶಿಷ್ಟ್ಯ, ಕನ್ನಡ ವರ್ಣಸಮಾಮ್ನಾಯ- ªÀÄvÀÄÛ ¸ÀAzsÀUÀ¼ÀÄ – ¾¿- PÁªÀåzÀ «ZÁgÀ, ²y®¢éva
2. ¸ÀdÁwÃAiÀÄ¢ü – ªÀiÁ£ÀåAiÀÄ¢ü; °AUÀ®PÀë, ¸ÀªÀÄ£ÁªÀ ZÀ£À: ®PÀë, ¸ÀªÀÄ£Á¥ÀzÀ¥ÀæwAiÀÄUÀ¼ÀÄ, «¨sÀQÛ ®PÀë, ¸ÀªÀÄ£Á¥ÀzÀ¥ÀæwAiÀÄUÀ¼ÀÄ.
3. ¸ÀªÀiÁ¸À: ®PÀë, ¸ÀªÀÄ£ÁªÀ ತತ್ಪುರುಷ, ಕರ್ಮಧಾರೆಯ, ದ್ವಿಗು, ಅಂಶಿ, ಬಹುವ್ರೀಹಿ, ದ್ವಂದ್ವ, ಗಮಕ ªÀÄvÀÄÛ QæAiÀiÁ ¸ÀªÀiÁ¸À
4. Dಖ್ಯಾತ ಪ್ರತ್ಯಯ, ಪುರುಷತ್ರಯ, ಕಾಲತ್ರಯ – vÀzÀÞvÀ ¸ÀA¸ÀÌøvÀ C¥À¨sÀæ±À vÀzÀãªÀ

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. ¦ÃpPÉUÀ¼ÀÄ, ¨sÁµÉUÀ¼ÀÄ : r.J¯ï. £ÀgÀ¹AºÁZÁgï
2. D¯ÉÆÃPÀ : JZï.J¸ï. ©½AiÀÄ
3. ¥ÁæaÃ£ÀPÀ£ÀßqÀ ªÁåPÀgÀtUÀ¼ÀÄ : JA«. ¹ÃvÁgÁªÀÄAiÀÄå
4. ªÁåPÀgÀtUÀ¼ÀÄ : «. ¹ÃvÁgÁªÀÄAiÀÄå
5. ಕನ್ನಡ ವ್ಯಾಕರಣ ಪರಂಪರೆಯ ಮೇಲೆ ಸಂಸ್ಕೃತದ ಪ್ರಭಾವ : ಪಿ. ಶ್ರೀಕೃಷ್ಣಭಟ್
6. ಕನ್ನಡ ಭಾಷಾವಲೋಕನ : PÉ.PÀÄ±Á®¥Àà ËqÀ
7. ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ವ್ಯಾಕರಣಗಳ ಅಧ್ಯಯನ : PÉ.PÀÄ±Á®¥Àà ËqÀ
8. ±À§ÝªÀÄtÂzÀ¥ÀðtzÀ ¸ÀªÀ¸Áå PÀæªÀÄ UÀ¼ÀÄ : «. ²ªÁ£ÀAzÀ
9. ±À§ÝªÀÄtÂ A : (¸À) n.«. ªÉAPÀlZÀ®±Á¹Ûç
10. PÀ«gÁdªÀiÁUÀð «ªÉÃZÀ£É : G¥ÀÄUÀgÀ ªÀÄ°èPÀ
11. ಕನ್ನಡ ವ್ಯಾಕರಣಗಳ ತೌಲನಿಕ ವಿಶ್ಲೇಷಣೆ : zÉÃgÀ¹ÃÁÄ
12. ±ÉÊzsÁAvÀPÀ : J£ï.J¸ï. vÁgÁ£ÁxÀ
13. PÀ£ÀßqÀ ªÁUÀéÉÊ¨sÀªÀ : r.J£ï. ±ÀAPÀgÀ¨sÀmï
14. ಭಾಷೆಯ ಸುತ್ತಮುತ್ತ : PÉ.«.£ÁgÁAiÀÄt
15. ಕನ್ನಡ ಭಾಷಾ ಕೈಪಿಡಿ : ¸ÀA¥ÁzÀPÀgÀÄ
16. ಭಾಷೆ : ¸À : PÉ. £ÁgÁAiÀÄt
17. PÀ£ÀßqÀ PÉÊ r : ©JA²æ

KNB 210: ¥ÀwæPÉ 5.2 eÁ£À¥ÀzÀ CzsÀåAiÀÄ£À d£À¥ÀzÀ gÀAUÀ¸ÀA¸ÀÌøw

Course Outcome

CO1: Understood the concept of Folk theatre setting
CO2: Able to understand the different forms of Folk arts
CO3: Able to understand the significance of various Folk festivels
CO4: Understand the concept of Folk Culture

1. ¸ÀA¸ÀÌøw JAzÀgÉãÀÄ? ¸ÀA¸ÀÌøwAiÀÄ ¥ÀæPÁgÀUÀ¼ÀÄ, £ÁUÀjPÀ ¸ÀA¸ÀÌøw, d£À¥ÀzÀ ¸ÀA¸ÀÌøw ªÀÄvÀÄÛ ¸ÀA¸ÀÌøwAiÀÄ gÀZÀ£É, d£À¥ÀzÀ zÀ±ÀðfÀ
2. eÁ£À¥ÀzÀ gÀAUÀ¨sÀÆ«ÄAiÀÄ ¥ÀjPÀ®à£É ¸ÀégÀÆ¥À ªÀÄvÀÄÛ d£À¥ÀzÀ zÀ±ÀðPÀgÀÄ, ¨sÁµÉ ªÀÄvÀÄÛ ¸ÀAUÀÃvÀ, £ÀÈvÀå ¸ÀAAiÉÆÃd£É ªÀÄvÀÄÛ DºÁgÀå ªÉÃµÀ
3. (ಅ) ಕರ್ನಾಟಕ ಜನಪದ ಕಲೆಗಳು : ಹಿನ್ನೆಲೆ, ಸ್ವರೂಪ, ಮಹತ್ವದ ಪ್ರಕಾರಗಳು : ವೇಷಗಾರರು, ¤gÀÆ¥ÀPÀgÀÄ, vÉÆUÀ®Ä UÉÆA¨É ZÉÃµÉ PÀÄtÂvÀ ªÀÄvÀÄÛ zÉÆqÀØ¯ÁmÀ
(D) PÀ£ÁðlPÀ d£À¥ÀzÀ gÀAUÀ¨sÀÆ«Ä - »£É߯É ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ¥ÀæPÁgÀUÀ¼ÀÄ, ¸ÀtÚ¥ÁlUÀ½AiÀÄ ¸ÀA§AzsÀ
zÉÆqÀØ, ¸ÀtÚ
4. ¨sÁgÀvÀzÀ eÁ£À¥ÀzÀ d£À¥ÀzÀ DAiÀÄÄUÀ¼ÀÄ PÉ®ªÀÅ ¸ÀAzÀ¨sÀðUÀ¼ÀÄ, d£À¥ÀzÀ DlUÀ¼ÀÄ, d£À¥ÀzÀ ªÉÃµÀ DPÀµÀðuÉ

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÁðlPÀ eÁ£À¥ÀzÀ	: PÀ£ÁðlPÀ eÁ£À¥ÀzÀ CPÁqÉ«Ä
2. PÀ£ÁðlPÀ d£À¥ÀzÀ PÀ¯ÉUÀ¼ÀÄ	: UÉÆgÀÄ ZÀ£Àß§¸ÀªÀ
3. ಕರ್ನಾಟಕ ಕಲೆಗಳು ೩ನೇ ಸಂಪುಟ ಕರಕುಶಲ ಕಲೆಗಳು : ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷvÀÛ ¨ÉAUÀ¼ÀÆgÀÄ	
4. ¸ÀÄªÀtð eÁ£À¥ÀzÀ ¨sÁUÀ - 1, 2	: PÀ£ÁðlPÀ eÁ£À¥ÀzÀ CPÁqÉ«Ä
5. £ÀªÀÄä ¸ÀAUÀÃvÀ £ÀÈvÀåUÀ¼ÀÄ	: r.PÉ gÁeÉÃAzÀæ
6. PÀ£ÁðlPÀzÀ eÁvÉæUÀ¼ÀÄ	: ¹.J¸ï. ²ªÀPÀĪÀiÁgÀ¸Áé«Ä
7. eÁ£À¥ÀzÀ ¸Á»vÀå zÀ±Àð£À ¸À¥ÀÛ UÀ¼ÀÄ	: PÀ£ÁðlPÀ «±Àé«zÁå®AiÀÄ, zsÁgÀªÁqÀ
8. eÁ£À¥ÀzÀ ¸À±ÉÆÃzsÀ£É	: gÁUËÀ

KNB 210: ¥ÀwæPÉ 5.3 ZÁjwæPÀ CzsÀåAiÀÄ£À PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ (13 £ÉÃ ±ÀvÀªÀiÁ£À)

Course Outcome

CO1: Able to understand the historical background of Kannada Poets
CO2: Understand the attitudes of Kannada Poets
CO3: Understand the different forms of Kannada Chandasu
CO4: Understand the relastionship between religion and Literature

¥ÀoÀå«µÀAiÀÄUÀ¼ÀÄ ªÀÄvÀÄÛ PÀÈwUÀ¼ÀÄ

1. ¥ÀæªÀÈwÛUÀ¼ÀÄ : ¸ÀªÀÄPÁ°Ã£À ¸ÀAzÀ¨sÀð, ¨sÀQÛ ಮತನಿಷ್ಠೆ, ಧಾರ್ಮಿಕ ಶಾಸ್ತ್ರ ಒಲವು, ಪ್ರಸಾರಾಕಾಂಕ್ಷೆ, ¨ÉÆÃzsÀ£Á ¸ÀAªÀÄÈzÀÞ, G¥ÀAiÉÆÃUÀ
2. ¥ÀzÀågÀ ZÀA¥ÀÆ, ಷಟ್ಪದಿ, ರಗಳೆ ಇತ್ಯಾದಿ ನೆಲೆಯಲ್ಲಿ: d£Àß PÀ«PÁªÀå zÀ±Àð£À, ºÀjºÀgÀ PÀÈwAiÀÄ ¥ÀjZÀAiÀÄ wÃªÀæ ªÀiÁvÀÄ JgÀqÀÄ ªÀiÁUÀð ªÀiÁqÀ, gÁWÀªÁAPÀ

3. PÀÀUÀ¼ÀÄ : DAqÀAiÀÄå ªÀÄ ÉPÁdÀÕ£ÀªÀÄ Á§®, PÉÃgÁd, ¥ÀÄ UÉÆÃ«AzÀ ¸ÉÆÃªÀÄ, gÀÄÛPÀ, ZÉÃAqÀÆgÀÄ ¥ÁAðÀÄ PÉ¸ÉÆÃªÀÄ£Á×À

4. ºÉZÀÑªÀÄÁ›w zÉÃgÀPÀÁÀPÀÀUÀ¼ÀÄ : PÉÃAiÀÄ ¸Ú ªÀÄæZÀAzÀæ£ÀAiÀÄ ªÀÄÕ, CªÀÄvÉÃ£ÀÀ¢

¥ÀgÁªÀıÀð£ÀPÀÈwUÀ¼ÀÄ

1. PÀÀ£ÀßqÀCzÀåAiÀÄ£À ¸À¸ÀÜÁAiÀÄ PÀÀ£ÀßqÀ ¸Á»vÀåZÀjvÉæ À¥ÀÄ 4, ¨sÁUÀ2 : ªÀÄÉ«
2. ¸ÀªÀÄUÀæPÀÀ£ÀßqÀ ¸Á»vÀåZÀjvÉæ À¥ÀÄ UÀ¼ÀÄ ¸À¥ÀÄ 4 : ¨ÉÃUÀÆgÀÄ ««
3. PÀÀ£ÀßqÀ ¸Á»vÀåZÀjvÉæ : gÀA²ãªÀÄÆUÀÆ
4. ZÀA¥ÀÆ PÀÀUÀ¼ÀÄ (¸ÀªÀÄUÀæPÀÀ£ÀßqÀ ¸Á»vÀåZÀjvÉæ À.2) : ¨ÉÃUÀÆgÀÄ ««
5. ಷಟ್ಪದಿ ಸಾಹಿತ್ಯ (ಸಾಮಾನ್ಯನಿಗೆ ಸಾಹಿತ್ಯ ಚರಿತ್ರೆ ಸಂ. ೫) : ¨ÉÃUÀÆgÀÄ ««
6. ±Á¸À£À ¸Á»vÀå(¸ÀªÀÄUÀæPÀÀ£ÀßqÀ ¸Á»vÀåZÀjvÉæ À.3) : ¨ÉÃUÀÆgÀÄ ««
7. «ÃgÀ±ÉÊªÀzÀ±ÀÄðzÀ±À£À ¨sÁUÀ2 ªÀÄvÀÄÛ3 : eÉ.¸ï.J¸ï UÀzÀÎ¹ÃªÀÄoÀ
8. ¦ÃoPÉUÀ¼ÀÄ, ¯ÉÃR£ÀUÀ¼ÀÄ : r.J¯ï. £ÀgÀ¹AºÁZÁgï
9. ºÀjºÀgÀ¥ÀæªÀ : PÀ£ÁðlPÀ ¸ÀA¸ÀÌøw gÁdzÁgÀ ªÀÄPÁÑ, PÉ. ¸Á«ÄgÀ
10. I ÀÄ¶PÀ gÁWÀªÁAPÀ : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
11. ¸Á»vÀå ªÉÆÃPÀ : J.Dgï. ²ãªÁ¸ÀªÀÄÆwð
12. ºÀUÀÀAiÀÄvÀCzÀåAiÀÄ£ÀUÀ¼ÀÄ : J.À azÁ£ÀAzÀªÀÄÆwð

<u>ವಿಶೇಷ ಉಪ ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ</u> **(Special Soft core)**

KNB 220: <u>¥ÀwæPÉ 6.1. PÀ£ÀßqÀ ¸À¸ÀÌøw ªÀÄvÀÄÛ £ÁUÀjPÀvÉ (DAiÀÄÝ ¯ÉÃR£ÀUÀ¼ÀÄ) (3:1=4 PÉæqÉmï)</u>

Course Outcome

CO1: Learn the details of Culture
CO2: Understand the details of Kannada Culture
CO3: Write down the details of Kannada Culture and Civilization
CO4: Write down the characteristics of Karnataka Culture
CO5: Learn the relationship between Women and Culture

1. ¸À¸ÀÌøw JAzÀgÉãÀÄ? - zÉÃªÀ¤ÃgÀÄ £ÀgÀ¹AºÀAiÀÄåAUÁgï
2. ¸À¸ÀÌøw ªÀÄvÀÄÛ £ÁUÀjPÀvÉ - qÁ J£ï. ²ãPÀAoÀAiÀÄå
3. ¸À¸ÀÌøw ªÀÄvÀÄÛ ¸Á»vÀå - J.J£ï. ªÀÄÆwðgÁªï
4. PÀ£ÁðlPÀ ¸À¸ÀÌøw - JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
5. «ZÁgÀPÁæAwUÉ DºÁé£À - PÀÄªÉA¥ÀÄ
6. PÀ£ÀßqÀ ªÀÄÁvÀÄ vÀ¯ÉªÀiÁvÀÄUÀ¼ÀÄ UÉ - ©.J.²ªÀ
7. ºÉ¸À À¢UÀvÀÄÛ¢UÉÃ ªÀÄvÀÄÛ ªÀÄÄRåªÁ ¸ÀªÀÄÁºÁ ÀA¥ÀÅÓÉvÁä - ¥ÀÆZÀAvÉÃ
8. d£À¥ÀzÀ ªÀÄvÀÄÛEwºÁ À - ಕೃಷ್ಣಮೂರ್ತಿ ಹನೂರು
9. ಆಧುನಿಕ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಾಮಾನ್ಯ ಮನುಷ್ಯ - r.Dgï. £ÁUÀgÁeï
10. zÀ°vÀ ªÀÄvÀÄÛ ªÀÄ»¼É - ¸Á gÁ C§ÄÝ¯ï PÁgï

¥ÀgÁªÀÄ±Àð :

1. ¸ÀA¸ÀÌöÈw PÀxÀ£ÀªÀÄvÀÄÛ ¸ÀA¸ÀÌöÈw E¯ÁSÉ,PÀxÀ£À ¨sÁµÉ, gÀ¸Àé¨ÉÆ¼ÀÄgÀÄ 2007,
2. ¨sÁgÀwÃAiÀÄ ¸ÀA¸ÀÌöÈw, qÁ J¸ï. ²ªÀPÀÄªÀiÁgÀ ¥ÀæPÁgÀAUÀ ªÉÄÊ¸ÀÆgÀÄ «.«. ªÉÄÊ¸ÀÆgÀÄ, 1969
3. UÁAzsÀ«ºÁgÀ2, PÀxÀ£À Czs¥ÀvÀ£À ¸À¸ÀÌöÈªÉÄÊ¸ÀÆgÀÄ «.«. ªÉÄÊ¸ÀÆgÀÄ 1983
4. PÀ£ÁðI PÀ¸À¸ÀÌöÈw ¸ÀªÀÄÃPÉë- JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä, 2011, r.«.PÉ ªÀÄÆwð ¥ÀæPÁ±À£À ªÉÄÊ¸ÀÆgÀÄ
5. PÀÄ«¥ÀÄ ¸ÀªÀÄUÀæ ¸ÀA¥ÀÄl-2, 2013, ರಾಷ್ಟ್ರಕವಿ ಕುವೆಂಪು ಪ್ರತಿಷ್ಠಾನ, ಕುಪ್ಪಳ್ಳಿ, ಶಿವಮೊಗ್ಗ
6. ªÀÄvÀÄÛ ªÀÄÄ¢ævÀ ¸ÀA¸ÀÌöÈw PÀxÀ£À ¸Á»vÀå«ªÀÄ±Éð- ¸À: gÀªÀÄvï vÀÄAPÀÆgÀÄ PÀ«, ºÀA¦ 2011,
7. «ªÀÄ±Áð«ªÀÄ±Éð – PÉ. ¥ÀÄ ðZÀAzÀæ ²é¥À¸À ¥ÀæPÁ±À£À ªÉÄÊ¸ÀÆgÀÄ 2009
8. ºÉÆ¸ÀUÀ£À ¥ÉÆ±Zï.eÉ®PÀÌ ¸ÀA±ÉÆÃzsÀ£À C©üªÀåQÛ 2004, vÀÄªÀÄPÀÆgÀÄ «±Àé«zÁå®AiÀÄ ªÉÄÊ¸ÀÆgÀÄ
9. C¥ÀÆtð ªÀÄvÀÄÛ UÀAqÀÄ r.Dgï. £ÁUÀgÁeï, 2009, CPÀëgÀ ¥ÀæPÁ±À£À ºÉUÉÎÃqÀÄ, ¸ÁUÀgÀ PÀ£ÁðI PÀ
10. ªÀÄ»¼É ªÀÄvÀÄÛ PÀxÀ£À ¸Á»vÀå ¸À: f.J¸ï. ²ªÀgÀÄzÀæ 1979, ¥ÀæPÁgÀAUÀ ¨ÉAUÀ¼ÀÆgÀÄ ««, ¨ÉAUÀ¼ÀÆgÀÄ

¥ÀoÀåªÀ¸ÀÄÛ¥ÀÄ¸ÀÛPÀUÀ¼ÀÄ

1. PÀ£ÁðI PÀ¸À¸ÀÌöÈw ¸ÀªÀÄÃPÉë	: JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
2. ±ÀÆzÀæ ¨sÁµÉ ªÀÄvÀÄÛ ªÀiË®å	: r.Dgï. £ÁUÀgÁeï
3. ¸ÁA¸ÀÌöÈwPÀ Czs¥ÀvÀ£À	: gÀªÀÄvï vÀÄAPÀÆgÀÄ
4. ²µÀÖ¸Á»vÀå	: ©.J.ªÀiÁ²µÀÖ
5. ¸À¸ÀÌöÈw	: r.«.f
6. f£À¥À¸À ËAzÀAiÀÄð ªÀÄvÀÄÛ ¸Á»vÀå	: r.«.f
7. ¸À¸ÀÌöÈw PÀxÀ£À	: r.Dgï. £ÁUÀgÁeï
8. ¨sÁgÀwÃAiÀÄ ¸À¸ÀÌöÈw	: (ಸಂ) ಅ.ನ.ಕೃಷ್ಣರಾಯ

KNB 220: ¥ÀwæPÉ.2 ªÀÄ»¼É ¸ÀAªÉÃzÀ- ¸Á»vÀå (DAiÀÄÝ ¥ÀoÀå£ÀUÀ¼ÀÄ)

Course Outcome

CO1: Able to understand the different arguments regarding women status
CO2: Students must learn the concept of Feminism
CO3: Learn the different types of Feminism
CO4: Learn the contribustion of Kannada Poets for feminism in 20th and 21st century

1.	ªÀÄ»¼Á ªÁzÀ ªÀÄvÀÄÛ ªÀÄ»¼Á ¸Á»vÀå	- «dAiÀiÁ zÀ©â
2.	ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ : ಅಭಿವ್ಯಕ್ತಿ	- JZï.J¸ï. gÁWÀªÉÃAzÀæ gÁªï
3.	¨sÁgÀwÃAiÀÄ ºÉtÄÚ ªÁzÀ(¦æPÁ ¨sÁUÀ ªÉÄzÀ© ¨sÁUÀ)	- ªÀÄ£ÀÄ ZÀPÀæªÀwð
4.	PÀ£ÀßqÀ ºÉtÄÚ ªÁ¢ «ªÀÄ±Éð	- «dAiÀiÁ zÀ©â
5.	¥ÁqÀÝ£ÀUÀ¼À°è ºÉtÄÚ¤ªÀÄ ¥ÀæwgÉÆÃzsÀ	- UÁAiÀÄwæ £ÁªÀqÀ
6.	d£À¥ÀzÀ PÁªÀå ¥ÀgÀA : ºÉ£ÀÄßUÀ¥ÀæwªÀå ¸ÀÜªÀgÀ¸ÀA±ÉÆÃzsÀ£É PÀxÀ£À	- ¸ÀÄ¦æAiÀÄ ¨sÀnÖ «ÃgÀUÉqÀ
7.	ಚಕ್ರಾಧಿಪತ್ಯ, ರಾಷ್ಟ್ರ ಮತ್ತು ಸಾಹಿತ್ಯಕ ಪಠ್ಯ	- ¸ÀÆ¸ï xÁgÀÄ ªÀÄvÀÄÛ PÉ®è vÀ C£ÀÄ JZï.J¸ï. gÁWÀªÉÃAzÀæ gÁªï
8.	ªÀÄÄ¹èA ªÀÄ»¼Á ¸ÀªÀÄ¸ÉåUÀ¼ÀÄ ªÀÄvÀÄÛ ¥ÀjºÁgÉÆÃ¥ÁAiÀÄUÀ¼ÀÄ	– ಕೆ. ಷರೀಫಾ

9. zÀªÀvÀ¸Á»vÀå¸ÀAè ªÀÄ»¼É - zÀgÉÆÃ¼ÀzÀ ²ªÀ±ÀgÀtgÀÄ
10. ªÀ¸ÀÄvÀÄ¸Á»vÀåªÀÄvÀÄÛ ¥ÀgÀ - C£ÀÄ¥ÀªÀiÁ ¤gÀAd£À

¥ÀoÀå¥ÀÄ¸ÀÛPÀ:

1. **£ÁªÀÅ : zÁ¹-¢UÀAvÀ** – «dAiÀiÁzÀ¼À 1997, gÀÉÉÁ ¥ÀæPÁ±À£À ªÉÊ¸ÀÆgÀÄ
2. **¨sÁgÀwÃAiÀÄ ¹ÛçÃzÀ** – CPÀëgÀ ¥ÀæPÁ±À£À 1993, ºÉUÉÎÆqÀ, ¸ÁUÀgÀ
3. ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ - ¸À: JZï.J¸ï. ²æÃzÉÃ«, ²ªÁ£ÀAzÀ J¸ï. «gÀªÀÄoÀ 2007, ªÀÄ»¼Á CzsÀåAiÀÄ£À PÉÃAzÀæ PÀ£ÀßqÀ «±ÀévÀ«zÁå®AiÀÄ, ºÀA¦
4. **¹ÛçÃªÁ¢ ¥ÀæªÉÃ±À** ¸À: ©.J£ï. ¸ÀÄ«ÄvÁæ¨Á¬Ä, J£ï.UÁAiÀÄwæ 1995, PÀ£ÁðlPÀ ¯ÉÃRQAiÀÄgÀ ¸ÀAWÀ ZÁªÀÄgÁd¥ÉÃmÉ ¨ÉAUÀ¼ÀÆgÀÄ
5. **«gÀ¼ÀÉ** – UÁAiÀÄwæ£ÁªÀqÀ 1997, J£ï.Dgï.J.JA. JZï. ¥ÀæPÁ±À£À PÉÃAzÀæ ±ÀgÀzÀ®è PÀ£ÀßqÀ
6. **§UÉ** ¸ÀA¥Á¨sÀ«ÄUÉqÀ 2001, ¯ÉÃ»AiÀiÁ ¥ÀæPÁ±À£À §¼Áîj
7. **¹ÛçÃªÁ¢ ¸Á»vÀå«ªÀÄ±Éð** (¸À) vÉÃd¹é ¤gÀAd£À 1994, PÀ£ÀßqÀ ¸ÀAWÀ PÁæöìÖ PÁ¯ÉÃeï, ¨ÉAUÀ¼ÀÆgÀÄ
8. **ªÀÄAiÀÄÆgÀ ªÀÄ»¼Á ¸ÀAªÉÃzÀ£É** – ಕೆ. ಷರೀಪಾ, ೨೦೧೧, ಅಂಕಿತ ಪುಸ್ತಕ, ಬೆಂಗಳೂರು
9. **¹ÛçÃzÀªÀÄvÀÄÛ ¨sÁgÀwÃAiÀÄvÉ** – zÀgÉÆÃ¼ÀzÀ ²ªÀ±ÀgÀtgÀÄ 1998, ZÉÃvÀ£À §ÄPï ºË¸ï, ªÉÊ¸ÀÆgÀÄ
10. **¸Á»vÀåªÀÄvÀÄÛ¥ÀgÀ** – C£ÀÄ¥ÀªÀiÁ ¤gÀAd£À 2008, r.«.PÉ ªÀÄÆwð, ªÉÊ¸ÀÆgÀÄ

¥ÀgÁªÀÄ±ÀðPÀ UÀæAxÀUÀ¼ÀÄ

1. ªÀÄ»¼Á ¸Á»vÀå ZÀjvÉæ	: (¸À) JZï.J¸ï. ²æÃzÉÃ«
2. ಹೆಣ್ಣು ಮತ್ತು ಭಾಷೆ	**: (¸À)** JZï.J¸ï. ²æÃzÉÃ«, ²ªÁ£ÀAzÀ J¸ï. «gÀªÀÄoÀ
3. **¹ÛçÃªÁ¢ ¥ÀæªÉÃ±À**	**: (¸À) ©.J£ï. ¸ÀÄ«ÄvÁæ¨Á¬Ä, J£ï. UÁAiÀÄwæ**
4. «gÀ¼ÀÉ	: UÁAiÀÄwæ£ÁªÀqÀ
5. ವಿಜಯಾನ್ವೇಷಣಂ	: (¸À) J¸ï.r. ±ÀPÀÄ

ªÀÄÆgÀ£ÉAiÀÄ ¸É«Ä¸ÀÖgï

ಪ್ರಧಾನ ವಿಷಯ UÀ¼ÀÄ (Hard core)

KNC 050: ¥ÀwæPÉ 1 vÀÄ®£ÁvÀäPÀ ¸Á»vÀå: ¥ÁoÀå: ªÀÄ ºÁPÁªÀå ªÀÄvÀÄÛ £ÁlPÀ (2:1=3 PÉærr)

Course Outcome

CO1: Learn in depth Homer's Illiad
CO2: Understand in details with examples Hamlet
CO3: Understand the classification and characteristics of Compartive Literature
CO4: Understand in depth Girish Karnad's Tughlaq

1. vÀÄ®£ÁvÀäPÀ ¸Á»vÀåzÀ ¸ÀégÀÆ¥À, ªÁå¦Û, gÁ¶ÖçÃAiÀÄ ¸Á»vÀå eÁUÀwPÀ ¸Á»vÀå ªÀÄvÀÄÛ ¸ÁªÀiÁ£Àå ¸Á»vÀå- vÀÄ®£ÁvÀäPÀ ¸Á»vÀå¥ÀxÀ«ÄÃAiÀÄ, ¹zÁÞAvÀ ªÀÄvÀÄÛ ¥ÀzÀÞwUÀ¼ÀÄ
2. **vÀÄWÀèPï** – PÁ£ÀðqïÀ, **PÁªÀå UÁæ** - D®æïð PÀA¥À (C£ÀÄ r.J. ±ÀAPÀgï)
3. **ºÁåªÉèmï** – PÉJ¸ï. ¨ÁªÀÄ£ï, **gÀÆ¥ÁAvÀgÀ**– PÀÄ ºÉÆ¥À
4. (C) Illiad – Homer   Prescribed Books 1,7
   (D) Aeneid – Virgil   Prescribed Books 5, 6

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. ¥Á±ÁÑvÀå ªÀÄ ºÁPÁªÀå UÀ¼ÀÄ : ²æÃPÀAoÀPÀÄ UÉ(¸À) ¥ÀæPÀ ±À£À «
2. ªÀÄ ºÁPÁªÀå¸ÀégÀÆ¥À : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
3. ªÀÄ ºÁPÁªÀå®PÀë : n. «. ªÉAPÀlZÀ®±Á¹Ûç
4. Comparative Literary studies : S.S. Pawar
5. Comparative Literary and Literary Theory : Ulrich Weisstein
6. Comparative Literature Method & perspective : (Ed) Newton P Stalknecht
7. Method and perspective Discriminations
   (First two Essays on Comparative Literature) : Horst Frenz

---

KNC 020: ¥ÀwæPÉ 2 DzsÀÄ¤PÀPÀ£ÀßqÀ ¸Á»vÀå À»£É£É (2:1=3 PÉærr)

Course Outcome

CO1: Learn in details Romaneticism
CO2: Learn the classification and characteristics of Progressive Liteature
CO3: Learn the characteristics of Modern Literature
CO4: Understand in details with examples Dalit Literature

1. £ÀªÉÇÃzÀAiÀÄ ¸Á»vÀå: ¥ÀæªÀÄR ¥ÀæªÀÈwÛUÀ¼ÀÄ, gÀªÀÄå PÀ«vÉ, ¹ÃªÉÄ, gÁ¶ÖçÃAiÀÄvÉ, ¸ÀªÀiÁdªÀÄÄRvÉ, zÉÃ±ÀªÀiÁAiÀÄvÉ, £ÁqÀÄ £ÀÄr
2. ¥ÀæUÀw²Ã® ¸Á»vÀå: ¥ÀæªÀÄR ¥ÀæªÀÈwÛUÀ¼ÀÄ, ªÀÄÄRå ªÀåQÛUÀ¼ÀÄ ªÀÄvÀÄÛ PÀÈwUÀ¼ÀÄ

3. £ÀªÀå¸Á»vÀå: ¥ÀæªÀÈwÛ¥ÀgÀ, ¥ÀjZÀAiÀiÁvÀäPÀ, C¤ÃvÀ

4. zÀ°vÀ§AqÁAiÀÄ: ¥ÀæªÀÈwÛ¥ÀgÀ, ªÀÄÄRå PÀ«UÀ¼ÀÄ, ¯ÉÃR£ÀgÀÄ, ªÀÄ»¼Á ¹ÛçÃªÁzÀ

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. ºÉƸÀUÀ£ÀßqÀ PÁªÀå : ²æÃ¤ªÁ¸À ºÁªÀ£ÀÆgÀ
2. ಹೊಸಗನ್ನಡ ಕವಿತೆಯ ಮೇಲೆ ಇಂಗ್ಲಿಷ್ ಕಾವ್ಯದ ಪ್ರಭಾವ : J¸ï. C£ÀAvÀgÁªÀÄ
3. AiÀÄÄUÀzÀ ºÁUÀÄ ¸Á»vÀå : QÃvÀð£ÁxÀ PÀÄvÀðPÉÆÃn
4. ¥ÀæUÀw²Ã® ¸Á»vÀå : C£ÀPÀȵÀÚ(¸À)
5. ¨sÁgÀwÃAiÀÄ ¥ÀÄ£ÀgÀÄvÁ÷ÜzÀ : ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ
6. ºÉƸÀUÀ£ÀßqÀ ¸Á»vÀå : ಎಲ್.ಎಸ್. ಶೇಷಗಿರಿರಾವ್
7. 20£ÉÃ ±ÀvÀªÀiÁ£ÀzÀ PÀ£ÀßqÀ ¸Á»vÀå : qÁ §¸ÀªÀgÁd ¸ÁzÀgÀ
8. PÀ«vÉ I PÀ¸ÀÄUÁw : PÀ£ÀßqÀ C©üªÀÈ¢Þ ¥ÁæzsÁPÀgÀ ¥ÀæPÀluÉ
9. Impact of Marxism on Indian life and Literature : H.M. Nayak (Ed)
10. Heritage of Karnataka : R.S. Mugali

KNC 030: ¥ÀwæPÉ3 ¨sÁgÀwÃAiÀÄ PÁªÀå«ÄÃªÀiÁA¸É (2:1=3 PÉærrmï)

Course Outcome

CO1: Write down the characteristics of Sanskrit Poetics
CO2: Learn in details with examples Kannada Poetics
CO3: Learn in details with examples Tamil Poetics
CO4: Identify the characteristics of Folk Poetics

1. ¸À¸ÀÌøvÀ PÁªÀå«ÄÃªÀiÁA¸É PÀ«-PÁªÀå ¸ÀégÀÆ¥À, PÀvÀÈ DPÀgÀ ¥ÀæªÉÆÃ¥ÀjPÀgÀ ªÀÄvÀUÀ¼ÀÄ ¥ÀæªÀÄR ¹zÁÞAvÀUÀ¼ÀÄ: gÀ¸ÀzsÀé, OavÀå
2. PÀ£ÀßqÀ PÁªÀå«ÄÃªÀiÁA¸É PÀgÁdªÀiÁUÀð ªÀÄvÀÄÛ EvÀgÀ ¥ÁæaÃ£À®PÀë UÀæAxÀUÀ¼ÀÄ, DzsÀÄ¤PÀ PÀ£ÀßqÀ PÁªÀå«ÄÃªÀiÁA¸ÉAiÀÄ «zsÀAvÀgÀ ºÉÆ¸À zÀÈ¶×UÀ¼ÀÄ £ÀªÉÇÃzÀAiÀÄ, £ÀªÀå, ¥ÀæUÀw²Ã®, zÀ°vÀ§AqÁAiÀÄ, ¹ÛçÃªÁzÀ
3. PÀ£ÀßqÀ PÀÄUÀÄÚPÁªÀå ®PÀëtzÀ ¥ÁæaÃ£ÀvÉ, DzsÀÄ¤PÀ
4. vÀ«ÄÁ¼ÀÄ PÁªÀå«ÄÃªÀiÁA¸É ªÀÄvÀÄÛ PÀ£ÀßqÀ eÁ£À¥ÀzÀ PÁªÀå«ÄÃªÀiÁA¸É

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. ¨sÁgÀwÃAiÀÄ PÁªÀå«ÄÃªÀiÁA¸É : w.£ÀA.²æÃ
2. vË®¤PÀ PÁªÀå«ÄÃªÀiÁA¸É : JZï. w¥ÉàgÀÄzÀæ¸Áé«Ä
3. PÁªÀåªÁåzÀ aAvÀ£À : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
4. PÀ£ÀßqÀ PÀÄUÀÄÚPÁªÀå ®PÀëtzÀ : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
5. PÀ£ÀßqÀ ªÀiÁè¸À gÀ¸ÀªÀÄÄ vÀvÀÛ÷é : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
6. PÁªÀåªÁåzÀ ¥ÀzÀ¨ÉÆÃ±À : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
7. ವಿಮರ್ಶೆಯ ಪರಿಭಾಷೆ : ಓ.ಎಲ್. ನಾಗಭೂಷಣಸ್ವಾಮಿ
8. PÀ£ÀßqÀ zsÀéä ¤ÃPÀë ¯ÉÃRPÀgÀÄ : ಕೆ.ಕೃಷ್ಣಮೂರ್ತಿ
9. OavÀå«ZÁgÀZÀZÉð : ಕೆ. ಕೃಷ್ಣಮೂರ್ತಿ
10. vÀ«ÄÁ¼À PÁªÀå«ÄÃªÀiÁA¸É : qÁ PÁ®ªÉÄÃ¸ï

KNC 040: ¥ÀwæPÉ 4 ¸ÀA±ÉÆÃzsÀ£Á «zsÁ£À ªÀÄvÀÄÛ UÀtPÀ §¼ÀPÉ (2:1=3 PÉærrmï)

Course Outcome

CO1: Learn in details with examples Computer application
CO2: Write down the details of Synopsis
CO3: Understand in depth Field Work
CO4: Learn the characteristics of Thesis
CO5: Understand the classification and characteristics of Research methodology

¸ÀA±ÉÆÃzsÀ£Á «zsÁ£À

1. ¸ÀA±ÉÆÃzsÀ£É CxÀð ªÀÄvÀÄÛ ¥ÀæPÁgÀUÀ¼ÀÄ, ¸ÀA±ÉÆÃzsÀPÀ£À°ègÀ¨ÉÃPÁzÀ UÀÄtUÀ¼ÀÄ, ¸ÀA±ÉÆÃzsÀ£Á ¯ÉÃR£À (Research Paper), ¤§AzsÀ (Dissertation), ªÀĺÁ¥Àæ§AzsÀ (Thesis) – EªÀÅUÀ¼À ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ¸ÀA±ÉÆÃzsÀ£Á ¸ÀA¹ÜwUÀ¼ÀÄ ¸ÀAQë¥ÀÛ gÀÆ¥ÀgÉÃSÉ (Synopsis)

2. ಸಂಶೋಧನೆಯ ಭಾಷೆ ಮತ್ತು ಶೈಲಿ, ಉದ್ಧರಣೆ, ಅಡಿಟಿಪ್ಪಣಿ, ಅನುಬಂಧ, UÀæAxÀ¸ÀÆa, PÉëÃvÀæPÁAiÀÄðzÀ ¸ÀégÀÆ¥À ªÀÄvÀÄÛ «zsÁ£À

UÀtPÀ §¼ÀPÉ

3. PÀA¥ÀÆålgï UÀtPÀ §¼ÀPÉ JA.J¸ï. D¦üøï, N¥À£ï D¦üøï –ªÀqïð –gÉnmï, ¥ÀªÀgï¥Á¬ÄAmï, ¸ÁªÀiÁf PÀeÁ® vÁt UÀ¼ÀÄ, CªÀÅUÀ¼À G¥ÀAiÉÆÃUÀ ªÀÄvÀÄÛ ¸Á»vÀå ¸À§AzsÀ
4. CAvÀeÁð® vÁt UÀ¼ÀÄ PÀA¥ÀÆålgï UÀ¼ÀÄ «-CAZÉ «-¸ÀzÀ£À «-¥ÀÄ¸ÀÛPÀUÀ¼ÀÄ PÀA¥ÀÆålgï ¸ÀA±ÉÆÃzsÀ£ÉAiÀÄ°è UÀtPÀ ªÀÄvÀÄÛ CAvÀeÁð®zÀ §¼ÀPÉ

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. ¸ÀA±ÉÆÃzsÀ£É : JA. azÁ£ÀAzÀªÀÄÆwð
2. PÀ£ÀßqÀ ¸ÀA±ÉÆÃzsÀ£Á ¸ÀégÀÆ¥À : JA.JA. PÀ®§÷ÄVð
3. ¸ÀA±ÉÆÃzsÀ£Á ¸ÀégÀÆ¥À : ©.«. ²gÀÆgÀ
4. ¸ÀA±ÉÆÃzsÀ£Á ¥ÀæPÉæ : (ಸಂ) ಹೇರಂಜೆ ಕೃಷ್ಣಭಟ್ಟ
5. ¸ÀA±ÉÆÃzsÀ£É vÁwéPÀ «ZÁgÀ : gÀªÀÄ ¸ÀÆgï vÀjÃPÉgÉ
6. CzsÀåAiÀÄ£À «¢üzsÁ£ÀUÀ¼ÀÄ : PÉ.gÁªÀÄZÀAzsÀæAiÀÄå
7. ªÀĺÁ ¥ÀæªÀAzsÀ : JA.JA. PÀ®§÷ÄVð
8. CzÀåAiÀÄ£À vÀAvÀæ PÀ : f.«.¤ªÉÆð, J¸ï. PÀAiÀÄå
9. ªÀiÁ£À«ÃAiÀÄ vÀAvÀæPÀ : f.«.¤ªÉÆð, J¸ï. PÀAiÀÄå
10. PÁAiÀÄPÀ C¢üAiÀÄ vÀAvÀæPÀ : f.«.¤ªÉÆð, J¸ï. PÀAiÀÄå
11. PÀA¥ÀÆålgï : ¥À©èµï

G¥À¥ÀoÀå«µÀAiÀÄ ವಿಷಯಗಳು (Soft core)

KNC 210: ಪತ್ರಿಕೆ: ೫.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಉಪಭಾಷಾವಿಜ್ಞಾನ (ಕನ್ನಡ)

Course Outcome

CO1: Specify in details with examples Dialects
CO2: Learn the characteristics of Kannada Dialects
CO3: Identify the classification and characteristics of Dialectology
CO4: Write down the details of Survey of Dialects

1. ಉಪಭಾಷಾವಿಜ್ಞಾನ : ಸ್ವರೂಪ ಮತ್ತು ವ್ಯಾಪ್ತಿ, ಭಾಷಾಭೂಗೋಳ, ಉಪಭಾಷಾಭೂಗೋಳ ಮತ್ತು ಭಾಷಾ ಭೂಪಟ- ಈ ಶಬ್ದಗಳ ಅರ್ಥ ಮತ್ತು ವ್ಯಾಪ್ತಿ; ಕನ್ನಡದ ಸಾಮಾಜಿಕ ಉಪಭಾಷೆಗಳು ಮತ್ತು ಪ್ರಾದೇಶಿಕ ಉಪಭಾಷೆಗಳು
2. ಉಪಭಾಷಾವಿಜ್ಞಾನದ ಸಂಕ್ಷಿಪ್ತ ಇತಿಹಾಸ : ಭಾರತ, ಫ್ರಾನ್ಸ್, ಅಮೆರಿಕÀ EAUÉèqï, ªÀÄvÀÄÛ dªÀÄð¤ ದೇಶಗಳಲ್ಲಿ ಉಪಭಾಷಾ ಅಧ್ಯಯನಗಳು, 'ಲಿಂಗ್ವಿಸ್ಟಿಕ್ ಸರ್ವೆ ಆಫ್ ಇಂಡಿಯಾ'ದ ಮಹತ್ವ
3. ಅ) ಭಾಷೆ, ಉಪಭಾಷೆ, ವ್ಯಕ್ತಿಭಾಷೆ, ಪ್ರಮಾಣ ಭಾಷೆ, ಭಾಷಾಗುಂಪು, ಪರಸ್ಪರ ಅರಿವು, ಸಾಮಾನ್ಯ wgÀ¼À

   ಆ) ಉಪಭಾಷಾವಿಜ್ಞಾನದ ವಿಧಾನಗಳು: ಏಕಕಾಲಿಕ, ದ್ವಿಕಾಲಿಕ
4. ಭಾಷಾವಿಜ್ಞಾನದಲ್ಲಿ ಕ್ಷೇತ್ರಕಾರ್ಯದ ಸ್ವರೂಪ ಮತ್ತು ಪ್ರಯೋಜನ, ವಕ್ತೃ, ಪ್ರತಿವ್ಯಕ್ತೃ-Cº ÀðvÉ PÁAiÀð¤ªÀðºÀuÉ zÀvÀÛ ÀAUÀæºÀ ¸ÀAzÀ±ÀðPÀ ¥ÀæªÁ½£À j Ãw ªÀÄvÀÄÛ ¸ÀAUÀæºÀ«zsÁ£À ºÀAvÀUÀ¼ÀÄ, ¸ÀAUÀæºÀPÁAiÀÄðzÀ°è ¥ÀæÆ³ÉAiÀÄUÀ¼ÀÄ ªÀÄvÀÄÛ EvÀgÀ G¥ÀPÀgÀtUÀ¼À

¥ÀgÁªÀÄ±Àð UÀæAxÀUÀ¼ÀÄ

1. ಉಪಭಾಷೆ	: ಕೃಷ್ಣ ಪರಮೇಶ್ವರ ಭಟ್ಟ
2. ಉಪಭಾಷಾ ಅಧ್ಯಯನ	: ±Àº¤ gÀAd£ÁxÀ
3. ಭಾಷಾಕ್ಷೇತ್ರಕಾರ್ಯ	: J¸ï.J¸ï. CAUÀr
4. PÉëÃvÀæPÁAiÀÄðzÀ ºÁ¢AiÀÄ°è	: PÁ¼ÉÃUËqÀ £ÁUÀªÁgÀ
5. ºÁ¢AiÉÆ¼ÀUÀ eÁ£À¥ÀzÀ	: ಹನೂರು ಕೃಷ್ಣಮೂರ್ತಿ
6. ಸಾಮಾಜಿಕ ಉಪಭಾಷೆ	: ªÀÄ ÁzÉêÀ AiÀÄÄ
7. ¸ÀªÀÄÆð ¸ÀAZÀAiÀÄ	: (¸À) zÉdªÀgÀÄUËqÀ
8. PÀÉëÃl PÀÄ¸ÀÄgÀÄ	: (¸À) ¸ÀÄ¥ÀæÁ¥ÀgÀÄ J¸ï.J¸ï.
9. Field Linguistics	: William J Samarien
10. The Structure of Karnataka	: R.C. Hiremath
11. An Outline of Colloquial Kannada	: William Bright
12. Kannada –Literary and colloquial	: H.M. Nayak
13. Field Study	: Sen Gupta
14. World Geography of the Eastern United States	: H Kurath
15. Handbook of the Linguistic Geography of New England	: H Kurath
16. Reading in American Dialectology	: Allen and Underwood
17. The Study of dialect	: K.M. Petyt
18. A course in Modern Linguistics	: Charles F Hockett

KNC 210: ¥ÀwæPÉ 5.2 eÁ£À¥ÀzÀ ÀCzÀ±Àð£À ÀPÀ¯ÉÉÃl PÀd£À¥ÀzÀ PÀ¯ÉUÀ¼ÀÄ

Course Outcome

CO1: Understand the concept of Folk theatre.
CO2: Able to understand the various forms of Folk arts
CO3: Able to understand the significance of Folk festivels
CO4: Understood the concept of Folk Culture

1. vÁwéPÀ ÀÉ: d£À¥ÀzÀ PÀ¯ÉUÀ¼À G UÀA, ¸ÀégÀÆ¥À ªÁå¦Û§ÄqÀPÀlÄÖ PÀ¯ÉUÀ¼ÀÄ, UÁæ«ÄÃt ÀvÀgÀ ಜನಪದ ಕಲೆಗಳು, ಶಿಷ್ಟಕ¯Á ¥ÀæÀgÀUÀ¼ÀÄ, d£À¥ÀzÀPÀ ÉPÀÀÁ«zÀgÀÄ ªÀÄvÀÄÛDzÀ±Àð PÀÀ¯ÉAiÀÄ ªÀÄÄSÁªÀÄÄT
2. ¥ÀæzÀ±Àð£Á vÀäPÀ PÀ¯ÉUÀ¼ÀÄ : ªÁzÀå ÀªÀÄÉÃ¼À£À: «ÃgÀUÀÁ¸É PÀgÀqÀªÀÄ, vÀªÀÄmÉ ÁzÀPÀ, ¤ÃgÀUÁgÀgÀ, ªÀÄÄR «ÃuÉ

3. DgÁzsÀ£Á ¥ÀzÀÞw£ÀAPÀÀ ÉÆ¼ÀÄ : ªÉÆ¯ÁgÀ, DnPÀ¼Àd, «ÃgÀ ªÀÄPÀÌ¼ÀÄ UÀÄqÀÄ, UÉÆgÀªÀgÀPÀÌ¼ÀÄ UÉÆAzÀ¼À UÀgÀÄ, ºÁ®Ì PÀÌ¼ÀÄ D¸Á¢ ºÁqÀÄUÀ¼ÀÄ, ¨sÀÆvÁgÁzsÀ£É

4. gÀUÀ¼ÀÆ«Ä : ºÀUÀgÀ, eÁ¯Á, §ºÀgÀÆ¦, PÉÆ¼À¯ÉvÁ¼À ÀzÀÝ¥É¸ÀÆvÀæÀÉÆA¨ÁIÀÄ, vÉÆUÀ®Ä ÉÆA¨ÁIÀÄ, PÉÆÃ Á¯É, ªÀÄEqÀ®¥ÁAiÀÄ, ¥ÀzÀªÀ®¥ÁAiÀÄ AiÀÄPÀëUÁ£À (vÉAPÀÄw ÀÄÖ §qÀUÀÄw ÀÄÖ)

¥ÀgÁªÀÄ±Àð£ÀPÀÈwUÀ¼ÀÄ

1. GvÀÛgÀPÀ£ÁðIPÀzÀ d£À¥ÀzÀ gÀUÀÀÆ«Ä : ZÀAzÀæ±ÉÃRgÀ PÀA¨ÁgÀ
2. zÀQëÚ PÀ£ÁðIPÀzÀ d£À¥ÀzÀ gÀUÀÀÆ«Ä : r.PÉ gÁeÉÃAzÀæ
3. PÀgÁªÀ½ ªÀÄAd¼À : r.PÉ gÁeÉÃAzÀæ
4. PÀ£ÁðIPÀd£À¥ÀzÀ ÀPÀ ÉÆ¼ÀÀPÉÆÃ±À : (¸À) ».a. ¨ÉÆÃgÀ°AUÀAiÀÄå
5. PÀ£ÁðIPÀd£À¥ÀzÀ ÀPÀ ÉÆ¼ÀÄ : UÉÆgÀÄ ZÀ£Àߧ¸À¥Àà
6. ºÉÆ£ÀßvÀÄA ÀºÉÆ®PÉ®è : UÉÆgÀÄ ZÀ£ÀߧªÀ¥Àà
7. PÀ£ÀßqÀ eÁ£À¥ÀzÀ «±ÀéPÉÆÃ±À : (¸À) ZÀAzÀæ±ÉÃRgÀ PÀA¨ÁgÀ
8. ¨sÀÆvÁgÁzsÀ£É : PÉ a£ÀߥÀàUËqÀ
9. ªÀiÁ PÀÀPÀ¼À : f.Dgï. w¥ÉàÁéÄ
10. eÁ£À¥ÀzÀ¥À¨sÀªÀ£É : f.Dgï. w¥ÉàÁéÄ
11. zÀQëÚ PÀ£ÁðIPÀd£À¥ÀzÀ PÀæÃqÉUÀ¼ÀÄ : f Ã±À ¥ÀgÀªÀÄ ªÀiÀÄå
12. AiÀÄPÀëUÁ£À : PÉ²ªÀgÁªÀÄ PÁgÀAvÀ
13. PÀ£ÀßqÀ eÁ£À¥ÀzÀ PÀÁ ¥ÀæÃ±À : ZÀPÉgÉ²ªÀ±ÀAPÀgÀ
14. The Encyclopedia of folk culture of Karnataka : Krishna Murthy Hanur

---

KNC 210: ¥ÀwæPÉ 5.3 ZÁ¸ÀwæPÀ Czsï ÀÄAiÀÄ£À: ±Á¸À£À¸ÀA¥Àæ¢AiÀÄ ¥À£À¥ÀæªÉÆÃdqÀ£É

Course Outcome

CO1: Learn to read inscription.
CO2: Understand_kannada culture through inscription.
CO3: Gain knowledge to explore and to save Inscription through field work.
CO4: Understand research works done in the field of epigraphy.

1. ±Á¸À£À JAzÀgÉãÀÄ? PÀ£ÁðIPÀzÀ ±Á¸À£À Czsï ÀÄAiÀÄ£ÀzÀ EwºÁ¸À - ±Á¸À£ÀUÀ¼À ¥ÀæPÁgÀUÀ¼ÀÄ ±Á¸À£ÀUÀ¼À ªÀUÃðPÀgÀt

2. ±Á¸À£ÀPÀ, °¦PÁgÀ, gÀZÀPÁ - ಶಾಸನಗಳ ವಿಷಯಾನುಪೂರ್ವಿ – zÁ£À±Á¸À£À PÀÆ ±Á¸À£À «ÃgÀUÀ®èÀ ªÀiÁ¹ÛÀ¤¹ ¢UÀ®è

3. ºÀä ±Á¸À£À - ¨ÁzÁ«ÄAiÀÄ PÀ¯ÉÆgÀ¼ÀÀÖ±Á¸À£À - PÀÄPÁÌ¤ßzÀ¯ f£À®è±Á¸À£À ±Á¸À£À

4. ®PÀÄëöä AiÀÄ CwªÀÄÚ AiÀÄ ±Á¸À£À - §½UÁ« AiÀÄ PÉÆÃ¯ï ªÀÄoÀzÀ ±Á¸À£À - ±ÀæªÀt ¨É¼ÀUÉÆ¼À ±Á¸À£À §ÄPÀÌgÁAiÀÄ£À ±Á¸À£À

¥ÀgÁªÀÄ±Àð£ÀPÀÈwUÀ¼ÀÄ:

1. ±Á¸À£À ªÁåPÀgÀt 1, 2 : JA JA PÀ®§ÄVð
2. PÀ£ÀßqÀ ±Á¸À£ÀUÀ¼À ¸ÁA¸ÀÌøwPÀ CzsÀåAiÀÄ£À JA azÁ£ÀAzÀªÀÄÆwð
3. PÀ£ÁðIPÀ ±Á¸À£À ¸ÀA¥ÀÄI PÉ. gÀªÀÄ±À
4. PÀ£ÀßqÀ °¦AiÀÄ GUÀªÀ ªÀÄvÀÛÄ «PÁ¸À J.«. £ÀgÀ¹AºÀªÀÄÆwð
5. PÀ£ÀßqÀ ±Á¸À£À ¸ÀA¥ÀÄI PÀ£ÀßqÀ ¸Á»vÀå ಪರಿಷತ್ತು

6. ±Á¸À£À±Á¸ÀÛç¥ÀæªÉñÀ: ¹¦ PÉ
7. ¨sÁgÀwÃAiÀÄ ±Á¸À£À±Á¸ÀÛç¥ÀjZÀAiÀÄ: (C£ÀÄ) ¹¦ PÉ
8. ±Á¸À£À¥ÀzÀ PÀÄdj (¥ÀæxÀªÀÄ¨sÁUÀ): (¸À) JA aznÁ£ÀAzÀªÀÄÆwð
9. Indian Epigraphy : D.C. Sircar
10. Indian Epigraphy and South Indian Scripts : C. Shivaramamurthy
11. Indian Paleography : Ahmed Hussain Dani
12. The Alphabet : David Diringer

ªÀÄÄPÀÛ LaÒPÀ (Open Elective)

KNC 530: ಪತ್ರಿಕೆ: ೬.೧ ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ
(¥ÁæaÃ£À, ªÀÄzsÀåPÁ°Ã£À, DzsÀÄ¤PÀ) (3:1=4 PÉærrmï)

Course Outcome

CO1: Specify in depth Vachanas' of Basavanna
CO2: Learn the details of Kavirajamarga
CO3: Write down in depth Vachanas' of Akkamahadevi
CO4: Learn the characteristics of Short Stories

1. **¥ÁæaÃ£À ¸Á»vÀå:**
   (C) PÀgÁdªÀiÁUÀð - £ÁqÀÄ£ÀÄr AiÀÄ ªÀtð£É¥ÀzÀåUÀ¼ÀÄ ¥ÀjZÉÒzÀ MAzÀgÀ ¥ÀzÀå ¸ÀASÉå 36, 37,38,39,40. ªÀÄÆgÀ£ÉAiÀÄ ¥ÀjZÉÒzÀ 174, 176, 177, 179£ÉÃ ¥ÀzÀå (¸À): JA«. ¹ÃvÁgÁªÀÄAiÀÄå
   (D) ªÀqÁØgÁzsÀ£É 'PÁwðPÀj¹AiÀÄ PÀxÉ (¸À) r.J¯ï. £ÀgÀ¹AºÁZÁgï
   (E) ¥ÀA¥À¨sÁgÀvÀ ಭೀಷ್ಮರ ಪಟ್ಟಾಭಿಷೇಕ ಪ್ರಸಂಗ – «PÀæªÀiÁdÄð£À«dAiÀÄ (¸À) n.«. ªÉAPÀmÁZÀ®±Á¹Ûç zÀ±ÀªÀiÁ±Áé¸À ¨sÁUÀzÀ ¥ÀzÀå ¸ÀASÉå 15 jAzÀ 25 gÀªÀgÉUÉ
2. **ªÀÄzsÀåPÁ°Ã£À ¸Á»vÀå-1 :**
   (C) §¸ÀªÀtÚ£ÀªÀgÀ ªÀZÀ£À¸ÀA¥ÀÄl (¸À) JA.JA. PÀ®§ÄVð
   ªÀZÀ£À ¸ÀASÉå 105, 158, 194, 235, 241, 345, 447, 638, 821, 580
   (D) CPÀÌªÀÄºÁzÉ«: ²ªÀ±ÀgÀtÂAiÀÄgÀ ªÀZÀ£À¸ÀA¥ÀÄl (¸À) «ÃgÀtÚ gÁdÆgÀ
   ªÀZÀ£À ¸ÀASÉå 78, 143, 196, 197, 206, 211, 268, 364, 365, 413
3. **ªÀÄzsÀåPÁ°Ã£À ¸Á»vÀå-2 :**
   (C) ¸ÀªÀðdÕ ¸ÀªÀðdÕ£À ªÀZÀ£ÀUÀ¼ÀÄ (¸À) GvÀÛAV ZÉ£ÀßPÀ
   ªÀZÀ£À ¸ÀASÉå: 531, 534, 545, 563, 893, 1239, 1145, 1148, 1155, 1275,
   (D) **QÃvÀð£ÉUÀ¼ÀÄ:**
   ¥ÀÄgÀAzÀgÀzÁ¸ÀgÀ zÁ¸ÀÄ ªÀiÁdAiÀÄªÉ§ ¢ªÀå ªÀÄAvÀæ
   PÀ£ÀPÀzÁ¸ÀgÀ PÀÄ®PÀÄ® PÀÄ®ªÉ£ÀÄªÀgÉÆqÉÁqÀj
4. **DzsÀÄ¤PÀ ¸Á»vÀå:**
   (C) **PÁªÀåUÀ¼ÀÄ** : PÀÄªÉA¥ÀÄ – CRAqÀ PÀ£ÁðlPÀ

		f .J¸ ï. ²ª ÀgÀÄz ÀæAiÀÄ	– ª ÄÊ¸ÀÆgÀÄ «±Àé «zÁå¤ ®AiÀÄ
(D)	DzsÀå PÀ§ÄÖ¤ZÁgÀ:	PÀÄ. «ÃgÀ¨sÀzÀæ¥Àà	– zÁªÀtUÉgÉ
		¸ÁgÁ C§Æ§PÀgï	– ZÀAzÀæUÀÄ¥ÀÛ

¥ÀgÁªÀ ÄcÀð£À UÀæAxÀUÀ¼ÀÄ

1. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ gÀ² ªÀÄ ¸ÀA¥ÀÄl
2. ª ÀÄ¸À èÄgÀÄ «±Àé «zÁå¤®AiÀÄ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ ¸ÀA¥ÀÄl UÀ¼ÀÄ
3. ¸Á° ÀvÀå CPÁqÉ«Ä ¸Á»vÀå ZÀjvÉæ ¸ÀA¥ÀÄl UÀ¼ÀÄ: ¨ ÉAUÀ¼ÀÆgÀÄ««
4. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ PÉ. ª ÉAPÀl gÁª ÀÄ¥Àà
5. PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ vÀ¸ À ±Áª ÀÄgÁAiÀÄ
6. PÀ£ÀßqÀ ¸Á»vÀå Ew° Á¸À gÀ² ªÀÄ ¸ÀA¥ÀÄl

****

£ÁlPÉÆÃvÀìªÀ ¸ÀA

ಪ್ರಧಾನ ವಿಷಯಗಳು (Hard core)

KND 050: ¥ÀvÀæ É1 DzsÀÄ¤PÀ PÀ£ÀßqÀ ¸Á»vÀå: ¥ÀzÀå: PÁªÀå, PÁzÀA§j, ¥ÀæªÀÄzsÀ

Course Outcome

CO1: Learn the details of Selected Poems
CO2: Learn in depth Purnachandra Tejaswi
CO3: Understand in depth Modern Kannada Poetry
CO4: Identify in depth Kannada Novel

1-2. PÁªÀå: 12 ¤UÀ¢vÀ PÀ«vÉUÀ¼ÀÄ

1. ²±ÀÄ£Á¼À±ÀjÃ¥sÀ	:	©¢AiÀÄ ¨ÉÃªÀÄzÀÄQ
2. zÀgÁ ¨ÉÃAzÉæ	:	£gÀ§°
3. PÀÄªÉA¥ÀÄ	:	ºÉÆÃUÀÄªÉÃ£Á
4. ¨ÉÃAzÉæ ÁPÀÄgÀÄ	:	ZÀqÀ±Á¸À£À
5. PÉ.¸ïJ£ï	:	¨sÉÃ«ÄvÀ
6. ಗೋಪಾಲಕೃಷ್ಣ ಅಡಿಗ	:	¨sÀÆvÀ
7. f.J¸ï.J¸ï	:	¸ÀeÉÁ
8. gÀe Á£ï zÀvÀÛ	:	¥ÀæÁ¼PÉ
9. ¹zÀÞAUÀAiÀÄå	:	¸Á«gÁgÀÄ £À¢UÀ¼ÀÄ
10. ªÉÊUÀ¤ UÀÄ±Éï	:	C£Á¢ AiÀÄ KPÁAvÀ VÃvÉ
11. ±ÀAPÀÀ ªÀÆ§ÀÄ	:	UÀÄ©ªÀÄ
12. ಸ. ಉಷಾ	:	ºÀA¸ÀºÁjzÀºÉævÀÄÛ

3.4. PÁzÀA§j
¥ÀzÀå: PÀÀÖ¯ÉE : PÉ. ¥ÀÆtðZÀAzÀæ vÉÃd¹é

¥ÀgÁªÀÄ±Éð: (PÀvÉUÀ¼À)

1. ²±ÀÄ£Á¼À±ÀjÃ¥sÀgÀ VÃvÉUÀ¼ÀÄ :¸À. qÁ ²ªÁ£ÀAzÀ UÀÄ§âgÁ PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸À¸ÀÌøw ¤zÉÃð±À£Á®AiÀÄ, ¨ÉA :1985
2. ±ÀæªÀÄ£ÀªÀÄ ¨ÁAiÀÄ PÉ : ¸À. a. ²ªÀgÀ ¸ÀgÁdÄ EvÀgÀgÀÄ, £À¼ÀÉÁðI PÀ¥À±À£À ¨ÉA : 1986
3. PÀÄªÉA¥ÀÄ ¸ÀªÀÄUÀæPÁªÀå ¸À¥ÀÄ-೧ : ರಾಷ್ಟ್ರಕವಿ ಕುವೆಂಪು ಪ್ರತಿಷ್ಠಾನ (ರಿ), ಕುಪ್ಪಳಿ, :2013
4. ¨ÉÃAzÉæ ÁPÀÄgÀÄ§zÀÄPÀÄ §gÀºÀ : ¸À. £É«ÄZÀAzÀæ PÀÉÁðI PÀ¯ÉRQAiÀÄgÀ ¸ÀAWÀ ¨ÉUÀ¼ÀÆgÀÄ: 1988
5. ªÀÄ¢üÉAiÀÄªÀÄÁÉ :
6. ºÉÆ¸ÀUÀ£ÀßqÀ PÀvÉ :ಸಂ. ಜಿ. ಎಚ್. ನಾಯಕ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು : 1985
7. CzÉ
8. ¸ÀªÀÄÀð PÁªÀå :¸À. ©.J. ¸ÀÀ, PÀ£ÀßqÀ ¸À¸ÀÌøw E¯ÁSÉ ¨ÉA : 2006
9. §AqÁAiÀÄ PÁªÀå :¸À. §gÀUÀÆgÀÄ gÁªÀÄZÀAzÀæ¥Àà PÀ£ÀßqÀ ªÀÄvÀÄÛ ¸À¸ÀÌøw ¤zÉÃð±À£Á®AiÀÄ, ¨ÉA : 1990

10. ¸ÁÜ¬Ä PÁªÀå :¸À. ©.J. ¸À£À¢, PÀ£ÀßqÀ ¸Á»vÀå ¥ÀjµÀvÀÄÛ, ¨ÉAUÀ¼ÀÆgÀÄ: 2006
11. ºÉÆ¸ÀUÀ£ÀßqÀ PÀvÉ :ಸಂ. ಜಿ. ಎಚ್. ನಾಯಕ, ಕನ್ನಡ ಸಾಹಿತ್ಯ ಪರಿಷತ್ತು, ಬೆಂಗಳೂರು: 1985
12. ©qÀÄUÀqÉAiÀÄ ¨ÉÃUÉ :¸À a. ²æÃªÀÄgÀÄ dÄ Evgà, ¸Á»vÀå CPÁqÉ«Ä, ¨ÉA :2012

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. 20£ÉÃ ±ÀvÀªÀiÁ£ÀzÀ PÀ£ÀßqÀ ¸Á»vÀå ZÀjvÉæ : qÁ §¸ÀªÀgÁd ¸ÁzÀgÀ
2. PÀ£ÁðI PÀ¸Á»vÀå CPÁqÉ«Ä PÀ£ÀßqÀ ¸Á»vÀå¥Àæ±À¹Û ªÀiÁ°PÉ ¥ÀæPÀluÉ ªÀiÁqÉAiÀÄ ¸À¥ÀÄÛ UÀ¼ÀÄ
3. ºÁqÀÄ ºÁ¢AiÀÄ vÉÆgÉ¸À vÀÄ : JZï.J¸ï. gÁWÀªÉÃAzÀæ gÁªï
4. Eº ÀzÀ¥ÀÄ ªÀÄÄzÀ ºÁ¢ : £ÀgÀºÀ½î ¨Á®¸ÀħæºÀätå
5. UÀÄUÉæÃwæ : PÀÄªÉA¥ÀÄ C©£ÀAzÀ£À ÀUÀæAxÀ
6. ²æÃPÀÄªÉA¥ÀÄ : ¸À: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
7. PÀÄªÉA¥ÀÄ PÁªÀå«ªÀÄ±Éð : ¸À: CgÀªÀAzÀ ªÀiÁ®UÀwÛ PÀÄªÉA¥ÀÄ PÀ£ÀßqÀ CzsÀåAiÀÄ£À ¸ÀA¸ÉÜ ªÉÄ¸ÀÆgÀÄ
8. ¸Á»vÀå ªÀÄvÀÄÛ AiÀÄÄUÀzsÀªÀÄð : QÃwð£ÁxÀ PÀÄvÀðPÉÆÃn
9. ºÉÆ¸ÀUÀ£ÀßqÀ PÁªÀå ÀJgÀqÀÄ ªÀiÁUÀðUÀ¼ÀÄ : ¸À: f.J¸ï. ²ªÀgÀÄzÀæ¥Àà

KND 020 ¥ÀwæPÉ2 ¥Á±ÁÑvÀå PÁªÀå«ÄÃªÀiÁA¸É (2:1=3 PÉærr)

Course Outcome

CO1: Learn in depth Psychic distance
CO2: Understand in depth Aristotle
CO3: Specify in depth Theory of Communication and Values
CO4: Write down in depth Western Poetics

1. Cj¸ÁÖ¯ï, ºÉÆgÉÃ¸ï, ¯ÁAf£À¸ï
2. §ÄèÉÆÃ : ªÀiÁ£À¹PÀ zÀÆgÀ
3. (C) n.J¸ï. J°AiÀÄmï : ¥ÀgÀA¥ÀgÉ ªÀÄvÀÄÛ ªÉÊAiÀÄQÛPÀ ¥Àæw¨sÉ
   (D) L. J. jZÀqïì : ªÀiË®å¹zÁÞAvÀ ªÀÄvÀÄÛ ¸ÀAªÀºÀ£À¹zÁÞAvÀ
4. eÉÆÃ£Áx£ï PÀ®gï : gÀZÀ£ÁªÁzÀ ªÀÄvÀÄÛ PÁªÀå«ÄÃªÀiÁA¸É

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. Cj¸ÁÖl®£À PÁªÀå«ÄÃªÀiÁA¸É : J£ï. ¨Á®¸ÀħæºÀätå
2. ºÉÆgÉÃ¸À£À ¸Á»vÀå«ªÀÄ±Éð : J£ï. ¨Á®¸ÀħæºÀätå
3. O£ÀßvÀå«ZÁgÀzÀ±Éð : J£ï. ¨Á®¸ÀħæºÀätå
4. vË®¤PÀ PÁªÀå«ÄÃªÀiÁA¸É : JZï. w¥ÉàÃgÀÄzÀæ¸Áé«Ä
5. ¥Á±ÁÑvÀå PÁªÀå«ÄÃªÀiÁA¸É : «.JA. E£ÁªÀÄzÁgï
6. ಇಂಗ್ಲಿಷ್ ಭಾಷೆಯಲ್ಲಿ ಆಧುನಿಕ ಸಾಹಿತ್ಯ ವಿಮರ್ಶೆ : ಎಲ್.ಎಸ್. ಶೇಷಗಿರಿರಾವ್
7. PÁªÀåªÀÄvÀÄ aAvÀ£É : f.J¸ï. ²ªÀgÀÄzÀæ¥Àà
8. ¸Á»vÀå«ªÀÄ±Éð : ¹.J£ï. gÁªÀÄZÀAzÀæ£ï
9. n.J¸ï. J°AiÀÄmï PÀAiÀÄ «ªÀÄ±ÉðAiÀÄ «ZÁgÀUÀ¼ÀÄ : JZï.©. «ÄdV
10. Structuralist Poetics : Jonathan Culler
11. On Deconstruction : Jonathan Culler

12.The Pursuit of Signs : Jonathan Culler
13. Linguistics and Poetics : Roman Jacobson
14. Principles of litatray Critisism : I A Richards

KND 030: ¥ÀwæPÉ 3 ¸ÀªÀÄÆºÀ ªÀiÁzsÀåªÀÄ (2:1=3 PÉærr)

Course Outcome

CO1: Understand in details with examples Mass media
CO2: Identify the characteristics of Audio and Visual media
CO3: Identify in depth Press media
CO4: Learn in depth Trasalation

1. **¸ÀªÀÄÆºÀ ªÀiÁzsÀåªÀÄzÀ ¥ÀjPÀ®à£É:** ªÁåSÁå£ÀUÀ¼ÀÄ, ¸ÀégÀÆ¥À, ªÀÄºÀvÀé, ¥ÀæPÁgÀUÀ¼ÀÄ: eÁ£À¥ÀzÀ ªÀÄvÀÄÛ DzsÀÄ¤PÀ ¥ÀæPÁgÀUÀ¼ÀÄ, PÁAiÀÄðUÀ¼ÀÄ, C©üªÀåQÛ ªÀÄvÀÄÛ ¸ÀªÀÄÆºÀ ºÁUÀÆ ¸ÁªÀiÁfPÀ §zÀÄPÀÄ ªÀÄvÀÄÛ ºÀAUÀÄ¸ÉPÀqÉ
2. **¥ÀwæPÉ ºÁUÀÆ ¥ÀÄ¸ÀÛPÀ ªÀiÁzsÀåªÀÄ:** ¥ÀwæPÉUÀ¼À ªÀÄvÀÄÛ ¥ÀÄ¸ÀÛPÀUÀ¼À ¸ÀégÀÆ¥À, ªÀÄºÀvÀé, ¥ÀæPÁgÀUÀ¼ÀÄ, PÁAiÀÄðUÀ¼ÀÄ, ¸ÀÄ»vÉåUÀ¼ÀÄ, ºÀÄlÄÖ ªÀÄvÀÄÛ ¨É¼ÀªÀtÂUÉ ¥ÀwæPÉ ªÀÄvÀÄÛ ¥ÀÄ¸ÀÛPÀ PÉëÃvÀæzÀ PÁAiÀÄðPÀvÀðgÀ ಗುಣಗಳು ಮತ್ತು ಇತಿಮಿತಿ, ಬರಹ, ಭಾಷೆ, ಸಾಹಿತ್ಯ, ವಿಮರ್ಶೆ, ವರದಿ, ಸುದ್ದಿ, ಲೇಖನ, ¸ÀA¥ÁzÀQÃAiÀÄ, CªÀÄÄæPÀ CAPÀ, ¥ÀÄgÀªÀtÂUÀ¼ÀÄ, eÁ»gÁvÀÄ, ªÀÄÄzÀæt ZÀ»£ÉUÀ¼ÀÄ ªÀÄvÀÄÛ «PÁ¸À ¥ÀæÁgÀA¨sÀ ºÁUÀÆ ªÀiÁgÁl
3. **DPÁ±ÀªÁt - zÀÆgÀzÀ±Àð£À - ZÀ®£ÀavÀæ** ¸ÀégÀÆ¥À, ªÀÄºÀvÀé, ¸À»vÉå ºÀÄlÄÖ ªÀÄvÀÄÛ ¨É¼ÀªÀtÂUÉ Ew»ÀÄwUÀ¼ÀÄ, PÉëÃvÀæzÀ PÁAiÀÄðPÀvÀðgÀ, DqÀÄvÀ ªÀåªÀ¸ÉÜ, ಬರಹ, ಭಾಷೆ, ಸಾಹಿತ್ಯ, ವಿಮರ್ಶೆ, (ಸಂಭಾಷಣೆ, ನಿರೂಪಣೆ, ವಾರ್ತೆ, ವರದಿ, ಕಾರ್ಯಕ್ರಮಗಳು) ಧ್ವನಿ, ಉಚ್ಚಾರಣೆ, ಸ್ಪಷ್ಟತೆ, ಉಡುಪು, «£Áå¸À¤ªÀiÁðt zÀÈPÀÌ¼É ¸ÀAVÃvÀ ¸À¥ÁzÀ£ÉPÀÌ¼ÀÄ
4. ಸಂವಹನ ಮಾಧ್ಯಮಗಳು ಮತ್ತು ಭಾಷಾಂತರ : ಭಾಷಾಂತರದ ಮಹತ್ವ, ವಿವಿzsÀ PÉëÃvÀæUÀ¼À°è CzÀgÀ CUÀvÀå ªÀÄvÀÄÛ ¥ÁæzÉÃ²PÀ ºÁUÀÆ ¸ÀAªÀºÀ£ÀzÀ (I ÁëgÉÃ¨ AiÀÄ ï£À°è ¥ÁæzÉÃ²PÀ ªÀiÁzsÀåªÀÄUÀ¼À C¨sÁå¸À ªÀiÁr ¸ÀÆPÀÛ

¥ÀgÁªÀÄ±Àð£À UÀæAxÀUÀ¼ÀÄ

1. ¥ÀwæPÉ/ ¸Á»vÀå : ಸರಜೂ ಕಾಟ್ಕರ್, ಅನ್ವೇಷಣೆ ಪ್ರಕಾಶನ, ಬೆಂಗಳೂರು
2. ¨sÁgÀwÃAiÀÄ ¥ÀwæPÉÆÃzÀåªÀÄ : ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ, ಪ್ರಸಾರಾಂಗ, ಮೈವಿವಿ
3. DzsÀÄ¤PÀ ¨sÁgÀvÀzÀ°è ¥ÀwæPÉÆÃzÀåªÀÄ : gÉÃ¢üAiÉÆà E H ¯ï¹£ï (ªÀÄÆ®) ²æÃgÀAUÀ ¯ï. ¨sÀqÁgïPÀgï (C£ÀÄ) ¥ÀæPÁgÀAUÀ, ªÉÄÊ«
4. ¨sÁgÀvÀzÀ°è ¥ÀÄ¸ÀÛPÀUÀ¼À ¨É¼ÀªÀtÂUÉ : C§ÄÝï ºÀ«Äzï (ªÀÄÆ®) f.¦. ²ªÀgÁA (C£ÀÄ), ªÉÄÊ«
5. ¥ÁæzÉÃ²PÀ ¥ÀwæPÉÆÃzÀåªÀÄ : (¸À) ©.«. ªÉÊPÀÄAoÀgÁdÄ, ¨ÉAUÀ¼ÀÆgÀÄ ««
6. ¸ÀªÀÄÆºÀ ªÀiÁzsÀåªÀÄUÀ¼ÀÄ : r.©. £ÁAiÀÄPÀ, UÀÄ®§UÁð ««
7. ಬ್ರಿಟಿಷ್ ಪತ್ರಿಕೋದ್ಯಮ : ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ, ಮೈವಿವಿ
8. ¦æAnï ¥ÀwæPÉÆÃzÀåªÀÄ : ¤gÀAd£À ªÁ£À½î, ªÉÄÊ«
9. ¸ÀªÀÄÆºÀ ªÀiÁzsÀåªÀÄUÀ¼ÀÄ ªÀÄvÀÄÛ gÁ¶ÖçÃAiÀÄ C©üªÀåQÛ: J.J¸ï. ¨Á®¸ÀÄ§æªÀÄtå, PÀÄªÉA¥ÀÄ «
10. ¥ÀwæPÉÆÃzÀåªÀÄ : ಎಂ. ಚಲಪತಿರಾವ್ (ಮೂಲ) ನಾಡಿಗ ಕೃಷ್ಣಮೂರ್ತಿ (ಅನು)

11. UÀzÀå¥ÀæPÁgÀ ±ÀÄ:¸ÀCgÀAzÀª ÀÄ®UÀ¼Àå¥ÀæPÁgÀUÀ¼À ªÉÆ« «

12.PÀªÀåªÀ ¥ÀæPÁgÀ ªÉa :¸À²ÃªÁ¸À ªÀ ¥ÀAUÀgÀ¥ÀæPÁgÀUÀ¼À ªÉÆ« «

13.eÁ£À¥ÀzÀ ªÀÄvÀÄÛ ¸ÀA¸ÀÌøw ªÀÄzÀå±ÀÄ: PÀ£ÁðI PÀ eÁ£À¥ÀzÀ ÀAi ÄÃgÀgÀÄ ¸ÀCPÁqÉÄ ¨ÉAUÀ¼ÀÆgÀÄ

14.¸Àª ÀÄzÀª ÀÄzÀ±ÀÄ: J¸ï.J A»gÉÃ ªÀÄvÀÄÛ .©.£ÁAi ÀPÀ

15. PÀ£ÁðI PÀ¸ÀUÁw : PÀ¤ÀqÀC©üªÀÈ¢Þ¥ÁæzsÁgÀ¥ÀæªÀuÉ

KND 040: ¥ÀæªÉÃ±À CªÀ±ÀåPÀvÉ /ªÀåPÀvÀé ¥ÁæAiÉÆÃV(1:2=3 PÉærrmï)

Course Outcome

CO1: Write down in details with examples Project work

CO2: Understand the details of information collection

CO3: Learn in depth Disseration

CO4: Understand the details of editing and Proof reading

PÉÆÃjPÉÆAqÀ, ªÀÄÁ»w ¸ÀAUÀæºÀuÉ ªÀÄvÀÄÛ ¥ÀoÀå

WÀlPÀ 1: C) CªÀ±ÀåPÀ¥ÀæªÀ ªÀÄvÀÄÛ ¥ÀoÀå

D) «ZÁgÀ¸ÀAQEÃ¶×/ ZÀZÉð / ¥À¤ÀAzsÀ£À

WÀlPÀ 2: C) PÀ¤ÀqÀ ªÀÄ¥ÀoÀå

D) ¥ÀæªÁ±À¸ÀÛÀ ºÁUÀÆ CAwªÀÄ ¥ÀoÀå

WÀlPÀ 3: ¸ÉÄ¸ÉÆÃ CAvÀåªÀºÀ ¥ÀoÀåAi ÀÄ ªÀÄgÀtªÀÄÁ¥À£ÀªÀ ªÀÄvÀÄÛ ªÀÄÆ PÀ¥ÀjÃPÀëÃ£À¤ÀÃ¤MÉ§âDAvjPÀ

ºÁUÀÆ MÉ§â¨ÁºÀå¥ÀjÃPÀëÃ£À¤ÀÃ¤AqÀvÉ¸ÀÄw £ÀqÉ¸ÀÄvÀÛÉ– 70 CAPÀUÀ¼ÀÄ

G¥Àå¢ûಾನ ವಿಷಯಗಳು (Soft core)

KND 210: ಪತ್ರಿಕೆ: ೫.೧ ಭಾಷಾವಿಜ್ಞಾನ ಅಧ್ಯಯನ : ಕನ್ನಡ ಭಾಷಾಸ್ವರೂಪ : ಆಯ್ದ ಪಠ್ಯಗಳು

Course Outcome

CO1: Learn the characteristics of History of Kannada Language

CO2: Learn in depth relationship between Liteature and Language

CO3: Write down in details with examples the usage of Technology and Kannada Language

CO4: Understand the details of Mothertongue

1. ±À¨Á eÁÕ¥À¶	: PÀ£ÀßrAiÀÄ M¼ÀÄ¥ÀÄ
2. ಎ.ಆರ್. ಕೃಷ್ಣಶಾಸ್ತ್ರಿ	: EA¢£À d£ÀÄ ªÀÄzÀÄª ÀÄ PÀ£ÀßqÀ
3. r.J¯ï.J£ï	: ¥ÀzÀUÀ¼À ºÀÄl ÖÀÄ ¸Àª À
4. PÀ¥É¥À ÄÄ	: ¸À¸ÀÌøw PÀ£ÁðI PÀ
5. f.J¸ï. ²ªÀgÀÄzÀæ¥Àà	: PÀ£ÀßqÀ¸Á»w ªÀÄvÀÄÛPÀ£ÀßqÀ
6. f. ªÉAPÀl¸ÀÄ§âAiÀÄå	: EUÉÎ PÀ£ÀßqÀ
7. AiÀÄÄDgï. C£ÀAvÀªÀÄÆwð	: PÀ£ÀßqÀzÀ ªÀÄÆgÀÄ ºÀª ÀªÀÄUÀ¼ÀÄ
8. PÉ.£ÁgÁAiÀÄ	: vÀÀvÀéªÁ¢ªÀ ÄvÀÄÛPÀ£ÀßqÀ

9. wgÀÄªÀÄ¯ÉÆèï : PÀ£ÀßqÀ¸Á»vÀå ZÀjvÉæ ¸ÀA¥ÀÄl è
10. §gÀÆgÀÄ gÁªÀÄZÀAzÀæ±ÀªÀÄð : PÀ£ÀßqÀ ©æäkÀ£À

¥ÀgÁªÀÄ±Àð :

1. ±À. ¨Á. eÉÆÃ¶ : PÀ£ÀßrAiÀÄ ºÀÄlÄÖ ¸ÀA¸ÀÌøw ¥ÀæPÁ±ÀPÀgÀÄ zsÁgÀªÁqÀ 1945
2. ಎ.ಆರ್. ಕೃಷ್ಣಶಾಸ್ತ್ರಿ : ಭಾಷಣಗಳು ಲೇಖನಗಳು, ಶಾರದಾ ªÀÄA¢gÀ ªÉÄÊ¸ÀÆgÀÄ
3. rJ¯ïJ£ï : ¦ÃpPÉUÀ¼ÀÄ ¯ÉÃR£ÀUÀ¼ÀÄ
4. (¸À) ²ªÁgÉØ : PÀªÀÄ¥Àì ¸ÀA±ÉÆÃzsÀ£À, PÀ£ÀßqÀ«±Àé«zÁå®AiÀÄ, ºÀA¦
5. ¸À. gÀªÀÄvÀï vÀgÀÃPÉgÉ : ªÀÄAvÀæªÁUÀ, §UÀÉ¸À¥ÀÄl.1, PÀ«, ºÀA¦ 2011,
6. ¸À. J£ï.J¸ï. vÁgÁ£ÁxÀ : ±ÀæªÀÄ£À ¸À±ÉÆÃzsÀ£É PÉÃAzÀæ PÀ¸Á»vÀåCPÁqÉÄ, ¨ÉÄ
7. AiÀÄÄDgï. C£ÀAvÀªÀÄÆwð : ªÁºÀ£ÀAiÀÄ£ÉÃzÀåÀè
8. PÉ«. £ÁgÁAiÀÄt : PÀ£ÀßqÀdUÀwÛ Czs±ÀæªÀÄ£À, PÀ£ÀßqÀ««
9. PÉ. wgÀÄªÀÄ¯ÉÆèï : £ÀªÀÄäPÀ£ÀßqÀ
10. ºÉï.J¸ï. ©½ªÀj : ªÀÄÆgÀÄ zÀÀÛG¥À£Áå¸ÀUÀ¼ÀÄ

KND 210: ¥ÀwæPÉ 5.2 eÁ£À¥ÀzÀ ÀCzsÀåAiÀÄ£À: PÀ£ÀßqÀd£À¥ÀzÀ ¸Á»vÀå (DAiÀÄÝ¥ÀoÀåUÀ¼ÀÄ)

Course Outcome

CO1: Understood the concept of Folk theatre setting
CO2: Able to understand the different forms of Folk arts
CO3: Able to understand the signification of different Folk festivels
CO4: Understood the concept of Folk Culture

1. vÁwéPÀ: eÁ£À¥ÀzÀ ¸Á»vÀå¥ÀæPÁgÀUÀ¼ÀÄPÀj vÀÄ F ªÀgÉUÉ£ÀqÉzÀ ÀCzsÀåAiÀÄ£ÀzÀ ¸ÀªÀÄÉ¥À ¥ÀæAiÉÆÃzÀÄ ¸Á»vÀå¥ÀæÁgÀzÀªÀèCzsÀåAiÀÄ£Àª ÀÄrzÀ¥ÀæµÁÖR «zÁA¸ÀgÀ¥ÀjZÀAiÀÄ

¥ÀoÀåUÀ¼ÀÄ

2. C) PÀ£ÀßqÀd£À¥ÀzÀPÀxÉUÀ¼ÀÄ : fÃ±À ¥ÀgÀªÀÄ ªÀAiÀÄå(¥ÀæPÀÄlUÀ¼ÀÄ £ÀªÉÆzÀ® JgÀqÀÄ PÀxÉUÀ¼ÀÄ)
D) UÀgÀwAiÀÄ ºÁqÀÄ : ºÀ®¸ÀÀV UÉÆÃ«AgÀÄ
3. C) UÀÄUÉÃjzÀÀ£À®Ä : (¸À) PÁ¼ÉÃUËqÀ£ÁUÀªÁgÀ – f.«. D£ÀzÀªÀÄÆwð (¤UÀ¢vÀ¨sÁUÀ¥ÀÄ 1 jAzÀ 107 ªÀÄvÀÛ 251 jAzÀ 300 gÀªÀgÉUÉ)
4. C) £ÀªÀÄä¸ÀÄwÛ£ÀUÁzÉUÀ¼ÀÄ : ¸ÀÄzsÁPÀgÀ
D) ¸Á«gÀzÀÀMUÀÄUÀ¼ÀÄ : ¸ÉÆÃªÀÄ±ÉÃRgÀ EªÀÄär¥ÀÄgÀ

KND 210: ¥ÀwæPÉ 5.3 ZÁj wæPÀCzsÀåAiÀÄ£À PÀ£ÀßqÀ PÀ¸À¸ÀÄ: DAiÀÄÝ¥ÀoÀåUÀ¼ÀÄ

Course Outcome

CO1: Able to understand the historical background of Kannada Poets
CO2: Students must learn the attitudes of Kannada Poets
CO3: Understood the different forms of Kannada Chandasu
CO4 : Understood the concept of Kannada Literature

1. **PÀgÁdªÀÄÁUÀðA : £ÁqÀÄ£ÀÄ ªÀÄÀð£É**
(D±ÁéÀ 1, ¥ÀzÀåUÀ¼ÀÄ 1 jAzÀ 43, D±ÁéÀ 2 ¥ÀzÀå 28)
2. **ªÀqÁØgÁzsÀ£É : ¨sÁæeÁµÀÄ ¨sÀlÖgÀPÀxÉ**

3. Cf vÀÄgÁ :CwÛÃ ÉÃª ÀÁ ÁªÀvÀ

(D±ÁéÀ1, ¥ÀÄÀÄ20 jAzÀ75)

4. §¸ÀÀ ÀÉÃgÀ¤UÀvÀ12 ªÀ¸ÀÀÄ :

1. ¸ÀÀ ÂiÀÄ¨ ÉÃÀÀªÀÁ
2. ¯ÉÃPÀ ÀqÉAPÀ¤Ãª ÁPÉ
3. º§ÀÉvÀzÀº gÀÁiÃ PÀ
4. ºÁª ÀwAzÀ gÀ£À ¸§º ÀzÃ
5. zÃ ÀÉÃPÀª ÃvÀ ¯ÉÃPÀÁ§ÄzÃ
6. ª ÃvÀ ¯ÉÃPÀÁ§ÄzÃ PÀÁgÀÀPÀ Ã ªÀiÀÁ
7. ª Á ÀÉAzÃ ªÉ£ÀvÀzÀÉ
8. PÀ£ÁUÀÀ
9. ª ÃzÀ ÉMgÁiÃ¤PÀ É
10. C¥ÀÃqÉÃº gÀPÀiÃ
11. GvÀÃ PÀzÀ º Ã ÖÉÁ§
12. CgÀÀª Ã£ÁiÃ èCgÀAiÀÁV¥ÃjAzÀ

5. PÃ gÁd zÀ ÁÃPÀgÀÀÉ(º jº gÀ

6. ¹zÀ Áª ÃZÁ vÀ£ÁÀ£ÁiÃ ¸Ä¢ü

7. **§¸ÀÀgÁ :¸ÃÀz Ã« º ÁÀEzÁ ª ÃÃiÃPÀÉ**(¸À¢ü51)

8. gÁª Ãz£ÀZjvÉ PÀÀÁ¸À

9. **gÁª Ã£ÁxÀZjvÉ ±À®zÀ ¸§À**(D±Áç À6, ¸À¢ü2, ¥ÀÀ1 jAzÀ104)

10. gÁ¢ Áª À PÀÁ¸ÁgÀ £ÀÀÀÁ¢ÃgÀ

11.¦ Ã gÃ¸ÀÀ zÀzÃLwº ÁPÀ Áª ÀÃ:º ÀÀ AiÃ¨ ÃqÀÃ

12. PÉ ÃÃÃ G¥À §t f UÀPÉ ÃÃÃ

DAvÀjPÀ ªÀiË®åªÀiÁ¥À£À (30 CAPÀUÀ¼ÀÄ)

¥ÀæxÀªÀÄ ªÀµÀð¸À«zÁåyðUÀ¼ÀÄ ErÃ vÀgÀUÀwAiÀÄ DAvÀjPÀ ªÀiË®åªÀiÁ¥À£ÀªÀ£ÀÄß F PɼÀUÀ£À ªÀiÁ£ÀzÀAqÀUÀ¼À DzsÁgÀzÀ ªÉÄðÉ ªÀiÁqÀ¯ÁUÀĪÀÅzÀÄ

PÀæªÀÄ	C£ÀÄ	CAPÀUÀ¼ÀÄ
mÉ¹ï-1	¥ÀæxÀªÀÄ ªÀµÀð¸ÀA2£ÉÃvÀgÀUÀ¼À CAvÀåzÀ°è (MAzÀÄ UAmÉ)	10
mÉ¹ï-2	¥ÀæxÀªÀÄ ªÀµÀð¸ÀA4£ÉÃvÀgÀUÀ¼À CAvÀåzÀ°è (MAzÀÄ UAmÉ)	10
	¥ÀæxÀªÀÄ ªÀµÀð¸ÀADgÀA¨sÀzÀ J gÀqÀÄ wAUÀ¼À C«gÀvÀ ªÀiË®åªÀiÁ¥À£À (I ÄãnÉÃ¸ï AiÀÄ ï)	05
	¥ÀæxÀªÀÄ ªÀµÀð¸À CAwªÀÄ J gÀqÀÄ wAUÀ¼À C«gÀvÀ ªÀiË®åªÀiÁ¥À£À (I ÄãnÉÃ¸ï AiÀÄ ï)	05
	MlÄÖ	30

3 «ZÁgÀUÉÆõÀ×/ ZÀZÁðUÉÆõÀ×/ ¥ÀæªÀÄvÀ£À– EAvÀºÀ À¸ÀzÀsÀðzÀ ªÀiÁ£ÀzÀAqÀ

ವಿಷಯ ಸಂಗ್ರಹಣೆ, ಪ್ರಬಂಧ ರಚನೆ, ಮಂಡನೆ ಮತ್ತು ಚರ್ಚೆಯಲ್ಲಿ ಭಾಗವಹಿಸುವಿಕೆ – ಗರಿಷ್ಠ 5 ಅಂಕಗಳು

4. ªÀiË®åªÀiÁ¥À£ÀWÀPÀ: 3 : «±ÀézÁå®AiÀÄ ZÀvÀÄ ªÀµÀð¸Àಅಂತ್ಯದಲ್ಲಿ ಮೂರು ಗಂಟೆ ಅವಧಿಯ ಗರಿಷ್ಠ 70 CAPÀUÀ¼À¥ÀjÃPÉë£ÀqÉ¸ÀÄvÀÛzÉ

5. C) C£ÀÄPÀæªÀiÁAiÀÄ / ªÀiÁ£ÀzÀAqÀ ¥ÀæªÀÄÄT (4 PÁåmïUÀjÄ) ªÀiË®åªÀiÁ¥À£À PÉëvÀæPÁAiÀÄð, ªÀiÁ»w ¸ÀAUÀæºÀuÉ ªÀÄvÀÄÛ ªÀgÀ¢

WÀPÀ1: C) C£ÀÄPÀæ¥Àæ±Éß ªÀÄvÀÄÛ ªÀgÀ¢ - 7.5 CAPÀUÀ¼ÀÄ
D) «ZÁgÀUÉÆõÀ×/ ZÀZÉð / ¥ÀæªÀÄvÀ£À - 7.5 CAPÀUÀ¼ÀÄ

WÀPÀ2: C) PÀgÀqÀÄ ªÀgÀ¢ - 7.5 CAPÀUÀ¼ÀÄ
D) ¥ÀæªÁ±ÀUÀ¼ÀÄ ºÁUÀÆ CAwªÀÄ ªÀgÀ¢ - 7.5 CAPÀUÀ¼ÀÄ

WÀPÀ3: ZÀvÀÄxÀð ªÀµÀð¸ÀzÀ CAvÀåzÀ°è ªÀgÀ¢AiÀÄ ªÀiË®åªÀiÁ¥À£À ªÀÄvÀÄÛ ªÀiËTPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß MqÀâ DAvÀjPÀ ºÁUÀÆ MqÀâ¨ÁºÀå ¥ÀjÃPÀëPÀgÉÆA¢UÉ £ÀqɸÀ¯ÁUÀÄvÀÛzÉ – 70 CAPÀUÀ¼ÀÄ

WÀPÀ4: ವಿದ್ಯಾರ್ಥಿಯು ಮೂರನೆಯ ಚತುರ್ಮಾಸದಲ್ಲಿ ವಿಭಾಗದ ಅಧ್ಯಾಪಕರೊಂದಿಗೆ ಚರ್ಚಿಸಿ ವಿಷಯ DAiÀÄÝ ªÀiÁr PÉÆAqÀÄ £Á®Ì£ÉAiÀÄ ZÀvÀÄxÀð ªÀµÀð¸ÀzÀ CAvÀåzÀ°è «¨sÁUÀPÉÌ¸À°è¸À¨ÉÃPÀÄ J-4 C½vÉAiÀÄ PÁUÀzÀzÀ°è 12 ¥Á¬ÄAmï CPÀëgÀUÀ¼À°è 50 ¥ÀÄlUÀ½UÉ PÀqÀªÉÄ E®èzÀAvÉ ªÀÄvÀÄÛ 80 ¥ÀÄlUÀ½UÉ «ÄÃgÀzÀAvÉ C£ÀÄPÀæªÀiÁAiÀÄ «gÀ¨ÉÃPÀÄ

WÀPÀ5: ZÀvÀÄxÀð ªÀµÀð¸ÀzÀ CAvÀåzÀ°è ªÀgÀ¢AiÀÄ ªÀiË®åªÀiÁ¥À£À ªÀÄvÀÄÛ ªÀiËTPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß CzsÀåAiÀÄ£À ªÀÄAqÀ½/ CzsÀåAiÀÄ£À «¨sÁUÀ/ ¥ÀjÃPÁë ªÀÄAqÀ½ CzsÀåPÀëgÀÄ CxÀªÁ C£ÀÄªÉÆÃ¢vÀ ªÀiÁ£ÀåvÉ ¥ÀqÉzÀ ªÀåQÛUÀ¼ÀÄ ºÁUÀÆ EvÀgÀ «±ÀézÁå®AiÀÄ / GzÀåªÀÄ / ¸ÀA¸ÉÜ / ¸ÀA±ÉÆÃzsÀ£Á ¸ÀAzÀ DºÁévÀgÀ¤zÀ MqÀâ¨ÁºÀå ¥ÀjÃPÀëPÀgÉÆA¢UÉ £ÀqɸÀ¯ÁUÀÄvÀÛzÉ – 10 CAPÀUÀ¼ÀÄ (60+10=70)

4£ÉÃ ZÀvÀÄxÀð ªÀµÀð¸ÀzÀ ವಿಷಯವಾದ ‘ಅವಧಿಕ ಕಾರ್ಯ’ ಬರಹದ ಮೌಲ್ಯಮಾಪನವನ್ನು 60 CAPÀUÀ½UÉ £ÀqɸÀ¯ÁUÀÄªÀÅzÀÄ 10 CAPÀUÀ½UÉ ªÀiËTPÀ ¥ÀjÃPÉëAiÀÄ£ÀÄß £ÀqɸÀ¯ÁUÀÄªÀÅzÀÄ

****

ª ÌÀÁ¤ ÌÀ ¥ÀoÀå¥ÀÄ¸ÀÛPÉ

2018-19 £ÉÃ ¸Á° £À¸ÀÄ ÁgÀ¥ÀjµÀÌöÈvÀ ¥ÀoÀåJ.J PÀ£ÀßqÀ ¥ÀoÀå ¸ÀÆa ¸ÀÆÖ ¸ÀÆPÀgÀ¸ÉÛÀÌÄ

(¹ ©¹ J¸ ï-¹ Jf ¦ ª ÌÀÁ¤ ÌÀ)

¥ÀoÀå«¨sÁUÀ² ÃÃ¶ðPÉ

¸ªÀÄAiÀÄ 3 UÀAmÉUÀ¼ÀÄ | CAPÀUÀ¼ÀÄ 70

¸ÀEZÀÉ: J¯ Áè¥àoÀåC À¥ÀoÀÁåUÀ¼ÀÄ PÀgÀÁqÀiÀÄ

(J) Cx ÀÁ (©) | CAPÀUÀ¼ÀÄ : 14

(¹) Cx ÀÁ (r) | CAPÀUÀ¼ÀÄ : 14

(E) Cx ÀÁ (J¥ïs) | CAPÀUÀ¼ÀÄ : 14

(f) Cx ÀÁ (JZï) | CAPÀUÀ¼ÀÄ : 14

AiÀÄÁª Àå Áz gÀÀE K½Ä¥ÀoÀÁåUÀ¼ÉG vÀgÀ | CAPÀUÀ¼ÀÄ: 7X2=14

(L) (M)

(eÉ) (¦)

(PÉ) (PÀÆå)

(J¯ï) (Dgï)

(Jª ÀÄ) (J¸ï)

(J£ï) (n)

¥ÀoÀåUÀ¼À¼À3¥ÀoÀåeÀÆz ÀJ¯ ÁèWÀPÀUÀ¼À¼ÀÄ3M½UÉÆAqÀvÉvÀAiÀÄj ¸ÀÄª Àå ÀÄ

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(AUTONOMOUS)

OOTY ROAD, MYSURU-570 025

(Autonomous under University of Mysore: Re-accredited by NAAC with 'A' Grade)

Choice Based Credit System and CAGP

MASTERS DEGREE

Syllabus

2020-22

Postgraduate Department of Computer Science

JSS College of Arts, Commerce and Science

Ooty Road, Mysore-25

2020-2022

PROGRAMME: MASTER OF SCIENCE IN COMPUTER SCIENCE

2 Years /4 Semesters (under CBCS-CAGP)

ADMISSIONS:

i) 50% seats of the total intake for M.Sc., Computer Science Programme of the College will be filled-up by University of Mysore through Centralized Admission Cell as per University regulations.

ii) Remaining 50% seats will be filled-up by the College under College Quota.

ADMISSION REQUIREMENT

Eligibility - All students who have 45% (40% for SC/ST) in their B.Sc degree (from Recognised University/ Open University) with Mathematics as one subject and any one-two among Electronics, Instrumentation, Computer Science or Computer Maintenance and Physics as other subject. OR Student with B.Sc (IT) are permitted provided they have not studied Mathematics in their 2 years PUC. OR Diploma (in Electronics, Computer Science and Information Technology) holders with B.Sc (IT) are permitted if they have SSLC level Mathematics. OR BCA degree from recognized University OR equivalent to this from any other recognized University in India or abroad is also permitted.

PROGRAMME OUTCOMES:

After Completing the M.Sc Program Students will be able to:

PO1. Identify, formulate, and solve computer science problems

PO2. Design, implement, test, and evaluate a computer system, component, or algorithm to meet desired needs

PO3. Receive the broad education necessary to understand the impact of computer science solutions in a global and societal context

PO4. Communicate effectively

PO5. Success in research or industry related to computer science

PO6. Have solid knowledge in computer science and engineering, including programming and languages, algorithms, theory, databases, etc.

PO7. Integrate well into and contribute to the local society and the global community related to computer science

PO8. Practice high standard of professional ethics

PO9. Draw on and integrate knowledge from many related areas

PROGRAMME SPECIFIC OUTCOMES:

PSO1. Programmers or the Software Engineers with the sound knowledge of practical and theoretical concepts for developing software.

PSO2. Serve as the Computer Engineers with enhanced knowledge of computers And its building blocks. Work as the Hardware Designers/Engineers with the knowledge of Networking Concepts.

PSO3. Work as the System Engineers and System integrators Serve as the System Administrators with thorough knowledge of DBMS.

PSO4. Work as the Support Engineers and the Technical Writers

PSO5. Work as IT Sales and Marketing person.

PSO6. Serve as the IT Officers in Banks and cooperative societies.

PSO7. Computer Scientist in research and R & D laboratories.

PSO8. Faculty for Graduate and Under graduate Colleges**.**

MSc. in Computer Science – 2018

I Semester

Course Code	Course	L:T:P	Credit Value
CSC101	HC1 (Data Structures and Algorithms)	3:0:1	4
CSC102	HC2 (System Software)	2:1:1	4
CSC103	HC3 (Computer Networks)	2:1:1	4
CSC104	SC1		4
CSC105	SC2		4
	TOTAL		**20**

II Semester

Course Code	Course	L:T:P	Credit Value
CSC201	HC4 (Analysis and Design of Algorithms)	2:1:1	4
CSC202	HC5 (Operating System and Unix)	2:0:2	4
CSC203	HC6 (Computer Graphics)	3:0:1	4
CSC204	SC3		4
CSC205	SC4		4
	TOTAL		**20**

III Semester

Course Code	Course	L:T:P	Credit Value
CSC301	HC7 (Software Engineering)	3:1:0	4
CSC302	HC8 (Theory of Languages)	3:1:0	4
CSC303	HC9 (Database Management System)	2:1:1	4
CSC304	SC5 / Term Work		4
CSC305	SC6 (Open Elective ****)		4
	TOTAL		**20**

IV Semester

Course Code	Course	L:T:P	Credit Value
CSC401	HC10 (Major Project)	0:1:7	8
CSC402	SC7		4
CSC403	SC8		4
	TOTAL		**16**

****** Open Elective Course: III Semester**

Course Code	Course	L:T:P	Credit Value
CSC305	OE- Computer Fundamentals / Programming with C	2:0:2	4

HARD CORE:

Sl. No.	Course	L:T:P	Credit Value
1	Computer Networks	2:1:1	4
2	Computer Graphics	3:0:1	4
3	Data Structures and Algorithms	3:0:1	4
4	Analysis and Design of Algorithms	2:1:1	4
5	DBMS	2:1:1	4
6	Software Engineering	3:1:0	4
7	Theory of Languages	3:0:1	4
8	Operating System and Unix	2:0:2	4
9	System Software	3:1:0	4

SOFT CORE:

Sl. No.	Course	L:T:P	Credit Value
1	Principles of Programming Language and C	2:1:1	4
2	Internet Technology	2:0:2	4
3	Java Programming	2:0:2	4
4	Multimedia	3:1:0	4
5	Microcontroller	3:1:0	4
6	Discrete Mathematics	3:1:0	4
7	Simulation and Modeling	3:1:0	4
8	Operations Research	3:1:0	4
9	Mobile Communication	3:1:0	4
10	C++	2:0:2	4
11	Pattern Recognition	3:0:1	4
12	Image Processing	2:1:1	4
13	Software Testing	3:0:1	4
14	Computational Techniques	3:0:1	4
15	Graph Theory	3:1:0	4
16	OOAD	2:1:1	4

17	Probability and Statistics	3:1:0	4
18	Data Mining	2:1:1	4
19	Artificial Intelligence	3:1:0	4
20	.NET Technologies	2:0:2	4
21	Object Oriented Modeling and Design with UML	2:1:1	4
22	Android Application Development	2:0:2	4
23	Advanced Database Management Systems	2:1:1	4
24	Compiler Design	3:0:1	4

SCHEME OF EXAMINATION AND ASSESMENT:

In view of the CBCS syllabus, Each Course is Assess with Components . Component 1 (C1), Component 2 (C2), and Component 3 (C3),

The following is the scheme which will be followed for the assessment of marks for both theory (HC/ SC/ OE) as well as practicals (HC/ SC) irrespective of the Credits associated with each Course. Thirty percent of the marks will be assessed for the internals (C1 and C2) and remaining seventy percent will be for the semester end examinations (C3). Each Course carries 100 marks and hence thirty marks for internal assessment and remaining seventy marks will be for Semester End Examinations. Out of thirty marks for internals, fifteen marks will be allotted to each C1 and C2 components.

Each theory Course (HC/ SC/ OE) consists of three components namely C1, C2 and C3. C1 and C2 are designated as Internal Assessment (IA) and C3 as Semester End Examination. Each Course (HC/ SC/ OE) carries 100 Marks and hence the allotment of marks to C1, C2 and C3 Components will be fifteen, fifteen and seventy marks respectively. i.e.,

C1 Component : 15 Marks C2 Component : 15 Marks	Internal Assessment Marks
C3 Component : 70 Marks	Semester End Examination
Total : 100 Marks	

The above will be followed in common for all the theory (HC/ SC/ OE) Courses in all the four semesters.

DATA STRUCTURES & ALGORITHMS **3:0:1**

Course Code:CSA100

Course Outcomes: At the end of the course students will be able to:

CO1. Select appropriate data structures as applied to specified problem definition.

CO2. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.

CO3. Implement Linear and Non-Linear data structures.

CO4. Implement appropriate sorting/searching technique for given problem.

CO5. Design advance data structure using Non Linear data structure.

UNIT I: Introduction

Introduction to Stages in Problem Solving, Difference between Data Type, Data Structure and Storage Structure, Formal Definition of Data Structure, Classification of Data Structure
Analysis of Algorithms: Algorithm, Time Complexity and Space Complexity, O-Notation, Omega Notation and Theta Notation.
Primitive Data Structure: Integer, Real, Character and Boolean and Its Storage Representation

UNIT II: Non-Primitive Data Structures

Arrays: Introduction to Array Data Structure and Its Representation, Sparse Matrix Representation. Introduction to Structures
Stacks: Introduction, Implementation Using Arrays, Applications - Tower Of Hanoi, Expression Evaluation, Conversion of Expressions

UNIT III: Stacks and Queues

Queue: Introduction, Types – Ordinary, Circular, Doubly Ended, Priority, Implementation Using Arrays

Linked List: Introduction, Types, Operations, Implementation of Stacks and Queues Using Linked List

UNIT IV: Non-Linear Data Structures

Graphs: Introduction, Basic Terminologies, Graph Representation – Adjacency and Incidence Matrix Representation

Trees: Introduction, Binary Tree Representation – Array and Linked List Representations, Traversals – Preorder, In-order, Post order, Binary Search Tree, Introduction to B-Trees

Hash Tables: Direct Address Tables, Hash Tables, Hash Functions, Open and Closed Addressing

References:

1. Data Structures and Algorithms, 2nd Edition, 2006 , Andrew Tanenbaum
2. "An Introduction to Data Structures, with Applications" McGraw Hill, Kongakusha 1976, Trembley and Sorenson
3. "Data Structures" SBCS Publication, 1980, Horowitz and Sahni
4. Data Structures using c, A K Sharma
5. Data Structures and program design in C, Kruse Robert L
6. Data Structures and analysis in C, Mark Allen Weiss
7. Data Structures and Algorithms, Alfred V AHO and Jeffrey D Ullman

SYSTEM SOFTWARE **2:1:1**

Course Code:CSA110

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand fundamentals of language processing and grammar

CO2. Apply knowledge of compilation and code optimization steps to mimic a simple compiler

CO3. Demonstrate the working of various system software like assembler, loader, linker, editor and device driver

UNIT 1

Background: Machine Structure, Evolution of the components of a programming system, evolution of operating system, operating system user view point functions, facilities

General Machine Structure, General Approach to a new machine, Machine Structure – 360 and 370, Assembly Language

UNIT 2

Assemblers: General design procedure, design of an assembler.

Macro language and macro processor, macro instructions, features of macro, implementation

UNIT 3

Loaders, different types of loaders, loader schemes, design of an absolute loader, design of direct linking loader.

Compilers: Structure and phases

UNIT 4

Lex and yacc: The Simplest lex Program, Recognizing Words with Lex, Parser-Lexer Communication, Regular Expressions, Grammars, Shift/Reduce Parsing, Structure of lex and yacc Programs, Programs in lex and yacc

References:

1. Systems Programming by Donovan
2. Principles of Compiler design by Ullman
3. System programming by Dhamdhare
4. Lex and yacc by John R Levine, Tony Mason and Doug Brown
5. System Software- Prof. Liland L Beck.

6. System Software- Prof. John R Levine

COMPUTER NETWORKS **2:1:1**

Course code:CSA120

Course Outcomes:

At the end of the course students will be able to:

CO1. Master the terminology and concepts of the OSI reference model and the TCP-IP reference model.

CO2. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.

CO3. Master the concepts of protocols, network interfaces, and design/performance issues in local area networks and wide area networks

CO4. Acquire knowledge of Application layer and Presentation layer paradigms and protocols.

CO5. Study Session layer design issues, Transport layer services, and protocols.

CO6. Gain core knowledge of Network layer routing protocols and IP addressing.

CO7. Study data link layer concepts, design issues, and protocols.

CO8. Read the fundamentals and basics of Physical layer, and will apply them in real time applications.

CO9. Familiar with wireless networking concepts

CO10. Familiar with contemporary issues in networking technologies
CO11. Familiar with network tools and network programming

UNIT 1

USES OF COMPUTER NETWORK: Business Applications, Home Applications, Mobile Users, Social Issues

NETWORK HARDWARE: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Wireless Networks, Home Networks, Internetworks

NETWORK SOFTWARE: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Service, Service Primitives, the Relationship of Services to Protocols

REFERENCE MODELS: The OSI Reference Model, The TCP/IP Reference Model, A comparison of OSI and TCP/IP Reference Model

UNIT 2

THE PHYSICAL LAYER

THE THEORETICAL BASIS FOR DATA COMMUNICATION: Fourier Analysis, Bandwidth-Limited Signals, The Maximum Data Rate of a Channel

GUIDED TRANSMISSION MEDIA: Magnetic Media, Twisted Pairs, Coaxial Cable, Fiber Optics

WIRELESS TRANSMISSION: The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared and Millimeter Waves, Light wave Transmission

COMMUNICATION SATELLITES: Geostationary Satellites, Medium-Earth Orbit Satellites, Low-Earth Orbit Satellites, Satellites versus Fiber

THE DATA LINK LAYER

DATA LINK LAYER DESIGN ISSUES: Services Provided to the Network Layer, Framing, Error Control, Flow Control

ERROR DETECTION AND CORRECTION: Error-Correcting Codes, Error-Detecting Codes

ELEMENTARY DATA LINK PROTOCOLS: A Utopian Simplex Protocol, A Simplex Stop-and-Wait Protocol

SLIDING WINDOW PROTOCOLS: A One-Bit Sliding Window Protocol, A Protocol Using Go-Back-N

UNIT 3

THE MEDIUM ACCESS CONTROL SUBLAYER

THE CHANNEL ALLOCATION PROBLEM: Static Channel Allocation, Dynamic Channel Allocation

MULTIPLE ACCESS PROTOCOLS: ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols

ETHERNET: Ethernet Cabling, Manchester Encoding, The Ethernet MAC sub layer protocol, the binary exponential back off algorithm, Ethernet Performance, Switched Ethernet, IEEE 802.2: Logical Link Control

THE NETWORK LAYER

NETWORK LAYER DESIGN ISSUES: Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks

ROUTING ALGORITHMS: The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing
CONGESTION CONTROL ALGORITHMS: Approaches to Congestion Control, Traffic-Aware Routing, Admission Control, Traffic Throttling, Traffic Shaping
INTERNETWORKING: How Networks Differ, How Networks Can Be Connected, Tunneling, Internetwork Routing, Fragmentation
THE NETWORK LAYER IN THE INTERNET: The IP Protocol, IP Addresses, IPv6

UNIT 4

THE TRANSPORT LAYER
THE TRANSPORT SERVICE: Services Provided to the Upper Layers, Transport Service Primitives
ELEMENTS OF TRANSPORT PROTOCOLS: Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery
THE INTERNET TRANSPORT PROTOCOLS: UDP: Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols
THE INTERNET TRANSPORT PROTOCOLS: TCP: Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Connection Management Modeling, TCP Sliding Window, TCP Timer Management
THE APPLICATION LAYER
DNS—THE DOMAIN NAME SYSTEM: The DNS Name Space, Resource Records, Name Servers
ELECTRONIC MAIL: Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery
NETWORK SECURITY:
CRYPTOGRAPHY: Introduction to Cryptography, Substitution Ciphers, Transposition Ciphers, Two Fundamental Cryptographic Principles
SYMMETRIC-KEY ALGORITHMS: DES—The Data Encryption Standard, Cipher Modes
PUBLIC-KEY ALGORITHMS: RSA, Other Public-Key Algorithms
DIGITAL SIGNATURES: Symmetric-Key Signatures, Public-Key Signatures

MANAGEMENT OF PUBLIC KEYS: Certificates

Reference Books:

1. Computer Networks, 5th Edition, Prentice Hall, 2006, Andrew S. Tanenbaum & David J. Wetherall
2. Data & Computer Communications, 6th Edition, Pearson Education, 2002, William Stallings
3. Computer Networks: 3rd Edition, Elserier, 2003, Larry L. Peterson & Bruce S. Davie
4. Data Communication & Networking, 4th Edition, Mc Graw Hill, 2006, Behrouza Forouzan
5. Computer & Networks with Internet Applications, 4th Edition, Pearson Education, 2004, Douglas E. Comer

ANALYSIS AND DESIGN OF ALGORITHMS **2:1:1**

Course Code:CSB060

Course Outcomes:

At the end of the course students will be able to:

CO1. Analyze different scenarios for running time of algorithms using asymptotic notations and Design using Recursion.
CO2. Apply divide and conquer strategy for design of various algorithms.
CO3. Develop algorithms for well known problems using greedy methods.
CO4. Describe and apply dynamic-programming approach for designing graph and matrix based algorithms.
CO5. Understand the concept of backtracking for traversal and search algorithms.
CO6. Apply the knowledge earned to determine the efficiency of algorithms considering time and space tradeoffs.

UNIT 1

INTRODUCTION**:** Algorithm specification, pseudo code conventions

PERFORMANCE ANALYSIS: Space Complexity, Time Complexity, Asymptotic Notation,

Mathematical Analysis: Recursive and Non recursive algorithms

BRUTE FORCE – Bubble Sort, Selection Sort, Sequential Search, String Matching

UNIT 2

DIVIDE- AND – CONQUER: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort, Strassen's Matrix Multiplication

THE GREEDY METHOD: The General Method, Knapsack Problem, Tree Vertex Splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees - Prim's Algorithm, Kruskal's Algorithm, Optimal Storage on Tapes, Optimal Merge Patterns, Single-Source Shortest Paths.

UNIT 3

DYNAMIC PROGRAMMING: The General Method, Binomial Coefficient, Multistage Graphs, All Pairs Shortest Paths Single-Source Shortest Paths: General Weights, String Editing, 0/1 Knapsack, the Traveling Salesperson Problem

BACKTRACKING: The General Method, the 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles

UNIT 4

Elementary Graph Problems: Depth First Search, Breadth First Search, Topological Sort

NP-Hard and NP-Complete Problems: Basic Concepts, Nondeterministic Algorithms, The Classes NP-Hard And NP-Complete

NP-Hard Graph Problems: Clique Decision Problem (CDP), Node Cover Decision Problem, Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP), AND/OR Graph Decision Problem (AOG)

References:

1. Analysis and Design of Algorithms: Horowitz Sahani
2. Analysis and Design of algorithms: Trembly
3. Introduction to Algorithms: Thomas H. Cormen
4. Analysis and Design of Algorithm: Padma Reddy
4. Introduction to the design and analysis of algorithm: Anany Levitin.
5. Design and analysis of algorithm: S Shridhar.

OPERATING SYSTEM and UNIX **2:0:2**

Course Code:CSB070

Course Outcomes:

At the end of the course student will be able to:

CO1. Understand device drivers
CO2. Write applications with improved performance and stability
CO3. Write set of small commands and utilities that do specific tasks well
CO4. Run multiple programs each at the same time without interfering with each other or crashing the system.
CO5. Implement Commands of UNIX.
CO6. Implement various file processing commands and shell Programming.

UNIT 1

Introduction to Operating System, Operating System Structures

Process Management: Processes, CPU Scheduling

UNIT 2

Deadlocks, Storage Management: Memory management, Virtual Memory, File-System Interface

UNIT 3

Introduction: Why UNIX? The Unix Environment, UNIX Structure, accessing UNIX, UNIX commands

File Systems: File Names, File Types, Regular Files, Directories, File System Implementation, Operations unique to directories, Operations unique to regular files, Operations common to both.

Vi editor, local commands, range commands in vi, global commands in vi, rearrange text in vi, ex editor.

UNIT 4

Introduction to shells: Unix Session, Standard Streams, Redirection, pipes, tee command, command execution, command line editing, quotes, command substitution, job control, aliases, variables, predefined variables, options, shell/environment customization.

Security and file permission: User and groups, Security levels, changing permissions, User masks, Changing ownership and group, Regular expressions: Atoms, Operators, grep: operation, grep family, Searching for file content, sed and awk.

C Shell Programming: Basic script concepts, Expressions, Decision making selections,, Built in commands, Scripting techniques, Shell environment & Script, Script examples

References:

1. Unix and Shell Programming, Behrouz A Forouzan and Richard F.Gilberg, 2nd Edition, 2003, Thomson.
2. System Programming and Operating Systems, Dhamdhare. D.M., 4th Edition, TataMcGraw Hill, 2006
3. A Practical Guide to Linux, Mark G. Sobell, 1st Edition, 2002, Pearson Education (Chapters:1 to 5, 8, 10, 11, 15)
4. UNIX: The Complete Reference, Kenneth Rosen and others, 2nd Edition, 2002,Obsborne/McGraw Hill
5. Design of the UNIX Operating System, Maurice J Bach.
6. Operating System: A Modern Perspective , Gary J Nutt.

COMPUTER GRAPHICS **3:0:1**

Course code:CSB080

Course Outcomes:

At the end of the course students will be able to:

CO1. Utilize the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.

CO 2. Learn the basic principles of 3- dimensional computer graphics.

CO3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.

CO4. Provide an understanding of mapping from a world coordinates to device coordinates, clipping, and projections.

CO 5. Implement the applications of computer graphics concepts in the development of computer games, information visualization, and business applications.

CO6. Comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles

UNIT 1

Introduction, Video Display Devices, Refresh Cathode-Ray Tubes, Raster-Scan Display, Random-Scan Displays, Color CRT Monitors, Flat-Panel Displays, Raster Scan Systems, Input devices.

Output primitives: Points & Lines, Line Drawing Algorithms, Loading the Frame Buffer, Circle Generating Algorithms, Pixel Addressing and Object Geometry

UNIT 2

Two dimensional transformations Basic & other transformations, Matrix representations, Homogeneous coordinates Composite transformations, General-pivot-point transformations.

Three Dimensional Transformations: Introduction to 3D Translation, Rotation & Scaling, Other Transformations, Modeling and Co-ordinate Transformations.

UNIT 3

Three Dimensional Viewing :Viewing Pipeling, window to viewport transformations, Projections, Types of projections.

Graphical User Interface & Interactive Input Methods : The User Dialogue, Windows & Icons, feedback, Input of Graphical Data, Interactive Picture Construction Techniques, Basic Positioning Methods, Constraints, Grids, Gravity Field, Rubber-Band Methods, Dragging, Painting & Drawing

UNIT 4

Curves & Surfaces: Properties, Bezier curves properties, Design techniques, Bezier surfaces, Displaying curves & surfaces

Hidden line removal algorithms

Introduction to fractals, Serpinsky's triangle, Construction, Koch curves.

Windowing & Clipping: Clipping operations, Line clipping algorithms, point clipping, text clipping, polygon clipping algorithms, Exterior clipping

Reference:

1. "Computer Graphics", Pearson Education, Donald D. Hern and M. Pauline Baker
2. " Principles of Interactive Computer Graphics" McGraw Hill 1989, W. M. Newman and Robert Sproull
3. "Computer Graphics a Programming Approach" McGraw Hill 1987, Steven Harrington
4. " Schaums outline of theory and problems of Computer Graphics" 2nd printing 1987, 1986 Edition, Roy A Plastock and Gardon Kelley
5. " Procedural Elements of Computer Graphics" McGraw Hill 2nd edition 1990, David F Frogers and J Alan Adams
6. Computer Graphics, James.D.Foley, A Vandam etal

SOFTWARE ENGINEERING **3:1:0**

Course Code:CSC040

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.

CO2 Learn methods of capturing, specifying, visualizing and analyzing software requirements.

CO3. Understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.

CO 4. Basics of testing and understanding concept of software quality assurance and software configuration management process.

CO 5. Understand need of project management and project management life cycle.

CO 6. Understand project scheduling concept and risk management associated to various types of projects.

UNIT 1

INTRODUCTION TO SOFTWARE ENGINEERING: Software and Software Engineering, phases in Software Development, Software Development Process models, Agile modeling, Introduction to metrics.

UNIT 2

SOFTWARE REQUIREMENT SPECIFICATION: Role of SRS, Problem Analysis, Requirement specification, validation, metrics, Monitoring and control

PLANNING A SOFTWARE PROJECT: Cost Estimation, Project Scheduling, Staffing personal planning, Team Structure, Software Configuration Management, Quality Assurance Plans, Project Monitoring plans, Risk Management.

UNIT 3

SYSTEM DESIGN: Design Objectives, design principles, Module level Concepts, Design methodology – object oriented approach Design Specification, Verification, Metrics, monitoring and control.

DETAILED DESIGN: Module Specification, Detailed design and process design Language, Verification

UNIT 4

CODING: Programming practice, Verification, Metrics

TESTING: Testing Fundamentals, Fundamental testing, Structural Testing. Testing process Clean Room approach

References:

1. "An Integrated approach to the Software Engineering" 2ed. Narosa Publishing House, New Delhi, 2002, Pankaj Jalote
2. Software Engineering Principles & Practice - 3rd Edition, Tata Mc Graw Hill Companies – 2006, Waman S Jawadekar
3. Software Engineering A Practitioner's Approach - 6th Edition
   McGraw Hill – 2005, Roger S Pressman
4. Software Engineering - 7th Edition : Pearson Education Ltd- 2006, Sommerville

THEORY OF LANGUAGES **3:1:0**

Course Code:CSC050

Course Outcomes:

At the end of the course students will be able to:

CO1. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.

CO2. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.

CO3. Design different types of Push down Automata as Simple Parser.

CO4. Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.

UNIT - 1

INTRODUCTION TO FINITE AUTOMATA**:** Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata.

FINITE AUTOMATA, REGULAR EXPRESSIONS: An application of finite automata; Finite automata with Epsilon-transitions; Regular expressions; Finite Automata and Regular Expressions

UNIT - 2

REGULAR LANGUAGES, PROPERTIES OF REGULAR LANGUAGES: Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Equivalence and minimization of automata.

CONTEXT-FREE GRAMMARS AND LANGUAGES: Context –free grammars; Parse trees; Ambiguity in grammars and Languages.

UNIT – 3

PUSHDOWN AUTOMATA: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.

PROPERTIES OF CONTEXT-FREE LANGUAGES: Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFL

UNIT - 4

TURING MACHINE: The turing machine; Extensions to the basic Turing Machines; UNDECIDABILITY: A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem

REFERENCES:

1. Introduction to Automata Theory, Languages and Computation – John E.. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman:, 3rd Edition, Pearson education, 2007.
2. Fundamentals of the Theory of Computation: Principles and Practice – Raymond Greenlaw, H.James Hoove, Morgan Kaufmann, 1998.
3. Introduction to Languages and Automata Theory – John C Martin, 3rd Edition, Tata McGraw-Hill, 2007.

DATABASE MANAGEMENT SYSTEM **2:1:1**

Course Code:CSC060

Course Outcomes:

At the end of the course students will be able to:

CO1. Explain the features of database management systems and Relational database.
CO2. Design conceptual models of a database using ER modelling for real life applications and also construct queries in Relational Algebra.
CO3. Create and populate a RDBMS for a real life application, with constraints and keys, using SQL.
CO4. Retrieve any type of information from a data base by formulating complex queries in SQL.
CO5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
CO6. Build indexing mechanisms for efficient retrieval of information from a database

UNIT 1

Introduction and conceptual modeling databases and Database users, Data modeling using the entity relationship (ER) model, the enhanced entity – relationship (EER) model.

UNIT 2

Relational model: Concepts constraints, Languages, Design and programming.

The relational data model and relational database constraints, Relational algebra and relational calculus, Introduction to SQL Programming technique

UNIT 3

Database design theory and methodology functional dependencies and Normalization for relational database, Relational database design algorithms and further dependencies, practical database design methodology and use of UML diagrams.

UNIT 4

Introduction to transaction processing concepts and theory recovery

REFERENCES

1. Fundamentals of database system – 5th Edition – Ramez elmasri, Navathe – Person edition

2 .An introduction to database system – 8th Edition – C. J. Date, Kannan – Person Education

3.Database system concepts – 5th Edition – Korth, Sudarshan – McGraw Bill Edition

4. Database Management System- Raghuramakrishnan.

5. An Introduction to Database System- Bipin Desai

6. Principles of Database System- J D Ullman

Softcore:

PRINCIPLES OF PROGRAMMING LANGUAGES AND 'C' 2:1:1

Course Code:CSA020

Course Outcomes:

At the end of the course students will be able to:

CO1. Analyzing semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing, and exception handling.

CO2. Implementation techniques for interpreted functional languages.

CO3. Using object-oriented languages.

CO4. Familiar with design issues of object-oriented and functional languages.

CO5. Familiar with language abstraction constructs of classes, interfaces, packages, and procedures.

CO6. Familiar with implementation of object-oriented languages.

CO7. Familiar with using functional languages

.

UNIT 1: Preliminaries

Reasons for studying concepts of programming languages, Programming domains, Language evaluation criteria, Implementation methods Names, Bindings, Type Checking, and Scopes Introduction, Names, Variables, The concept of Binding, Type Checking, String Checking, Type Compatibility, Scope, Scope and Lifetime, Referencing Environments, Named Constants, Variable Initialization.

UNIT 2: Data Types

Introduction, Primitive Data types, Character String Types, User-Defined Ordinal Types, Array Types and Associative Arrays, Record Types, Union Types, Set Types, Pointes Types.
Expression, Assignment Statements and Statement Level Control Structures
Introduction, Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational And Boolean Expressions, Short-Circuit Evaluation, Assignment Statements, Mixed-Mode assignment.

UNIT 3

Compound Statements, Selection Statements, Iterative Statements, Unconditional Branching, Guarded Commands, Conclusion.

Subprograms: Introduction, fundamentals, design issues, local referencing environments, parameter passing methods, overloaded programs, generic subprograms, coroutines, user defined overloaded operators

UNIT 4

C LANGUAGE: C Fundamentals, Operation data input and output, Control statements, Function Storage classes, Arrays, Pointers, structures and unions, Enumeration, Command line parameters, Macros, 'C' processor.

Reference:

1. Concepts of Programming Languages, Eight Edition, Pearson, Robert W. Sebesta
2. Foundation for Programming Languages, John C Mitchell
3. Principles of Programming Language, Chopra Rajiv
4. Principles of Programming Language, Dowek
5. Types and Programming Languages, Benjamin C Pierce
6. Programming Languages: Principle and Practices ,3rd Edition, Kenneth C Louden

INTERNET TECHNOLOGY **2:0:2**

Course Code:CSD220

Course Outcomes:

At the end of the course students will be able to:

CO1. Develop analytical ability in network technology.

CO2. Create quality websites
CO3. Work individually as a web designer and set up their own business
CO4. Get the job opportunities in most companies for professional web designers and build websites more visually elegant and interactive
CO5. Implement interactive web page(s) using HTML, CSS and JavaScript.
CO6. Design a responsive web site using HTML5 and CSS3.

UNIT 1

Fundamentals: introduction to the Internet, WWW, Web Browsers, Web Servers, URL, Multipurpose Internet Mail Extensions (MIME), HTTP, Security,

Introduction to HTML: Origins and Evolution, Basic Syntax, Document Structure, Basic tags, Images, Links, Lists, Tables, Forms, Frames.

UNIT 2

Introduction to XML: Syntax of XML, XML Document Structure, Document Type Definition.

Introduction to XHTML: Origins and Evolution, Basic Syntax, Document Structure, Basic tags, Images, Links, Lists, Tables, Forms, Frames, Syntactic difference between HTML and XHTML.

Cascading Style Sheets (CSS): Introduction, levels of style sheets, Selector Forms, Property value forms, Font properties, Color, Alignment of Text, Box model, Background Images, and tags.

UNIT 3

The basics of JavaScript: Overview, Object Orientation and JavaScript, General syntactic characteristics, Primitives, Operations and Expressions, Screen Output and Keyboard Input, Control Statements, Objects, Arrays, Functions, Constructors, Errors.

JavaScript and XHTML Documents: Element access, Events and Event Handling, Handling Events from Body elements, Handling Events from Button elements, Handling Events from Text Box and password elements.

Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating Mouse Cursor, Reacting to Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

UNIT 4

Introduction to PHP: Origins and Uses, Overview, General Syntactic Characteristics, Primitive, Operations and Expressions, Output, Control Statements, Arrays, Functions, Form Handling, Cookies.

REFERENCES:

1. Programming the World Wide Web – by Robert W. Sabesta 4th Edition Pearson Publications
2. HTML and XHTML the Complete Reference.
3. How to program the World Wide Web – by Deitel and Deitel
4. Mastering in HTML – by Ray and Ray.
5. Web programming and Internet Technologies: An E Commerce approach- By Porter ` Seobey and Pawan Lingras.
6. Internet Technology and Information services by Joseph Miller

JAVA Programming **2:0:2**

Course Code:CSA270

Course Outcomes:

At the end of the course students will be able to:

C01. Understand concept of Object Oriented Programming & Java Programming Constructs.

C02. Understand basic concepts of Java such as operators, classes, objects, inheritance, packages ,Enumeration and various keywords.

C03. Understand the concept of exception handling and Input/Output operations.

C04. Design the applications of Java & Java applet.

C05. Analyze & Design the concept of Event Handling and Abstract Window Toolkit.

UNIT 1

History and evolution of Java, An overview of Java, Data types, variables and arrays, Operators, Control statements- Introducing classes ,A closer look at methods and classes, Inheritance, Packages and interfaces.

UNIT 2

Exception handling, Multithreaded Programming, Enumeration, Autotoxins, I/O, Applets

UNIT 3

Networking, Event handling, Swings.

UNIT 4

String handling, Collection framework, Introduction to J2EE, Java servlet, Java server pages (JSP) and HTML, JDBC objects.

REFERENCES:

1. The complete reference Java – 7th Edition – Herbert Schildt – Tata Mcgraw hill Edition.

2. The complete reference J2EE – Jem Keogh – Tata Mcgraw hill Edition.

3. Object Oriented Programming with Java- M T Somashekara, D S Guru and K S Manjunatha.

4. The Complete Reference 7th Edition Herbert Schiidt

5. Introduction to Java Programming – E Balaguruswamy

6. Head First Java – 2nd Edition

7. Core Java- Horst Mann, C S –8th Edition-Cornell.

8. Core Servelet and Java Server pages- Hall, M-Brown L

MULTIMEDIA **3:1:0**

Course Code:CSD210

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand various file formats for audio, video and text media.

CO2. Develop various Multimedia Systems applicable in real time.

CO3. Design interactive multimedia software.

CO4. Apply various networking protocols for multimedia applications.

CO5. Develop understanding of technical aspect of Multimedia Systems

UNIT 1

Introduction to Multimedia (MM) Communication, Scope, Range, Feasibility and Challenges of MM Communication Key aspects of MM: Compression, Coding, Transmission and Replay.

UNIT 2

Types of Compression: Quantization, Coding as PCM, DPCM, ADPCM. Simple Encoder and Decoders based on PCM Samples. Introduction to Transform domain Compression. Introduction to Audio part of MPEG, Psychoacoustics

UNIT 3

Compression in Spatial Domain Algorithms for Data Compression in Transform Domain: DCT. Variable Length Coding, Huffman code. Variable Length Coding: Arithmetic Coding. Introduction to JPEG 2000 Standard, Encoders-Decoders based on this. Audio Compression and MPEG Audio

UNIT 4

Fundamental concepts of Video. MPEG Architecture Details: Audio-Video- Systems. Video Coding standard related to H.263 and H. 264. MPEG- 1, 2 Video. MPEG- 4 : Video. Streaming and Transport Issues: Multiplexing, Synchronization and File formats. Errors in MPEG and Error handling, Concealment. Buffer structures and Buffer Management

Introduction to MPEG-7 and MPEG-21., HDTV. Content based Image Retrievals and Digital Libraries.

References:

1. Fundamentals of Multimedia, 2nd Ed, Pearson, 2005, Ze-Nian Li and Mark Drew
2. Multimedia Communications., Pearson, 2005, Fred Halsall
3. Introduction to Data Compression, 3rd Ed, Morgan Kaufman (India Ed), 2005, Khalid Sayood
4. The DATA compression; The Complete Reference, 3rd Ed, Springer (India Ed), 2006, David Solomon
5. Multimedia foundations: A Core Concepts of for Digital Design, Vic Cost Ello
6. Multimedia: Making it work, 9th edition, Tay Vaughan

MICROCONTROLLERS **3:1:0**

Course Code:CSC210

Course Outcomes:

At the end of the course students will be able to:

CO1. Describe the architecture of 8051 microcontroller and write embedded program for 8051 microcontroller.

CO2. Design the interfacing for 8051 microcontroller.

CO3. Understand the concepts of ARM architecture.

CO4. Demonstrate the open source RTOS and solve the design issues for the same.

CO5. Select elements for an embedded systems tool.

CO6. Understand the concept and architecture of embedded systems

UNIT 1

Introduction, Numbering system and binary arithmetic,

UNIT 2

The 8051 Architecture, Basic assembly language programming concepts, Moving data,

UNIT 3

Logical operations, Arithmetic operations Jump and call instructions

UNIT 4

An 8051 Microcontroller design, Applications

References

1. "The 8051 Microcontroller", 3rd Edition, Thomson India edition, 2007, Kenneth Ayala
2. "Programming and customizing the 8051 microcontroller", Tata McGraw-Hill edition, 2006, Myke prick
3. "The 8051 Microcontroller and embedded systems", Pearson India, 2006, Muhammad Ali Mazidi & Janice Gillispie Mazidi,
4. Microcontroller and Embedded System, Mazidi, M A- Mazidi
5. Microcontroller: Architecture, Programming and application, Ayala, Kenneth

DISCRETE MATHEMATICS **3:1:0**

Course Code:CSA260

Course Outcomes:

At the end of the course students will be able to:

CO1. Construct simple mathematical proofs and possess the ability to verify them.
CO2. Have substantial experience to comprehend formal logical arguments .
CO3. skillfull in expressing mathematical properties formally via the formal language of propositional logic and predicate logic.
CO4. Specify and manipulate basic mathematical objects such as sets, functions, and relations and will also be able to verify simple mathematical properties that these objects possess.
CO5. Apply basic counting techniques to solve combinatorial problems .
CO6. Use various techniques of mathematical induction (weak, strong and structural induction) to prove simple mathematical properties of a variety of discrete structures

UNIT 1

Set Theory: Sets and Subsets. Operations on sets, Countable and uncountable sets, The addition principal, the concept of probability.

Mathematical Logic: Propositions, Logical Connectives, Tautologies; Contradictions, Logical equivalence, Application to switching networks, Duality, Commentates NAND and NOR, Converse, Inverse and Contrapositive, Rules of inference.

UNIT 2

Open statements; Quantifiers, Logical Implication involving Quantifiers, Statements with more than one variable, Methods of proof and disproof, Mathematical Induction.

UNIT 3

Relations and Ordering: Cartesian products of sets, Relations, Paths in relations and digraphs, Operations on relations, Composition of relations, Properties of relations, Equivalence relations, Partial orders, Total Orders, External elements in posets, Lattices.

Functions: Functions, Types of functions, Composition of function, Invertible functions, Permutation Function.

UNIT 4

Fundamental principles of counting: Principles of inclusion and exclusion: The rule of sum and product, Permutations, combinations: The binomial theorem, combinations with repetition,

Ramsey number, the Catalan numbers, sterling number and bell numbers, Generalizations of principles, the pigeonhole principle, Derangements-Nothing is in its Right place, Rook polynomials, Arrangements with Forbidden positions.

References:

1. Discrete Mathematics by Dr. Chandrashekar S .
2. Discrete and combinational Mathematics by Ralph P. Grimaldi, 5th edition, Addison Wesley, 2004
3. Discrete mathematical structures by Kolman, Robert C Busby and Sharon., 6th Edition, Prentice Hall, 2008
4. Discrete Mathematics and Application by Kenneth H Rosen.
5. Discrete Mathematics by Norman L Biggs.

SIMULATION & MODELLING **3:1:0**

Course Code:CS/A/B/C/D300

Course Outcomes:

At the end of the course students will be able to:

CO1. Understand the definition of simulation and how to develop and analyze a simulation model

CO2. Understand the fundamental logic, structure, components and management of simulation modeling

CO3. Demonstrate knowledge of how to use Arena

CO4. Build a simulation model with basic operations and inputs

CO5. Build a simulation model with detailed operations

CO6. Perform statistical analysis of output from terminating simulation

UNIT 1

Introduction, Simulation of prepursuit problem, A system & its model, Simulation of an inventory problem, The basic nature of simulation

Simulation of continuous systems: A chemical reactor, Numerical integration vs continuous system simulation, Selection of an integration formula, Runge Kutta integration formulas, simulation of a servo system, Simulation of a water reservoir system, Analog vs digital simulation

UNIT 2

Discrete system simulation

Fixed time-step vs event to event model, On simulating randomness, Generation of random numbers, Generation of non uniformly distributed random numbers, Monte Carlo computation vs stochastic simulation

UNIT 3

Simulation of queuing systems

Rudiments of queuing theory, simulation of single server queue, Simulation of two server queue, Simulation more general queues.

Simulation of PERT network

UNIT 4

Network model of a project, Analysis of an activity network, Critical path computation, Uncertainties in activity duration, Simulation of an activity network, Computer program for simulation, Resource allocation and cost considerations, Inventory control & forecasting Elements of inventory theory, More complex inventory models, simulation examples, Generation of Poisson & erlang variates, Forecasting & regression analysis

Design and Evaluation of Simulation Experiments

Length of simulation runs, Variance reduction techniques, Experimental layout, validation

References:

1. System Simulation with Digital Computer Narsingh Deo
2. System Simulation and Modeling - Sengutta
3. Computer Methods for solving Dynamic Seperation problems- C D Holland and A I Liapis.
4. Fundamentals of Modeling separation Process- C D Holand.
5. Process Modeling-M M Denn

OPERATIONS RESEARCH **3:1:0**

Course Code: CS A/B/C/D 310

Course Outcomes:

At the end of the course students will be able to:

CO1: Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics.

CO2: Apply the concept of simplex method and its extensions to dual simplex algorithm.

CO3: Solve the problem of transporting the products from origins to destinations with least transportation cost.

CO4: Convert and solve the practical situations into non-linear programming problem.

CO5: Identify the resources required for a project and generate a plan and work schedule

UNIT 1

Introduction: formulation of LP problems, graphical solution of LP problems, General formulation of L P problems, Slack & Surplus variables, Standard form, Matrix form, Simplex method, Revised Simplex method, Dual simplex

UNIT 2

Assignment model, Transportation model, Game theory

Probability: Introduction, Basic terms of probability, The Addition law of probability, discrete & continuous, variables, random variables, probability distribution of random variables, Mean variance& standard deviation, Mathematical expectation of a random variable.

UNIT 3

Queuing theory

Introduction, queuing system, distribution, Kendall's Notation, Classification, model I (m/m/1).

UNIT 4

Project management by PERT CPM

Introduction, history, Applications, Basic steps, Network diagram representation, rules of drawing network diagram, labeling Fulkerson's I-J rule, Time estimates & Critical path, PERT, Resource allocation, Uses of PERT/CPM.

References:

1. Operations Research - S D Sharma
2. Operations Research - R K Gupta & D S Hira
3. Introduction to Operation research – Frederick S Hillier ,Gerald J and Liberman.
4. Operation research: An Introduction by Hamdy A Taha.
5. Operation research: Application and algorithm by Wayne L Winston.

MOBILE COMMUNICATION **3:1:0**

Course Code:CS A/B/C/D 320

Course Outcomes:

At the end of the course students will be able to:

CO1. Design a mobile cellular network

CO2. Optimize a radio channel system

CO3. Select the apt diversity scheme for a given wireless system to improve the performance.

CO4. Perform efficient spectral allocation using multiple access techniques such as CDMA, and OFDM.

CO5. Select the correct MAC protocol and routing algorithm for mobile ad-hoc networks.

CO6. Optimize the mobile ad-hoc network, MAC protocols and routing algorithms as per application.

UNIT 1

Introduction, Applications, History of wireless communication, reference model,
Wireless transmission, Frequencies for radio transmission, signals, Antennas, Signal propagation Multiplexing, Modulation, Spread spectrum

UNIT 2

Cellular Systems, Medium Access control, Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, Comparison.

UNIT 3

Telecommunications Systems, GSM, DECT, TETRA, UMS & IMT 2000
Satellite Systems, history, Applications, Basics, Classical TCP improvements, TCP over 2.5/3G wireless networks, performance enhancing proxies

UNIT 4

Support for mobility, File Systems World Wide Web, Wireless Application protocol

References:

1. Cellular and Mobile Communication- Krishna.
2. Cellular Mobile Communication – V S Bhagat
3. Cellular and Mobile Communication- V Jeyasri Arokiamary.
4. Wireless Communication and Networks – William Stallings.

5. Cellular Communication; A Comprehensive and practical guide- Nishith Tripathi and Jeffreyhreed.

C++ 2:0:2

Course Code:CSA250

Course Outcomes:

At the end of the course students will be able to:

CO1 . Understand the features of C++

CO2. Understand the relative merits of C++ as an object oriented programming language

CO3. Understand how to produce object-oriented software using C++

CO4. Understand how to apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism

CO5 Understand advanced features of C++ specifically stream I/O, templates and operator overloading

Unit I

Quick overview of C : Expressions - Statements - Arrays and Null-Terminated Strings – Pointers - Functions – Structures, Unions, Enumerations and User-Defned Types – C Style Console I/O – File I/O -.

Unit II

An Overview of C++ - Classes and Objects – Arrays, Pointers, References, and the Dynamic Allocation Operators

Unit III

Function Overriding, Copy Constructors and Default Arguments – Operator Overloading - Inheritance – Virtual Functions and Polymorphism

Unit IV

Templates – Exception Handling - The C++ I/O System Basics

References :

1. The Complete Reference C++, 4th Edition, Tata-McGraw-Hill, 2003, Herbert Schildt
2. Object Oriented Programming with C++ , M T Somashekara, D S Guru, H S Nagendraswamy and K S Manjunatha
3. C++ Premier, 5th Edition. Stanley B Lippman
4. C++ Programming language, E Balaguruswamy
5. The C++ programming language, 4th Edition, Bjarne Stroustrup

PATTERN RECOGNITION **3:0:1**

Course Code:CAC230

Course Outcomes:

At the end of the course students will be able to:

C01. Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.

C02. Summarize, analyze, and relate research in the pattern recognition area verbally and in writing.

C03. Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.

C04. Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

C05. Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

UNIT 1

Machine perception, pattern recognition systems, Design Cycle, Learning and adaption, models of Pattern recognition

UNIT 2

Bayesian Decision Theory

Introduction, Bayesian, Decision theory- Two category classification, classifiers-Two category case and multi category case, missing and noisy features.

UNIT 3

Nonparametric Techniques

Introduction, Density estimation, Parzen window, KN neighbor estimation, The nearest neighbor rule, Metrics and Nearest Neighbor Classification, Error analysis of nearest decision rule

UNIT 4

Introduction, Heirarchical clustering techniques, partitional clustering techniques Dimensionality reduction techniques Introduction, principle component analysis, Fisher Linear Dicriminant Analysis, Spectral clustering based dimensionality reduction

References:

1. Pattern Classification, 2nd edition, Wiley publications, R. O Duda, P.E. Hart and D G Stork,
2. Pattern Recognition and Image Analysis, Prentice Hall of India, Pvt Ltd, Earl Gose, Richard, Johnsonbaugh, Steve Jost
3. Pattern Recognition and machine Learning, Cristopher M Bishop,
4. Pattern Recognition (Blue Ant) – Willian Gibsom.
5. Pattern Recognition, 4th Edition- Sergios Theodoridis and Konstantios Koutroumbas

IMAGE PROCESSING **2:1:1**

Course Code:CS A/B/C/D 330

Course Outcomes:

At the end of the course students will be able to:

C01. Analyze general terminology of digital image processing.

C02. Examine various types of images, intensity transformations and spatial filtering.

C03. Develop Fourier transform for image processing in frequency domain.

C04. Evaluate the methodologies for image segmentation, restoration etc.

C05. Implement image process and analysis algorithms.

C06. Apply image processing algorithms in practical applications.

UNIT I

Introduction, digital image fundamentals

UNIT II

Image enhancement in the spatial domain, Image enhancement in the frequency domain

UNIT III

Image restoration, color image processing

UNIT IV

Wavelets and multi-resolution processing image compression

References:

1. Digital Image Processing-Rafel C.Gonzalez and Richard E Words.
2. The Image Processing hand Book- John C Cruss.
3. Fundamentals of Digital Image Processing- Anil K Jain.
4. Digital Image Processing –Jayaraman S.
5. Digital Image Processing- Sanjay M Shah Munesh Chandra Trivedi

SOFTWARE TESTING **3:0:1**

Course Code:CSC440

Course Outcomes:

At the end of the course students will be able to:

CO1.Check Various test processes and continuous quality improvement

CO2.Verify Types of errors and fault models

CO3.Check Methods of test generation from requirements

CO4.Check Behavior modeling using UML: Finite state machines (FSM)

CO5.Test generation from FSM models

CO6.Input space modeling using combinatorial designs

UNIT 1

Assessing Testing Capabilities and Competencies, Building a software Testing Environment: Building a software Testing Strategy, Establishing a Software Testing Methodology, Determining your Software Testing Techniques, Selecting and Installing Software Testing Tools.

UNIT 2

The Eleven-Step Testing Process: Eleven-Step Testing Process Overview, Step1: Access Project Management Development Estimate and status, Step2: Develop Test Plan, Step3: Requirement Phase Testing,

UNIT 3

Step4: Design Phase Testing, step 5: Requirement Phase Testing, Step6: Execute Test and Record Results,

UNIT 4

Step7: Acceptance Test Results Step8: Report Test Results, Step9: Testing Software Installing, Step10: Test Software Changes, Step11: Evaluate Test Effectiveness.

.

REFERENCES:

1. Effective Methods for Software Testing, William E. Perry, 2nd Edition 2003, Wiley
2. *Surviving the Top Challenges of Software Testing*, New York: Dorset House, 1997., Rice, Randall and Peery, William E.,
3. A practitioner's Guide to Software Test Design, By Lee Copelane.
4. The Art of Software Testing By Glenford Myers.
5. Testing Object System: Models, Patterns and Tools by Robert V Binder.

GRAPH THEORY **3:1:0**

Course Code:CSB270

Course Outcomes:

At the end of the course students will be able to:

CO1. Explain basic concepts in combinatorial graph theory

CO2. Define how graphs serve as models for many standard problems

CO3. Discuss the concept of graph, tree, Euler graph, cut set and Combinatorics.

CO4. See the applications of graphs in science, business and industry.

UNIT 1

Introduction to Graph theory: Basic terminologies—direst & undirect graphs, walks, paths & circuits, sub-graphs and complements, Graph Isomorphism, vertex degree and regular graphs,

UNIT 2

Konigsberg bridge problem & Euler graphs. Hamilton graphs & traveling salesman problem, planar graphs- definition & examples, Bipartite & Kuratowskis graphs, Euler's formula & detection of planarity, Dual of Planar graphs,

UNIT 3

Graph Coloring: Proper coloring & chromatic number of graphs, Chromatic polynomial, four color problems, Trees: Optimization & Matching: Trees; Definition & Properties, Rooted & binary rooted trees, ordered trees & trees sorting. Weighted trees & prefix codes

UNIT 4

Spanning trees, optimization, Networks, Cutset, Edge & Vertex connectivity of a graph, Max-flow Min-cut thermo and its applications, Matching theory and its applications

References:

1. Graph Theory, V.K Balakrishnan, Schaum Series, McGrawHill, 1997
2. Graph Theory, by Frank Harary, Westview Press, 1994.
3. Introduction to Graph Theory, Douglas B west.
4. Hand Book of Graph Theory, Jonathan L Gross and Jay Yellen.
5. Graph Theory with application to Engineering and Computer science, Narsingh Deo.

OOAD **2:1:1**

Course Code:CSB210

Course Outcomes

At the end of the course students will be able to:

CO1. Analyse, design, document the requirements through use case driven approach.

CO2.Identify, analyse, and model structural and behavioural concepts of the system.

CO3.Develop, and explore the conceptual model into various scenarios and applications.

CO4.Apply the concepts of architectural design for deploying the code for software**UNIT I**

Implementation of Object Oriented concepts using C++

UNIT II

Introduction, Object orientation, OO development, OO themes, OO modeling ,History. Modeling, Abstraction, Models .Class Modeling Object & class, Link & Association concepts, Generalization & Inheritance, sample Class Model, Navigation of class models. Advanced class modeling: advanced object & class concepts, Association end N ary Association, Aggregation, Abstract Classes, Multiple Inheritance, Meta Data, Reification, Constraints, Derived Data.

UNIT III

State modeling: Events, States, Transitions & Conditions, State Diagrams, State Diagram behavior. Advanced state modeling, interaction modeling.

UNIT IV

System design: Overview of System design, Estimating performance, making a Reuse plan, Breaking a System into Subsystems, Identifying concurrency, Allocation of subsystems, Management of Data Storage.

Reference:

1. Object Oriented Analysis and Design – Blaha, Rambaugh.

2. Object Oriented Analysis and Design with the Unified Process- W Satzinger, Robert B Jackson and Stephen D Burd.

3. Object Oriented Analysis and Design with application, 3rd edition- Grady Booch, Robert A Maksimchuk, Michael W Engel

4. Object Oriented Analysis and Design with application- Grady Booch.

PROBABILITY AND STATISTICS **3:1:0**

Course Code: CS A/B/C/D 340

Course Outcomes

At the end of the course students will be able to:

CO1. Apply probability theory to set up tree diagrams
CO2. Apply probability theory via Bayes' Rule
CO3. Describe the properties of discrete and continuous distribution functions
CO4. Use method of moments and moment generating functions
CO5. Assess the consistency, efficiency and unbiasedness of estimators
CO6. Apply method of maximum likelihood estimation
CO7. Apply the Central Limit Theorem
CO8. Use statistical tests in testing hypotheses on data

UNIT 1

Introduction, basic terminology, Interpretation of probability: Axioms of probability, Some elementary theorems, Conditional probability, Mathematical Exception

UNIT 2

Probability Distributions: Introduction, Discrete probability distributions continuous probability distributions, The expected value of a random variable Chebyshev's Theorem

UNIT 3

Sampling distributions, Populations and samples, Sampling distribution, The sampling distribution of the mean, sampling distributions of proportions, sampling distributions of mean, chi squared distribution, F distribution.

UNIT 4

Estimation and inference theory, introduction, point estimation, interval distribution, bayesian estimation, test of hypot, Introduction to ANOVA.

References:

1. Probability and Statistics: Bheeshma Rao
2. Probability and Statistics, 4th edition, Degroot, Schervish.
3. Probability and Statistics for Engineering and Science, 8th edition, Jay L Devore.
4. Probability and Statistics, Michael Akritas.

5. An Introduction to Probability and Statistics,3rd edition, Vijay K Rohatgi and A K MD Ehsanes Saleh.

DATA MINING **2:1:1**

Course Code:CSD230

Course Outcomes:

At the end of the course students will be able to:

CO1. Demonstrate an understanding of the importance of data mining and the principles of business intelligence

CO2. Organize and Prepare the data needed for data mining using pre preprocessing techniques

CO3. Perform exploratory analysis of the data to be used for mining.

CO4. Implement the appropriate data mining methods like classification, clustering or Frequent Pattern mining on large data sets.

CO5. Define and apply metrics to measure the performance of various data mining algorithms.

UNIT 1

Introduction, what kind of patterns can be mined? which technologies are used? which kind of applications are targeted?, major issues in Data mining.

Getting to know your data: Data objects and attribute types, basic statistical description of data, Data Visualisation, Measuring Data similarity and dissimilarity.

UNIT 2

Data Preprocessing: data cleaning, Data integration, Data Reduction, Data transformation and Data Discretization

UNIT 3

Mining frequent patterns, Associations and correlations: Basic concepts, Frequent mining methods, pattern Evaluation methods, Pattern mining in Multilevel multi dimensional space, Decision tree induction.

UNIT 4

Cluster analysis, partioning methods, heirarchical methods, density based methods, grid based methods, evaluation of clustering.

References:

1. Data Mining: Concepts and Techniques, Third Edition, Jaiwei Han, Micheline Kamber, Jian Pei.

2. Learning Data Mining with Python, 2nd edition, Robert Layton.

3. Data Mining; The Text book, Charu C Aggarwal.

4. Data Mining, 4th edition: Practical Machine learning Tools and Techniques by Lan H Witten and Fibe Frank.

5. Introduction to Data Mining – Pang- Ning Tan and Micheal Steinbach

ARTIFICIAL INTELLIGENCE **3:1:0**

Course Code:CS A/B/C/D 350

Course Outcomes

CO 1. At the end of the course students will be able to:

CO 1. Create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.

CO 2. Know concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems

CO 3. Review the different stages of development of the AI field from human like behavior to Rational Agents.

CO4. Impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.

CO5. The basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of other topics such as minimal, resolution, etc. that play an important role in AI programs.

CO6. Introduce advanced topics of AI such as planning, Bayes networks, natural language processing and Cognitive Computing.

UNIT 1

AI problems, AI techniques, defining the problem as state space search, production systems, problem characteristics

Heuristic Search: Generate and test, hill climbing, BFS, Problem Reduction, Constraint Satisfaction, Means-End Analysis

UNIT 2

Knowledge Representation: Representations and mappings, approaches to knowledge representation

procedural v/s declarative knowledge, normal forms in predicate logic and clausal forms, non-monotonic reasoning

Declarative Representations: semantic nets, conceptual dependency, frames, scripts

UNIT 3

Game playing: minimax search procedure, adding alpha-beta cut offs

Planning: An Example Domain – the blocks world, Components, goal stack planning

UNIT 4

Expert systems: expert systems v/s conventional computers, expert system shells, explanation based learning.

Learning: Learning from observation - Inductive learning – Decision trees – Explanation based learning – Reinforcement Learning, Neural Networks, Introduction to Natural Language Processing.

References:

1.Artificial Intelligence, Third Edition, Elaine Rich, Kevin Knight, Shivashankar B Nair, Tata McGraw-Hill.

2. Introduction to Artificial Intelligence, Wolfgang Ertl.

3. Artificial Intelligence,2nd edition, Stuart Russel, peter Norvig.

4. Artificial Intelligence, Jeorge F Luger

5. Artificial Intelligence, Saroj kaushik

.NET TECHNOLOGIES **2:0:2**

Course Code:CSB280

Course Outcomes

At the end of the course students will be able to:

CO1. Design web applications using .NET
CO2. Use .NET controls in web applications.
CO3. Debug and deploy .NET web applications
CO4. Create database driven .NET web applications and web services

Unit 1

Benefits of .NET Framework, Architecture of .NET Framework 4.0, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET.

Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and Unboxing, Variables and Constants. Expression and Operators: Operator Precedence, Using the :: (Scope Resolution) Operator and Using the ***is*** and ***as*** Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.

Unit 2

Arrays and Strings: One Dimensional and Multidimensional Arrays, Jagged Arrays

Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs. Strings: Constructing Strings, Operating on Strings, Arrays of Strings, The String Class

Unit 3

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism/Overloading, Runtime Polymorphism/

Overriding. Abstraction: Abstract classes, Abstract methods. Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.
Delegates: Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/finally statement, Checked and Unchecked Statements.

Unit 4

Introduction, Windows Forms, Life Cycle, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event- Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, MonthCalendor Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control ; Building an Multiple Document Interface (MDI) Application. Introduction to ADO.NET

References:

1. Programming in C# 4.0, Tata McGraw Hill, Hebert Shildt
2. C# with .net 4.0 by Andrew Troelsen
3. Programming in C# , 3rd Edition, E Balaguruswamy
4. The Complete Reference C#, Herbert Schildt.
5. The Complete Reference ASP.NET, Robert Standefer III

OBJECT ORIENTED MODELING AND DESIGN WITH UML 2:1:1

Course Code:CSA/B/C/D 360

Course Outcomes

At the end of the course students will be able to:

CO1. Design & Programming course is a unique course that teaches students how to use object-oriented techniques to build software.
CO2. Gathering requirements & end with implementation.
CO3. Analyze and design classes, their relationships to each other in order to build a model of the problem domain.
CO4. Use common UML diagrams throughout this process, such as use-case, class, activity & other diagrams.
CO5. Create The diagrams through a free tool.
CO6. Capture and manage requirements.

Unit I

INTRODUCTION : Object-Oriented Analysis and Design - Iterative, Evolutionary, and Agile. - Case Studies : The NextGen POS System - INCEPTION : Inception is Not the Requirements Phase – Evolutionary Requirements - Use Cases – Other Requirements:NextGen Example

Unit II

ELABORATION ITERATION 1: Basics – Domain Models – System Sequence Diagrams – Operation Contracts – Requirements to Design-Iteratively – Logical Architecture of UML Package Diagrams

Unit III

On to Object Design – UML Interaction Diagrams – UML class Diagrams - GRASP : Designing Objects with Responsibilities – Object Design Example with GRASP:NextGen POS system – Designing for Visibility – Mapping Designs to Code

Unit IV

ELABORATION ITERATION 2: UML Tools and UML as Blueprint – Quick Analysis Update: NextGen POS – Iteration 2: More Patterns – GRASP: More Objects with Responsibilities – applying GoF Design Patterns

Reference:

1. "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Third Edition, Pearson Education, 2005, Craig Larman,
2. Advanced Object Oriented Analysis and Design using UML , James J Odell.
3. Object Oriented Analysis and Design , Mike O-Docherty.
4. Object Oriented Modeling and Design with UML, 2nd edition, Michael R Blaha, James R Rumbauh.
5. Object Oriented Systems and Analysis and Design using UML, Simon Bennetth, Steve McRovv and Ray Farmer.

ANDROID APPLICATION DEVELOPMENT **2:0:2**

Course Code:CSA/B/C/D 370

Course Outcomes

At the end of the course students will be able to:

CO1. Describe and compare different mobile application models/architectures and patterns.
CO2. Apply mobile application models/architectures and patterns to the development of a mobile software application.
CO3. Describe the components and structure of a mobile development framework (Google's Android Studio).
CO4. Apply a mobile development framework to the development of a mobile application.
CO5. Demonstrate advanced Java programming competency by developing a maintainable and efficient cloud based mobile application

Unit 1

Introduction to Android & Open Handset Alliance

Installation of Android Studio and other Development Environments like Gradle.

Understanding Android File System.

Creating First Android Application

Understanding Intent, Activity, Service, Content Providers, Broadcast Receivers.

Understanding Android Application, Manifests, Layouts, Drawables, Styles, Android Activity, View

Understanding Android XML based layout (Linear Layout, Relative Layout, Frame Layout).

Introduction to Android Life Cycle Events

initialization and Button Click Listeners.

Unit 2

Development of Simple app containing Dialog Box, Intents,Toast, Spinners, Listeners examples.

Android Listview / GridView and Adapters

Android Date Picker Dialog, Time Picker Dialog

Launching sub Activity

Building Custom ListView and Understanding Adapters in detail

Understanding SQLite database. Populating database.

Developing simple app by using SQLite database (insert, delete, update)

Unit 3

Working with web server basics

Background loading, AsyncTask , Using Threads

Developing simple app by downloading image from web and showing it in ImageView

Understanding Importance of External Libraries and demonstration of simple external library

Image lazy loading, Image loading in list view, grid view

Unit 4

Working with Google Maps

ViewPager

Introduction to fragment, add, remove, replace fragment

ViewPager

Side Navigation Drawer

Action bar/ Toolbar

ViewPager Adapter / Swipe View

References:

1. Android Programming for Beginners by John Horton.

2. Professional Android 4 application development by Reto Meir.

3. Android Book by Lan F Darwin.

4. Learning Android Building application for The Android Market by Marko Gargenta.

5. Programming Android Java programming for the new generation of Mobile Devises by Zigurd Mellieks

ADVANCED DATABASE MANAGEMENT SYSTEM **2:1:1**

Course Code:CS A/B/C/D 380

Course Outcomes

At the end of the course students will be able to:

CO1. Evaluate and Apply Advanced Database Development Techniques.

CO2. Evaluate Database Systems.

CO3. Administer Database Systems.

CO4. Design & Implement Advanced Database Systems.

Unit 1

Disk storage, Basic file Structures and hashing, indexing structures for files.

Algorithms for query optimization.

Unit 2

Physical database design and tuning, Introduction to transaction, Concurrency control techniques.

Concept for object databases, Object databases standard and design, database security.

Unit 3

Enhanced datamodels for advanced applications, distributed databases and client server architectures, Emerging database technologies and applications.

Unit 4

Definition of NoSQL, History of NoSQL and Different NoSQL products, NoSQL Basics. Exploring one among MongoDB/CouchDB/Cassandra along with Java/Ruby/Python interface : Interfacing and Interacting with NoSQL, NoSQL Storage Architecture, CRUD operations, Querying, Modifying and Managing NoSQL Datastores, Indexing and ordering datasets

References:

1. Fundamentals of Database System :5th Edition ,Navathe

2. Database Management System, Panneerselvam R.
3. Database Management System, Raghu Ramakrishnan and Johannes Gehrke.
4. Data Schemes: Models and algorithms (Advances in Database Systems), Charu C Aggarwal.
5. Multilevel secure Transaction Processing (Advances in Database system), Vijay Atluri and Sushin Jajodia.

COMPILER DESIGN **3:0:1**

Course Code:CS A/B/C/D 390

Course Outcomes

At the end of the course students will be able to:

CO1. Construct a parse tree, or explain why no parse tree exists, given a BNF grammar and a string over the appropriate alphabet.

CO2. Implement a lexical analyzer from a specification of a language's lexical rules.

CO3. Compute the FIRST set for a BNF grammar.

CO4. Compute the FOLLOW set for a BNF grammar.

CO5. Determine FIRST intersect FIRST constraint satisfaction - determine if a BNF grammar satisfies the constraint on intersection of FIRST sets required for single-symbol-lookahead, top-down, lookahead parsing ()

CO6. Determine FIRST intersect FOLLOW constraint satisfaction - determine if a BNF grammar satisfies the constraint on intersection of FIRST and FOLLOW sets required for single-symbol-lookahead, top-down, lookahead parsing ()

Unit-1

Introduction, Classification of grammars. Context free grammars. Deterministic finite state automata (DFA) Non-DFA.

Lexical analysis :Language processors; The structure of a Compiler; The evolution Of programming languages; The science of building a Compiler; Applications of compiler technology; Programming language basics. Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

Unit-2

SyntaxAnalysis

Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing; Bottom-up Parsing.

Introduction to LR Parsing: Simple LR; More powerful LR parsers (excluding Efficient construction and compaction of parsing tables) ; Using ambiguous grammars; Parser Generators.

Unit-3

Intermediate Code Generation

Variants of syntax trees; Three-address code; Translation of expressions; Control flow; Back patching; Switch-statements; Procedure calls.

Run-Time Environments

Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection.

Unit-4

Code Generation

Issues in the design of Code Generator; The Target Language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator

Code optimization. Folding, redundant sub-expression evaluation. Optimization within iterative loops.

References:

1. Compilers Principles, Techniques and Tools, 2nd Edition, Addison-Wesley, 2007, Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman

2."The Theory and Practice of Compiler Writing". McGraw Hill, New York, 1985, Tremblay, et. al

3. Principles, Techniques and Tools of Compilers.- Allen I Holob.

4. Elements of Compiler Design.- Meduna

5. Compiler Design - K Muneeswaran.

OPEN ELECTIVES **2:0:2**

OP1: COMPUTER FUNDAMENTALS

Course Code: PHC/CHC/BCC/BTC/BOC/MAC/SWC/KAC/ENC/MCC/ZOC 640

Course Outcomes:

At the end of the course students will be able to:

CO1. Use technology ethically, safely, securely, and legally.
CO2. Identify and analyze computer hardware, software, and network components.
CO3. Design basic business web pages using current HTML/CSS coding standards.
CO4. Install, configure, and remove software and hardware.
CO5. Use systems development, word-processing, spreadsheet, and presentation software to solve basic information systems problems.

UNIT 1

INTRODUCTION

Computer, Characteristic of Computer, History of Computer, Components of Computer

Key Factors of Computers: Hardware, Software - types of Software (Application and system), forms of software (firmware, shareware, freeware), Translator - Assembler, Compiler and Interpreters. Computer Application – Business, Scientific, Entertainment and educational.

CLASSIFICATION OF COMPUTERS

Mode of operations – Analog, Digital and hybrid Computers

Size and capabilities – Micro, Mini, Main frame and Super computer

UNIT 2

MEMORY UNITS

Primary memory - RAM, ROM, PROM, EPROM, EEPROM, Flash memory

Secondary memory – Magnetic disk (Hard disk, Zip disk, Jaz disk, Super disk)

Optical disk (CD, CD – R, CD – RW, DVD), Magneto-optical disk device

COMPUTER PERIPHERALS DEVICES AND INTERFACES

Input devices – Working principle of Keyboard and mouse, Functional capabilities of Scanner, Digital Camera, OMR, OCR, touch pad, touch screen. Output Devices – Monitor, Printer, Plotter and projector.

Processors, Classification of Processors on speed, Motherboard, Power Supply, I/O Ports and its Maintenance

PROGRAMMING LANGUAGES

Machine, Assembly language and High Level Language

UNIT 3

Introduction to Windows, Elements of Word Processing, Spread Sheet, Presentations .

Nudi/Baraha.

UNIT 4: INTERNET

Basics of Internet: www, HTTP, DNS, IP address, Email, Web browsers, Search Engines

HTML: Introduction to HTML, CSS

E-Commerce: Introduction, Types, Advantages of e-commerce, Applications, survey on popular e-commerce sites

E-governance, Introduction to Cyber Ethics

References:

1. Computer Fundamentals (6th Edition) – Rajaraman.
2. Computer's Today – Suresh K Basandra.
3. Computer Fundamentals-P K Sinha
4. Computer System Architecture (3rd Edition) PHI-2002. Chapters 3.3 & 3.4- Morris Mano,
5. Digital Principles and application (4th Edition) – Malvino Leach, Tata Mc Graw-Hill Edition
6. Computer System Architecture (3rd Edition) – Morris Mano, PHI
7. Microsoft office 365-Katherine Murray.
8. Microsoft office 2016- Nita Rutkosky, Denise Seguin, Audrey Rutkosky Roggenkamp
9. The Complete reference HTML by Herbert Schildt
10. Learn to program HTML and CSS for beginners
11. HTML black book –Steven Holzner.

ENE21001

SEMESTER V

DISCIPLINE SPECIFIC COURSE - 13

5.1 ENTREPRENEURSHIP DEVELOPMENT

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the required characteristics and procedure to become an young entrepreneur

CO2: Specify in details with application, if applicable, easily access different financial scheme to small business

CO3: Identify in detail with examples to easily different financial schemes offered by Banks and Government Agencies

CO4: Understand in depth and identify the social responsibility of an entrepreneur towards different sectors

CO5: Learn in depth the Self employment opportunities

CO6: Learn in detail the ethics in business

CO7: Identify the content of project report

CO8: Understand in depth the procedure of setting up of new business

Unit 1: Introduction

Meaning, definition of Entrepreneur, Enterprise, Entrepreneurship, Characteristics of successful entrepreneur, Functions, Role of entrepreneur in economic development, women entrepreneur, Rural entrepreneur, Agricultural entrepreneur-meaning and challenges.

Unit 2: Entrepreneurship Development Program (EDP)

Meaning, objective, importance, institutions doing EDP in India, DIC, CEDOCK, SSI, NSIC, EDII, AWAKE, KVIC,RUDSET, Industrial estate-Meaning and importance.

Unit 3: Financing of Small Business in India

Institutional and non institutional assistance SFCs, banks, SIDBI, NBFC-meaning and schemes; venture capital, bills discounting, factoring, state and central government subsidies and incentives for SSI (existing) - recent industrial policy(2011), PM MUDRA YOJANA- meaning, objectives, procedures for obtaining loan under MUDRA.

Unit 4: Setting up of new business, forms for small business

Small proprietorship, partnership, private company, cooperative society-meaning and nature, project formulation, project report-meaning, importance, general format of project report, project appraisal, financial, technical, marketing, social feasibility study, obtaining license, clearance certificate, registration procedure.

Unit 5: Business Ethics

Meaning, ethics in business, importance, various social responsibility of an entrepreneur towards customers, suppliers, government and society, self- employment-recent trends in the areas of self employment-event management-meaning and areas of business in event management (party organizing , catering, wedding plan and corporate event plan) tourism-meaning, tourism products, E-marketing as self employment opportunity.

Reference:

1.Entrepreneurship And Small Business Management- C B Guptha And S S Khanka

2.Entrepreneruship Development – C B Guptha And Srinivasan 3.Entreprenership development development –Shankaraiah

4.Entrepreneurship development-S S Khanka

ENE22001

SEMESTER V

DISCIPLINE SPECIFIC COURSE -14

5.2 IFRS (IND - AS)

L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Deliberate the characteristics of IFRS
CO2: Understand in depth frame work for the preparation and presentation of financial statement
CO3: Learn in details with examples Accounting for assets and liabilities
CO4: Learn in details with examples IND AS on business combination
CO5: Understand the details of IND AS in relation to accounting for Revenue and Expenses

Unit 1: IFRS

Meaning, Need for IFRS, IASB, IASB Current Structure, IFRS Due Process, Benefits and limitations of IFRS; Introduction to Indian Accounting Standards (IND-ASs - Converged IFRSs), Accounting Regulations in New Companies Act – 2013, IFRSs issued by IASB (1-17),List of IND-ASs.

Unit 2: Framework for the Preparation and Presentation of Financial Statements

Meaning of Framework, Purpose and status - Scope - Application - Uses and their information and needs – objectives - Underlying assumptions – Qualitative characteristics – Elements of Financial statements – Recognition and Measurement of the elements of financial statement Balance sheet, Statement of changes in Equity, Statement of Profit and Loss consolidated financial statements, other comprehensive income as per schedule III of the Companies Act, 2013 – **Simple problems on each statement**.

Unit 3: Accounting for Assets and Liabilities

Recognition and Measurement criteria for Investment Property (IND-AS 40) – Borrowing Cost (IND-AS 23) –– Provisions, Contingent Assets and Contingent Liabilities (IND-AS 37) - Share-based Payment (IND-AS 102) - . Recognition and Measurement for Property, Plant and Equipment (IND-AS 16) – Intangible Assets (IND-AS 38) - Inventories (IND-AS 2) - Leases (IND-AS 17) – Impairment of Assets (IND-AS 36) - **Theory and Simple Problems only**

Unit 4: Accounting for Revenue and Expenses

Income Taxes (IND-AS 12) – Employee Benefits (IND-AS 19) -Construction contracts (IND-AS 11) - Revenue (IND-AS 18) - Revenue from Contracts with Customers (IND-AS 115).

Unit 5: IND-AS on Business Combination

IND-AS on Business Combination, Consolidation and Disclosure-Consolidated Financial Statements (IND-AS 110) – Joint Arrangements (IND-AS 111) – Business Combinations (IND-AS 103) - Related Party Disclosures (IND-AS 24) – Operating Segments (IND-AS 108) – First-time adoption of International Financial Reporting Standards (IND-AS101)– Financial Instruments: Disclosures (IND-AS 107) – Disclosure of interests in Other Entities (IND-AS 112) –Earning Per Share (IND-AS 33) – Interim Financial Reporting (IND-AS34)– Insurance Contracts (IND-AS 104)– **Theory and Simple Problems only**.

References:

1. A Quick Guide to Indian Accounting Standards (Ind-AS) by Chethan N. Patel and BhupendraMantri, Taxmann Publication (P.) Ltd.

2. Students' Guide to Ind ASs – Converged IFRSs by Dr. D.S. Rawat, Taxmann Publication (P.) Ltd.

3. IFRS for India, Dr.A.L. Saini, Snow white publications

4. Roadmap to IFRS and Indian Accounting Standards by CA ShibaramaTripathy

5. IFRS concepts and applications by Kamal Garg, Bharath law house private limited

6. IFRS: A quick reference guide by Robert J Kirk, Elsevier Ltd.

ENF21001

SEMESTER VI

DISCIPLINE SPECIFIC COURSE - 15

6.1 PRINCIPLES AND PRACTICE OF AUDITING

L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth to practice as an Auditor

CO2: Learn the characteristics of errors and frauds and minimize them in maintenance of books of accounts

CO3: Identify in detail the importance of Internal Control and Internal Check

CO4: Identify the details of audit planning
CO5: Learn in depth verification and valuation of Assets and Liabilities
CO6: Deliberate in details with examples audit of different types of organizations

Unit 1: Introduction

Meaning and definition of auditing- Nature and importance of auditing objectives of auditing-advantages, different types of audit, qualities of an auditor- audit report-auditing in a computerized environment.

Unit 2: Audit planning and control

Factors affecting audit planning - audit programme advantages-audit note book-appointment of a company auditor- qualifications, disqualifications-rights and duties of a company auditor.

Unit 3: Internal check and internal control

Meaning and objective-internal check for various transactions-limitations of internal control. Vouching-meaning and importance – vouching of cash transactions.

Unit 4: verification and valuation of assets and liabilities

Meaning- problems in valuation of assets, verification and valuation of assets and liabilities- goodwill, Stock in trade, Investments, Patents, Copy rights and trademarks, plant and machinery- capital, creditors, debentures, outstanding expenses, contingent liabilities.

Unit 5: Audit of different types of organizations

Audit of sole trader, audit of partnership firms, audit of hotels, audit of educational institutions, audit of trust, audit of co-operative societies.

References:

1. Auditing T R Sharma
2. Practical auditing B N Tandon
3. Practical auditing- Spicer and Spegler
4. Auditing Jagadeesh prakash

ENF22001

SEMESTER VI

DISCIPLINE SPECIFIC COURSE -16

6.2: BUSINESS LAWS

L:T:P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in details various laws related to business and able to work as legal adviser of business enterprises

CO2: Understand the characteristics of legal environment and practice business ethics

CO3: Learn in depth and apply the basic legal knowledge to business enterprises
CO4: Understand the characteristics of different intellectual properties and protect them
CO5: Identify and appointed as member of various commerce and legal boards / committee
CO6: Specify the details of Information technologies Act
CO7: Learn the provisions of Special Contract

Unit 1: Introduction

Concept of law, Sources Of Law- Mercantile Law; Agreement, Contract-Definition, Essentials Of a Contract, Legal Rules As To Valid Offer And Acceptance; Termination Of An Offer.

Unit 2: Contractual Capacity

Minor's Agreement, Consideration-Definition, Essentials and Exceptions. Free Consent-Coercion, Undue Influence, Fraud, Misrepresentation, Mistake, Definition and Features only.

Unit 3: Special Contract

Contingent contract, quasi contracts, Wagering Agreement, Discharge of a Contract, Remedies for Breach of Contract.

Unit 4: Intellectual Property Act

Definition and Registration Procedure for Patent, Copy Right, Trademarks.

Unit 5: Information Technology Act 2000

Definition of Information-Digital Signature, Legal Recognition of Electronic Records, License to issue Digital Signature Certificate And Acceptance Of Digital Signature.

References:

1. Mercantile Law - N.D.Kapoor P C Tulsian and Bharat
2. Business Law - Tulsian
3. Mercantile Law - P P S Gogna .

ENC24001 / END24001

GROUP A1

SKILL ENHANCEMENT COURSE-1

COMPUTERIZED ACCOUNTING SYSTEM

L: T: P- 2:0:2

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics of computerized accounting system

CO2: Identify the reason for differences between cash book and bank statement
CO3: Learn in details with examples computerised accounting software
CO4: Specify in details with examples periodic reports
CO5: Learn the classification and characteristics of data entry system
CO6: Prepare the quotation, purchase order etc., using computer software

Unit 1: a) – Computerised Accounting System

Meaning of computerised Accounting Traditional / Manual System of Accounting; process of Computerised Accounting; features of Computerised Accounting; difference between manual accounting system and computerised accounting. Process/Steps in Computerised Financial Accounting; Advantages of the Computerised Financial Accounting System; Various Components of a Computerised Financial Accounting System

b) - Voucher Types of Voucher; Bank Payment Voucher; Bank Receipt Voucher; Cash Payment Voucher ; Cash Receipt Voucher ; General Voucher.

Unit 2: - Bank Reconciliation Statement

Common transactions with bank; Cashbook and bank statement ; Reasons for difference between cash book and bank statement ; Bank reconciliation statement

Unit 3: Computerized Accounting

Scope of Computerized Accounting; Computerized Accounting Software; Creating a Corporation in Computerized Accounting Software. Chart of Accounts ; Creating Chart of Accounts ; Update Chart of accounts ; Charts of accounts Beginning Balances ; Organizational codes ; Editing charts of accounts;

Unit 4: Periodic Reports

General Journal ; Ledger; Trial Balance ; Income Statement ; Balance Sheet Inventory report; Account Receivable report; Account Payable report

Unit 5: Data Entry System

Voucher and Entry of vouchers ; Sales Entries ; Purchase Entries; Cash Receipt Entries ; Cash Payment Entries ; Bank transaction Entries Maintain the Records of Sales &

Customers ; Quotations to customers ; Sales orders ; Sales Invoices ; Sales receipts ; Record of Customers ; Sales report ; Customer Report.

Unit 6: Maintain the Records of Purchases and Vendors/ Suppliers

Preparing the Quotations; Purchase orders; Payment to vendors; Record of vendors; Utility Bills Payable; Purchase Report; Vendors Report.

References:

1.Computer Accounting (Accounting & Finance) Paperback – Michael Fardon
2.Computerized Accounting Spiral-bound – 2008- Arens and Ward (Author)

3.Computerized Accounting -Prof.C.M.Tembhurnekar, Dr.Alok Dwivedi
4.https://margcompusoft.com/Free_accounting_software.html

ENC25001 / END25001

GROUP A1

SKILL ENHANCEMENT COURSE-2

E-FILLING OF RETURNS

L:T:P-2:0:2

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the types of e-filing and e-verification of returns
CO2: Specify in details with examples E-filling of returns
CO3: Understand the details of steps involved in e- filling of different forms of IT Return
CO4: Learn the details of E-filling of returns under GST
CO5: Learn the details of returns to be filled by composition tax payer

Unit 1: **E-filing of Returns**
Meaning- objectives- advantages, features of E-filing; Types of e- filing, e-filing Process flow, Types of e-Verification of Returns, How to e-file, who should file e-return;

Unit 2: ITR-1 and ITR2- ITR-3- ITR-4 introduction
Format- Heads of income covered- contents- filling the return- steps involved in filing of ITR-1, ITR-2, ITR-3, ITR-4

Unit 3: ITR-5- ITR-6; ITR-7- introduction
Format- Heads of income covered- contents- filling the return- steps involved in filing of ITR-5, ITR-6, ITR 7.

Unit 4: E-filing of returns under GST
GSTR-1- GSTR-1A, GSTR-2, GSTR 2A; GSTR-3, GSTR 3A, GSTR-3B, GSTR 9, Assesses required to file, contents to be filled, Documents required, steps in filing the above returns;

Unit 5: **Returns to be filed by composition tax payers**
GSTR-4A, GSTR-4, GSTR-9; Returns to be submitted by an input service distributor-GSTR 6, GSTR-6A; Returns to be filed by Tax Deductor-GSTR-7, GSTR-7A;Contents- steps to be followed in filing the above returns

References:
1.https://incometaxindiaefiling.gov.in/eFiling/Portal
2.https://www.bankbazaar.com/tax/step-by-step-guide-efile-income-tax-return-online.html
3.https://www.icicibank.com/knowledge-base/tax/steps-for-e-filing
4.https://taxguru.in/income-tax/download-free-ebook-the-process-efiling-income-tax-returns.html
5.Students Guide To e-Returns- vinod K singhania- taxmann
6.https://www.profitbooks.net/gst-returns/

ENC26001 / END26001

GROUP A1

SKILL ENHANCEMENT COURSE -3

PRINCIPLES AND PRACTICE OF GENERAL INSURANCE

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Identify the classification and characteristics of General insurance

CO2: Learn the details of fire insurance policies, insurance coverage and consequential loss

CO3: Deliberate in details with examples underwriting and settlement of claims

CO4: Understand in depth the details of claim procedure and Settlement limitation

CO5: Learn in detail with examples non life miscellaneous insurance

Unit 1: **Introduction**

Meaning of General Insurance – The Evolution and Growth of General Insurance – Types of General Insurance – Fundamentals of General Insurance –Recent innovations. Organization and Management of General Insurance Companies – Regulatory Framework for General Insurance in India.

Unit 2: **Fire Insurance**

Standard policies – Fire Insurance coverage – Consequential loss (fire) Insurance policies – Declaration policies, Marine Insurance: Marine Cargo policies – Hull policies – Institute cargo clauses – Institute hull clauses – Open policies – Accumulation of risk per location - Motor Insurance: Types of policies – Third party Insurance – Comprehensive coverage – Conditions and Exclusions – premium.

Unit 3: **Non life miscellaneous insurances**

Personal Accident Insurance, Health Insurance and Mediclaim policies, Liability Insurance, Burglary Insurance other Miscellaneous Insurances, Rural Insurance covers, Engineering Insurance and its Consequential loss covers, Aviation hull and Aviation liability.

Unit 4: **Underwriting and Settlement of Claims**

Proposal forms, Cover notes, Certificates of Insurance, Endorsements, Moral and Physical Hazards, Statistics Spreading of Risks, Premium Rating, Premium Loading.

Unit 5: **Settlement of Claims**

Claim procedure, TPAs: Claim forms, Investigation / Assessment, Essential Claim Documents, Settlement Limitation, Arbitration, Loss Minimization and Salvage.

References:

1. Insurance Institute of India – IC 34 – General Insurance
2. Insurance Institute of India – IC 45- General Insurance Underwriting
3. Module I, Principles and Practice of General Insurance, The Institute of Chartered Accountants of India: New Delhi.
4. H Narayanan, Indian Insurance: A Profile, Jaico Publishing House: Mumbai.
5. K.C. Mishra and G.E. Thomas, General Insurance - Principles and Practice, Cengage Learning: New Delhi

ENC27001 / END27001

GROUP A1

SKILL ENHANCEMENT COURSE - 4

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth supply chain management

CO2: Write down the details of designing the supply chain network

CO3: Learn in details with examples designing and planning transportation network

CO4: Learn the details of Information technology in supply chain

CO5: Identify the dimensions of logistics

CO6: Understand in depth the details of demand management and customer care

Unit 1: **Introduction to Supply Chain Management**

Supply chain – objectives, importance, decision phases, process view, competitive and supply chain strategies, achieving strategic fit, supply chain drivers, obstacles, framework, facilities, inventory, transportation, information, sourcing, pricing.

Unit 2: **Designing the Supply Chain Network**

Designing the distribution network, role of distribution, factors influencing distribution, design options – e-business and its impact, distribution networks in practice, network design in the supply chain, role of network, factors affecting the network design decisions, modelling for supply chain.

Unit 3: **Designing and Planning Transportation Networks**

Role of transportation, modes and their performance, transportation, infrastructure and policies, design options and their trade-offs, tailored transportation. SOURCING AND PRICING: Sourcing, In-house or Outsource – 3rd and 4th PLs – supplier scoring and assessment, selection, design collaboration, procurement process, sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.

Unit 4: **Information Technology in the Supply Chain - IT Framework**

Customer relationship management, internal supply chain management – supplier relationship management, transaction management, future of IT. Coordination in a supply chain: Lack of supply chain coordination and the Bullwhip effect, obstacle to coordination, managerial levers, building partnerships and trust , continuous replenishment and vendor-managed inventories, collaborative planning, forecasting and replenishment.

Unit 5: **Dimensions of Logistics**

Introduction: A macro and micro dimension, logistics interfaces with other areas, approach to analysing logistics systems, logistics and systems analysis, techniques of logistics system analysis – factors affecting the cost and importance of logistics.

Unit 6: **Demand Management and Customer Service**

Outbound to customer logistics systems, Demand Management, Traditional Forecasting, CPFRP, customer service, expected cost of stock-outs, channels of distribution.

References:

1. Sunil Chopra and Peter Meindl, Supply Chain Management – Strategy, Planning and Operation, Pearson.
2. Coyle, Bardi, Longley, The management of Business Logistics – A supply Chain Perspective, Thomson Press.
3. Supply Chain Management by Janat Shah Pearson Publication.
4. Donald J Bowersox, Dand J Closs, M Bixby Coluper, Supply Chain Logistics Management, TMH, Second Edition.

ENE23001 / ENF23001

GROUP A2

SKILL ENHANCEMENT COURSE-5

CORPORATE TAX PLANNING

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth and specify the tax saving strategies for decision making

CO2: Understand in depth the provisions and laws of tax and able to become tax consultant

CO3: Identify the tax provisions and deductions and able to become tax planner with reference to business restructuring

CO4: Write down the details and identify special provisions in respect of Free Trade Zone, Infrastructure Development and Backward areas

CO5: Learn in detail the provision of Income Tax Act relating to amalgamation

CO6: Understand the classification and characteristics of taxation relief

CO7: Deliberate the provisions of IT Act in relation to managerial decisions

Unit 1: Introduction:

Corporation tax, Tax Planning, Tax Evasion, Tax Avoidance, Tax Management, Dividend Tax, Domestic Company, Foreign Company.

Unit 2: a) **Tax Planning for new Business:** Location and Nature of Business, Forms of Business Organization

b)**Tax Planning and Financial Management Decisions**: Tax Planning relating to Capital Structure Decision, Dividend Policy, Inter-Corporate Dividends and Bonus Shares

Unit 3: **Tax Planning and Managerial Decisions**

Tax planning in respect of Own or Lease, sale of assets used for scientific research, make or buy decisions, repair, replace, renewal or renovation of an asset, shut-down or continue decisions.

Unit 4: Special Tax Provisions

Tax provisions in respect of Free Trade Zone, Tax provisions in respect of Infrastructure Development, Tax provisions in respect of Backward Areas, Tax provisions in respect of Tax Incentives to Exporters.

Unit 5: **Amalgamation**

Meaning of amalgamation under the Income-tax Act, Transactions not treated as amalgamation, Actual cost and written down value when assets are transferred in a scheme of amalgamation, When a capital asset (other than a block of assets) is transferred, When a block of asset is transferred, Assets in amalgamation not treated as transfer, Transfer of capital assets to amalgamated Indian company.

Unit 6: Tax Payment

Tax deduction at source, Tax collection at source, and Advance payment of tax, Relief for double taxation [Secs. 90, 90A and 91], ADT agreements [Sec. 90], Modes of granting relief under ADT agreements , Unilateral relief [Sec. 91], Double taxation relief in case of specified associations [Sec. 90A]

References:

1.Direct Tax Laws and Practices- Vibnod K. Singhania
2.Direct Taxes – H C Meharothra
3.Corporate tax planning & business tax procedures- Vinod K songhania

ENE24001 / ENF24001

GROUP A2

SKILL ENHANCEMENT COURSE-6

COMPANY LAW AND SECRETARIAL PRACTICE

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth features of Companies Act -2013 and types of companies

CO2: Learn in details the promotion of a Joint Stock Company and conversion

CO3: Write down the details of conducting the Board of Directors and Subcommittee meetings

CO4: Understand the procedure for alteration of Articles of Association and Memorandum of Association

CO5: Learn in detail the appointment of company secretary

CO6: Learn the preparation of minutes of various meetings

Unit 1: **Companies Act**

Introduction- companies Act 2013- features of companies Act - 2013, Types of companies- Public companies, Pvt company, statutory corporation, One person company, Dormant company, Associate company, Small company, Limited Liability Partnership- Application of Company Law to banking/insurance sector- Registrar of companies- functions, Ministry of Corporate affairs-functions; SEBI-functions of SEBI.

Unit 2: **Secretary**

Definition, Who can be company secretary, Appointment, General Legal position, Duties of a Company Secretary, Rights of Company Secretary, Liabilities of Company Secretary, Qualification for Appointment as secretary, Dismissal of the Secretary, Secretary in the Whole time practice, Secretarial Compliance certificate, Specimen form

Unit 3: Company Formation and Conversion

Company Formation and Conversion Choice of the form of the business entity, Conversion/reconversion of one form of business entity into another, Procedure for incorporation of private/public companies, Companies limited by guarantee and unlimited companies and their conversion/re-conversion registration., Obtaining certificate of commencement of business, obtaining certificate of re-registration, Commencement of new business and certification,

Unit 4: **Procedure for alteration of various clauses of memorandum**

Procedures for alteration of articles, Effect of alteration, specimen forms: Procedure for issue of Shares – Public Issue, Rights Issue and Bonus Shares, Issue of Shares at Par/Premium/Discount; Issue of Shares on Preferential /Private Placement Basis – Allotment, Calls on Shares and Issue of Certificates – Issue of Sweat Equity Shares,

Employees Stock Option Scheme (ESOPs), Employees Stock Purchase Scheme (ESPS), Shares with Differential Voting Rights

Unit 5: Meetings

Collective Decision Making Forums, Authority, Accountability, Delegation and Responsibility ; Board Meetings , Convening and Management of Meetings of Board and Committees; Preparation of Notices and Agenda Papers, General Meetings, Convening and Management of Statutory Meeting, Annual and Extra-Ordinary General Meetings, Voting

through Electronic Means; Conducting a Poll and Adjournment of a Meeting; Post-Meeting Formalities, Preparation of Minutes and Dissemination of Information and Decisions

References:

1. S. Srikanth , Shanti Rekha Rajagopal ,Revathy Blakrishnan, Corporate Laws and Secretarial Practice, Jain Book
2. M C Kuchhal, Secretarial Practice, Vikas Publishing House, New Delhi.
3. Sangeet Kedia, Advanced Company Law And Practice, Pooja Law Publishing Company,

ENE25001 / ENF25001

GROUP A2

SKILL ENHANCEMENT COURSE-7

QUANTITATIVE DECISION TOOLS

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in depth the characteristics and features of statistics

CO2: Learn the details of methods and sources of collection of data

CO3: Understand in details with examples Measures of central tendency

CO4: Understand in detail the characteristics and application of correlation and regression

CO5: Understand in details the classification and application of correlation

CO6: Deliberate the characteristics of Index numbers

CO7: Learn the characteristics of Testing of hypothesis with application

CO8: Learn the creation of variables and entering data using SPSS

Unit 1: **Introduction**

Meaning and definition of statistics, functions, advantages, limitations- collection of data - methods of collecting primary data, and sources of secondary data - classification and tabulation-SPSS –Introduction, uses, creation of variables and entering data.

Unit 2: **Measure of central tendency**

Meaning and Definition of Averages-Arithmetic mean, Median, Mode [grouping method], standard deviation, Calculation of mean, median and Standard deviation using SPSS.

Unit 3: **Correlation**

Meaning and Definition, types of correlation, Methods of calculating correlation co-efficient [Karl pear sons and Spearman's correlation] calculation of correlation using SPSS; Regression-Meaning and Definition, Distinction between correlation and Regression, Regression equations and estimations Calculation of Regression using SPSS.

Unit 4: **Index Numbers**

Definition – Types – Methods of Construction and Problems in the Construction – Cost of living index numbers.

Note-Besides solving problems chapter-wise in class rooms, teach using SPSS in computer lab.

Unit 5: **Testing of Hypothesis**

Meaning of hypothesis, types of hypotheses, test of Significance Procedure of testing hypothesis – Z test, one sample t test, Chi square test.

References:

1. Fundamentals of Statistics: D. N. Elhance, Veena Elhance and B. M. Aggarwal
2.Statistical Methods: S. P Gupta.
3.Fundamentals of Statistics: S.C Gupta
4.Practical Statistics: R S N Pillai and Bhagavathi
5.Statistics (Theory, Methods and Application): D.C. Sancheti and V.K. Kapoor
6.Statistics for Management: Richard I. Levin and David S. Rubin
7. Statistics: Dr. B.H. Suresh, Dr. G.H. Mahadevaswamy, Nithya Publications, Mysore.

ENE26001 / ENF26001

GROUP A2

SKILL ENHANCEMENT COURSE-8

BUSINESS RESEARCH METHODS

L: T: P-3:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth different methods of research, methodology, data collection, analysis and interpretation of data to become a good business researcher

CO2: Understand and able to report about various issues of different organisations through research report

CO3: Understand the details of types of Business Research and Research design

CO4: Identify and contribute to the discipline of commerce and management through the research

CO5: Deliberate the details of Data analysis

CO6: Identify the details of Research Report

CO7: Specify in details with examples sampling and hypothesis testing

Unit 1: **Introduction to Business Research**

Meaning, types, criteria of good research, scientific approach to research in physical and management science, limitations of applying scientific methods in business research problems, ethical issues in business research, research process, problem formulation, preparation of business research plan/proposal.

Unit 2: **Business Research Design**

Types of business research, Exploratory, Descriptive, and Causal research, Exploratory research: Meaning, suitability, collection, hypothesis, formulation, Descriptive research: Meaning, types of descriptive studies, data collection methods, Causal research: Meaning, various types of experimental designs, types of errors affecting research design.

Unit 3: **Data Collection**

Primary and Secondary data – Sources – advantages/disadvantages, Data collection Methods – Observations, Survey, Interview and Questionnaire design, Qualitative Techniques of data collection. Measurement and Scaling Techniques: Nominal Scale, Ordinal Scale, Interval Scale, Rating Scale, Criteria for good measurement, attitude measurement.

Unit 4: **Sampling and Hypothesis Testing**

Sampling: Meaning, Steps in Sampling process, Types of Sampling – Probability and non probability Sampling Techniques, Errors in sampling. Hypothesis: Meaning, Types, characteristics, sources, Formulation of Hypothesis, Errors in hypothesis testing.

Unit 5: **Data Analysis**

Editing, Coding, Classification, Tabulation, Univariate, Bivariate and multivariate Analysis, Interpretation.

Unit 6: **Research Report**
Types, advantages, disadvantages, Components of research reports, format, chapterisation, language, referencing.

References:

1. Marketing Research – Naresh K Malhotra – Pearson Education.
2. Business Research Methods- S.N.Murthy/U.Bhojanna- Excel Books.
3 .Business Research Methods–Donald R. Cooper & Pamela S Schindler,TMH.
4. Marketing research: Text and cases- Rajendra Nargundkar – TMH.
5. Business Research Methods – Alan Bryman & Emma Bell, Oxford.
6. Research Methodology – C R Kothari- Vishwa Prakashan.
7. Business Research Methods – William G Zikmund- Thomson,
8. Methodology of Research in Social Sciences – O R Krishnaswami, M Ranganatham, HPH.

ENE27001 / ENF27001

GROUP A2

SKILL ENHANCEMENT COURSE-9

PROJECT WORK

L:T:P- 1:0:3

C1 – Proposal of Project Work - 15 Marks
C2 – Progress of Project Work - 15 Marks
Viva - 20 Marks
Valuation of Report – 50 Marks

Course Outcome:

On successful completion of the project work the students are able to:
CO1: Understand in depth the gap between theory and practical through internship
CO2: Understand in detail with examples the procedure and able to write a report on the various issues of an organization
CO3: Convince and communicate effectively
CO4: Learn in detail and able to absorb as an employee by the employer
CO5: Specify and analyze the components of project report and prepare the report effectively
CO6: develop leadership qualities

ENE28001

GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

CONSUMER AFFAIRS

L: T: P-4:1:0

Course Outcome:

On successful completion of the project work the students are able to:

CO1: Learn conceptual frame work of consumer and consumer market
CO2: Understand in depth the characteristics of consumer protection law in India
CO3: Deliberate the details of role played by the advisory bodies at different level
CO4: Indentify the grievance redressal mechanism
CO5: Specify the details of role played by industry regulator in consumer protection
CO6: Understand in depth the consumer movement in India

Unit 1: Conceptual Framework

Consumer and Markets: Concept of Consumer, Nature of markets: Liberalization and Globalization of markets with special reference to Indian Consumer Markets, E-Commerce with reference to Indian Market, Concept of Price in Retail and Wholesale, Maximum Retail Price (MRP), Fair Price, GST, labelling and packaging along with relevant laws, Legal Metrology. Experiencing and Voicing Dissatisfaction: Consumer buying process, Consumer Satisfaction/dissatisfaction-Grievances-complaint, Consumer Complaining Behaviour: Alternatives available to Dissatisfied Consumers; Complaint Handling Process: ISO 10000 suite

Unit 2: The Consumer Protection Law in India

Objectives and Basic Concepts: Consumer rights and UN Guidelines on consumer protection, Consumer goods, defect in goods, spurious goods and services, service, deficiency in service, unfair trade practice, restrictive trade practice. Organizational set-up under the Consumer Protection Act

Unit 3: Advisory Bodies

Consumer Protection Councils at the Central, State and District Levels; Adjudicatory Bodies: District Forums, State Commissions, National Commission: Their Composition, Powers, and Jurisdiction (Pecuniary and Territorial), Role of Supreme Court under the CPA with important case law.

Unit 4: Grievance Redressal Mechanism

Grievance Redressal Mechanism under the Indian Consumer Protection Law , Who can file a complaint? Grounds of filing a complaint; Limitation period; Procedure for filing and hearing of a complaint; Disposal of cases, Relief/Remedy available; Temporary Injunction, Enforcement of order, Appeal, frivolous and vexatious complaints; Offences and penalties. Leading Cases decided under Consumer Protection law by Supreme Court/National

Commission: Medical Negligence; Banking; Insurance; Housing & Real Estate; Electricity and Telecom Services; Education; Defective Products; Unfair Trade Practices.

Unit -5: Role of Industry Regulators in Consumer Protection.

Banking: RBI and Banking Ombudsman. ii. Insurance: IRDA and Insurance Ombudsman iii. Telecommunication: TRAI iv. Food Products: FSSAI v. Electricity Supply: Electricity Regulatory Commission vi. Real Estate Regulatory Authority

Unit 6: **Contemporary Issues in Consumer Affairs**

Consumer Movement in India: Evolution of Consumer Movement in India, Formation of consumer organizations and their role in consumer protection, Misleading Advertisements and sustainable consumption, National Consumer Helpline, Comparative Product testing, Sustainable consumption and energy ratings.

Quality and Standardization: Voluntary and Mandatory standards; Role of BIS, Indian Standards Mark (ISI), Ag-mark, Hallmarking, Licensing and Surveillance; Role of International Standards: ISO an Overview

Note: Unit 2, 3 and 4 refer to the Consumer Protection Act, 1986. Any change in law would be added appropriately after the new law is notified

References:

1. Khanna, Sri Ram, Savita Hanspal, Sheetal Kapoor, and H.K. Awasthi. (2007) Consumer Affairs, Universities Press.
2. Choudhary, Ram Naresh Prasad (2005). Consumer Protection Law Provisions and Procedure, Deep and Deep Publications Pvt Ltd.
3. G. Ganesan and M. Sumathy. (2012). Globalisation and Consumerism: Issues and Challenges, Regal Publications
4. Suresh Misra and Sapna Chadah (2012). Consumer Protection in India: Issues and Concerns, IIPA, New Delhi
5. Rajyalaxmi Rao (2012), Consumer is King, Universal Law Publishing Company
6. Girimaji, Pushpa (2002). Consumer Right for Everyone Penguin Books.
7. E-books :- www.consumereducation.in
8. Empowering Consumers e-book,
9. e-book, www.consumeraffairs.nic.in

ENE29001

GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

INTERNATIONAL BUSINESS

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in detail about import and export and able to become an importer and exporter

CO2: Specify in detail the application of foreign trade policies and analyse how international factors affect domestic concern

CO3: Learn in depth and analyse legal issues related to international business

CO4: Identify and analyse various social culture and responsibility awareness on global issues

CO5: Understand in detail and identify sources of trade finance and forms of payment

CO6: Identify the function of WTO and regional integrations

CO7: Understand in depth characteristics of foreign exchange market

CO8: Identify the details of facilities provided by the International monetary institutions

Unit 1: Introduction

Globalisation – Meaning and implications - Globalisation of markets and production – The emerging global economy - Drivers of Globalisation. Modes and entry strategies of international business – arguments for and against – trends in international trade. Differences between domestic and international business.

Unit 2: International Business Environment

Cultural aspects, values and norms, social structure, religious and ethical systems, language, education, implications of cultural differences on business. International business environment, Political and legal factors, political systems, legal systems, International business environment, Economic factors, the determinants of economic development. Tariffs, subsidies, local content requirements, administrative policies, anti dumping policies, political and economic arguments for intervention ,Development of the world trading system.

Unit 3: WTO and Regional Integrations

GATT, the Uruguay round of negotiations. WTO, genesis and functions, the future of WTO. Regional Integrations, Trading Blocks, nature and levels of integration, arguments for and against regional integration, Trading blocks, European Union, ASEAN, APEC, NAFTA, SAARC.

Unit 4: Multinational Corporations

Organisation, design and structures, head quarters and subsidiary relations in multinational corporations.

Unit5: Foreign Exchange Market

Functions, nature of foreign exchange market, the trading mechanism, exchange rate determination, balance of trade, stability of exchange rate, currency convertibility

Unit 6: International Monetary System

Funding facilities and strategies of IMF and World Bank, Expatriation and Repatriation, Ethical dimensions in International Business.

References:

1. Charles W L Hill. And Arun Kumar Jain. International Business: competing in the global market place, Mc Graw-Hill.
2. John D. Daniels Lee H Radebaugh, International Business: Environments and Operations Addison Wesley.
3. Justin Paul – International Business – Prentice Hall of India.
4. Oded Shenkar Yadong Luo: International Business – John Wiley and Co.
5. Wild J. John, Wild L. Keneth and Han C. Y. Jerry, International Business: An integrated approach, Prentice Hall
6. Alan M. Rugman and Richard M. Hodgetts – International Business by Pearson Education.

ENE30001

GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

GOODS AND SERVICES TAX-I

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand the technology and flow of return filing under GST

CO2: Learn in details and gain knowledge to practice as GST Consultant

CO3: Learn in details provisions of GST to handle TDS and POS online and off line more efficiently

CO4: Understand in depth tax provisions to make managerial decisions effectively in various tax related matters

CO5: Understand the provisions of integrated goods and service Tax Act, 2017

CO6: Learn in depth the provisions relating to place of supply of goods imported into, or exported from India

CO7: Identify the details of provisions in relation to Time of supply of goods

Unit 1: Introduction to GST

Indirect tax Structure in India, Issues in Indirect Tax, Rationale for Transition to GST; GST-Meaning, Definition of GST, Types of GST, Features of GST, Benefits of GST, Problems on Computation of GST.

Unit 2: Definitions

Actionable claim, Address of Delivery, Aggregate Turnover, Agriculturist, Associated enterprises, Business, GST Council, Credit note and Debit note, Deemed exports, Draw-back, Electronic Credit ledger, Exempt Supplies, Input, Input service, Input Service Distributor, Input Tax, Input tax Credit, Intra-state supply of Goods, Job work, Reverse Charge, Invoice, Composition Levy, Mixed Supply, outward supply, Person, Turnover in State

Unit 3: Levy and Collection of Tax

Scope of supply; Levy of GST; Liability of tax payable person, Rate and value of tax, meaning and conditions of supply, list of transactions without consideration list of neither a supply of goods, nor supply of services; meaning and treatment of mixed supply: meaning and treatment of composite supply: reverse charge mechanism: Composition levy.

Unit 4 : The Integrated Goods and Service Tax Act,2017

Short title, extent and commencement; Definitions; Central tax, Customs frontier of India, Export of Goods and Services, Import of goods and services; Location of Recipient of service, Location of supplier of service; Appointment of officers; Levy and Collection; Power to grant exemption from tax; Inter-State supply;. Intra-State supply; Supplies in territorial waters

Unit 5: Place of supply of goods other than supply of goods imported into, or exported from India

Place of supply of goods imported into, or exported from India; Place of supply of services where location of supplier and recipient1 is in India; Place of supply of services where location of supplier or location of recipient is outside India; Special provision for payment of tax by a supplier of online information and database access or retrieval services

Unit 6: Time of supply

Introduction, time of supply-forward charge, reverse charge, residuary, special charges-Time of supply of service- forward charge, reverse charge, Vouchers, Residuary, Special charges. Problems on determination of time of supply.

References:

1. Taxmann publications
2. Compendium on Goods and service tax-Dr. Manju S 3.www.cbec.gov.in/
4. www.ICSI.edu.in
5. www.icai.org.
6. Students Guide To GST & Customs Law Vinod K Singhania

ENE31001

GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

FINANCIAL MANAGEMENT-I

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Identify the details of various sources of finance
CO2: Learn the characteristics of different methods of time value of money and its application to investment decision
CO3: Learn the classification and characteristics of cost of capital
CO4: Identify the characteristics of capital structure and factors affecting the capital structure
CO5: Learn the details of Capital Budgeting
CO6: Understand the classification and characteristics of Dividend theories

Unit 1: Introduction to financial management

Meaning – scope – goals of financial management – sources of finance.

Unit 2: Time value of Money

Present value and future value concepts-present value of annuity, application of present and future value to investment decisions, preparation of amortization table.

Unit 3: Cost of capital

Meaning- importance of cost of capital in financial decisions, determination of specific costs-cost of debt- cost of preference share capital-cost of equity, cost of retained earnings-weighted average cost of capital-Leverages- meaning- types problems on Leverages.

Unit 4: Capital Structure

Meaning-optimum capital structure-features of appropriate capital structure-factors influencing capital structure-theories of capital structure-NI approach-NOI approach, MM approach, traditional approach, determination of optimal debt-equity mix.

Unit 5: Capital budgeting

Meaning-features, role of capital budgeting, techniques of capital budgeting-payback period, average rate of return, net present value, profitability index, internal rate of return, discounted pay back method. Application of excel in capital budgeting techniques.

Unit 6: **Dividend decisions**

Meaning, Dividend decisions, Dividend policies - objectives of dividend policy-determinants of dividend policy-dividend relevance- Walter's model, Gordon model-Dividend irrelevance-MM hypothesis.

References:

1. Financial Management I.M.Pandey.
2. Financial Management Ravi Kishore
3. Financial Management Dr.V.R.Palanivelu
4. Financial Management Kulkarni
5. Financial Management Tulsian P C
6. Financial Management Khan and Jain

ENE32001

GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

ADVANCED COST AND MANAGEMENT ACCOUNTING-I

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth various Costing methods

CO2: Understand the details of contract costing and process costing

CO3: Identify reasons for reconciliation of cost and financial accounts

CO4: Learn in depth the details of Activity based costing

CO5: prepare the operating cost sheet

Unit 1: Introduction to Costing Methods

Meaning, Importance and Categories, Cost accounting Standards- Generally Accepted Cost Accounting Principles (GACAP)- Purpose, Objective and Applicability.

Unit 2: **Contract costing**

Introduction- Contract account, Profit on incomplete contracts, work in progress, Contractee's Accounts, Escalation clause.

Unit 3: Process costing: Introduction, Distinction between Job costing, and process costing, process losses, inter-process profits, Joint products and by-products- Meaning, features, differences, problems on process accounts including joint and by products.

Unit 4: **Operating Costing**

Introduction, transport costing, standing charges, operating/running charges, and preparations of operating cost sheet.

Unit 5: Reconciliation of cost and financial accounts

Meaning, need for reconciliation, reasons for disagreement, reconciliation procedure, problems on reconciliation.

Unit 6: Activity based costing (ABC)

Definition, Features, Advantages, Differences between ABC and traditional costing, Allocation of overheads; Objectives of ABC, Development of ABC, Implementation of ABC, Problems on Computation of Activity Based Costing and Traditional Costing;

References:

1.Cost Accounting: N.K. Prasad
2.Cost Accounting: Nigam & Sharma :
3.Practical Costing: Khanna, Pandey & Ahuja
4: Cost Accounting: M.L. Agarwal
5.Cost Accounting: Jain & Narang
6.Cost Accounting: S.P. Iyengar

ENE33001

GROUP B

SEMESTER V

DISCIPLINE SPECIFIC ELECTIVE

RETAIL MANAGEMENT

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics of retailing

CO2: Understand in depth the details of retail consumer

CO3: Identify and basis of retail market segmentation and strategies

CO4: Specify the factors determining the retail location selection

CO5: Understand in depth merchandise and managing them

CO6: Learn in depth the details of retail operation and retail pricing

Unit 1: **Introduction to Retailing**

Concept of retailing, Functions of retailing, Terms and Definition, retail formats and types, Retailing Channels, Retail industry in India, Importance of retailing, Changing trends in retailing.

Unit 2: **Understanding the Retail Consumer**

Retail consumer behaviour, Factors influencing the Retail consumer, Customer decision making process, Types of decision making, Market research for understanding retail consume.

Unit 3: Retail Market Segmentation and Strategies

Market Segmentation and its benefits, kinds of markets, definition of Retail strategy, Strategy for effective market segmentation, Strategies for penetration of new markets, Growth strategies, Retail value chain.

Unit 4: Retail Location Selection

Importance of Retail locations, Types of retail locations, Factors determining the location decision, Steps involved in choosing a retail locations, Measurement of success of location.

Unit 5: **Merchandise Management**

Meaning of Merchandising, Factors influencing Merchandising, Functions of Merchandising Manager, Merchandise planning, Merchandise buying, Analyzing Merchandise performance.

Unit 6: **Retail Operations and Retail Pricing**

Store administration, Premises management, Inventory Management, Store Management, receipt Management, Customer service, Retail Pricing, Factors influencing retail prices pricing strategies, controlling costs.

References:

1. Retail Management 01 Edition S. C. Bhatia
2. Retail Management: Text and Cases (English, Paperback, Swapna Pradhan
3. Retail Management; Principles and Practices – R. Sudarshan
4. Retail Management PB (English, Paperback, Mathur U C)

ENF28001

GROUP C

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE

INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics of investment

CO2: Understand in depth characteristics of financial system and stock market

CO3: Identify and use different models for portfolio analysis

CO4: Learn in depth capital asset pricing model

CO5: Identify the risk and return of investment

CO6: Understand in depth portfolio selection

CO7: Understand in depth the efficient market hypothesis and portfolio analysis

Unit 1: Introduction to Investment

Meaning, Financial and Economic Meaning, Characteristics, Objectives, Investment v/s Speculation, Investment v/s Gambling, Types of Investors and Investment avenues.

Unit 2: **Indian Financial System and Stock Market-Investment Planning,**

Introduction to Stock Market, Overview of Indian Financial System, Market Indices, Methods of Computation of Market Indices.

Unit 3: Portfolio Management

Meaning, Phases, Evolution, Role of Portfolio Management, Calculation of Risk and Return, Fundamental Analysis: Economic Analysis, Industry analysis and Company analysis and Technical Analysis: Meaning, Dow Theory, basic Principles, Trends and charts.

Unit 4: Share and Bond Valuation-Share

Concepts and present value, share valuation model, constant Growth Model, Multiple Growth Model, Discount rate, Multiplier Approach to share values and Regression Analysis. Bonds: Bond Returns, Prices, Pricing Theories, Bond Risks and Bond Duration.

Unit 5: Efficient Market Hypothesis and Portfolio Analysis

EMH: Random Walk Theory, the Efficient Market Hypothesis, Forms of Market Efficiency. Portfolio Analysis: Expected Return and Risk of Portfolio, Reduction of Portfolio Risk through Diversification, Portfolio with more than two Securities – solved examples.

Unit 6: Portfolio Selection

Feasible set of Portfolios, Selection of Optimal Portfolio, Limitations of Markowitz Model and Single Index Model and Multi Index Model. Capital Asset Pricing Model and Arbitrage Pricing Theory.

References:

1.Investment analysis and Portfolio Management Prasanna Chandra
2.Security Analysis and Portfolio Management Punithavathi pandian
3.Security Analysis and portfolio Management Ambika Prasad Dash
4.Security Analysis and Portfolio Management, M. Ranganatham, R. Madhumathi

ENF29001

GROUP C

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE

FINANCIAL DERIVATIVES

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the characteristics of financial derivatives and derivatives market

CO2: Deliberate the characteristics of futures and forwards
CO3: Understand in details with examples options
CO4: Deliberate the classification and characteristics of financial swaps
CO5: Write down the details of commodity market
CO6: Identify in depth credit derivatives

Unit 1: Financial Derivatives
Introduction, -meaning- Types of financial derivatives - Features of derivatives market - Factors contributing to the growth of derivatives - functions of derivative markets - traders in derivatives markets - Derivatives market in India

Unit 2: Futures and forwards
Meaning, differences-valuation of futures, Mechanics of buying & selling futures, Margins, Hedging using futures -specification of futures - Commodity futures, Index futures, interest rate futures – arbitrage opportunities.

Unit 3: **Options:**
Types of options, option pricing, factors affecting option pricing – call and put options on dividend and non-dividend paying stocks put-call parity - mechanics of options - stock options - options on stock index - options on futures – interest rate options. Concept of exotic option. Hedging & Trading strategies involving options, valuation of option: basic model, one step binomial model, Black and Scholes Model,

Unit 4: Financial Swaps
features and uses of swaps - Mechanics of interest rate swaps – valuation of interest rate swaps – currency swaps – valuation of currency swaps

Unit 5: Commodity derivatives
Commodity futures market-exchanges for commodity futures in India, Forward Market Commissions and regulation-commodities traded – trading and settlements – physical delivery of commodities

Unit6: Credit Derivatives

Meaning, common credit derivatives, types of credit dervates, Credit Default swaps(CDS), Total Return swaps, Collateralized debt obligations(CDO), Indian scenario.

References:

1. Financial Derivatives- Vohra and Bagri
2. Capital Market Instruments Kotreshwar G
3. Fundamental Financial Derivatives N R Parasuraman
4. Financial Derivatives S L Guptha

ENF30001

GROUP C

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE

GOODS AND SERVICES TAX AND CUSTOM DUTY-II

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand the technology and flow of return filing under GST

CO2: Learn in details and gain knowledge to practice as GST Consultant

CO3: Learn in details provisions of GST in relation to value of taxable supply and input tax credit

CO4: Understand in depth tax provisions to make managerial decisions effectively in various tax related matters

CO5: Learn in detail the procedure to be followed to assess the value and determine customs duty

CO6: Understand the procedure of registration under GST

CO7: Prepare tax invoice, credit and debit notes

Unit 1: Value of taxable supply

Conditions, inclusions, Consideration not wholly in money, Supply between two related persons, Supply through agent, cost based value, Residual valuation, specific supplies, Service of pure agent. Problems on determination of value of supply.

Unit 2: Input tax credit

Meaning, conditions for taking credit, ineligible input tax credit, availability of credit in special circumstances, Input tax credit and change in constitution of registered person, Taking input tax credit in respect of inputs and capital goods sent for job work, Manner of Distribution of Credit by Input Service Distributor (ISD)

Unit 3: Tax Invoice, Credit and Debit Notes

Tax invoice; Prohibition of un authorised collection of tax; Amount of tax to be indicated in tax invoice and other documents ; Credit and debit notes.

Unit 4: Registration under GST

Persons liable for registration, compulsory registration, Procedure for Registration, Rejection of application for registration, cancellation of Registration

Unit 5: Returns

Brief introduction to various GSTRS-procedure for filing various returns.

Unit 6: Customs Act 1962

Meaning- Notified goods –specified goods- Prohibition of importation and exportation under sec 11- types of customs duty- Basic customs duty, Education Cess, Anti dumping duty, Safeguard Duty, IGST, GST Compensation Cess- Computation of Assessable value and applicable duties. Exports – Meaning- zero rated supply.

References:

1. Taxmann publications
2. Compendium on Goods and service tax-Dr. Manju S
3. www.cbec.gov.in/
4. Systematic Approach GST- Dr. Ravi. Gupta, Dr. Girish. Ahuja

ENF31001

GROUP C

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE

FINANCIAL MANAGEMENT –II

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Deliberate the details of working capital management

CO2: Learn in depth the details of cash management

CO3: Understand the details of working capital financing

CO4: Deliberate in details with examples Venture capital financing

CO5: Learn in depth the details of shareholders value creation

CO6: Deliberate in depth International financial management

Unit 1: Working Capital Management

Meaning, Features, types of working capital, factors influencing working capital, level of current assets, operating cycle and cash cycle, current assets financing policy

Unit 2: Cash Management

Cash budget cash collection and disbursement, options for investment of surplus funds, credit management- credit policy variables-credit evaluation. Inventory management- need for inventories; order quantity-EOQ model- monitoring and control of inventories-ABC- JIT techniques.

Unit 3: Working Capital Financing

Leasing-types of leases, Rationale for leasing, operating leases, leasing as a financing decision; hire purchase financing- Hire purchase financing v/s lease financing, instalment sale, evaluation of Hire purchase financing

Unit 4: Venture Capital Financing

Meaning, features, development of venture capital in India, stages in venture financing- the business plan- essentials of a business plan, the process of venture capital financing- Methods of venture financing; Disinvestment mechanisms

Unit 5: Share Holder Value Creation

Financial goals and strategy, shareholder value creation- market value added, Market to book value, Economic value added(EVA)- Balanced scorecard- the learning and growth perspective, significance of balanced score card , implementation of score card.

Unit 6: International Financial Management

Foreign exchange market, foreign exchange rates- spot exchange rates, bid-ask rate, forward exchange rates- foreign exchange risk- transaction exposure, economic exposure, translation exposure, hedging of foreign exchange risk- foreign currency option, money market operations- financing international operations.

References:

1. Financial Management I.M.Pandey.
2. Financial Management Ravi Kishore
3. Financial Management Dr.V.R.Palanivelu
4. Financial Management Kulkarni

5. Financial Management Tulsian P C
6. Financial Management Khan and Jain

ENF32001

GROUP C

SEMESTER VI

DISCIPLINE SPECIFIC ELECTIVE

ADVANCED COST AND MANAGEMENT ACCOUNTING-II

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand the details of management accounting

CO2: Learn in depth the details of financial statement analysis techniques

CO3: Analyze the inflow and outflow of cash and able to prepare cashflow statement

CO4: Understand the characteristics of different types of ratios

CO5: Learn in depth budget and budgetary control and prepare various budget for different activities of the business

CO6: Learn in depth marginal costing and able to effective decision regarding make or buy, accepting foreign order, continuance or discontinuance of manufacturing a products

Unit 1: Introduction

Meaning and Definition of Management Accounting, Scope and Objectives of Management Accounting-Differences between Management Accounting and Financial Accounting –Management accounting and Cost accounting-Limitations of Management Accounting.

Unit 2: Analysis of Financial Statements

Common Size Statements, Comparative Statement, Trend analysis.

Unit 3: Ratio Analysis

Meaning and Objectives-Types of rations - (A) Profitability Ratios-GP ratio - NP Ratio-Operating ratio- Operating profit ration-Return on capital employed ratio- EPS, (B) Turnover Ratios-working capital turnover ratio- Stock Turnover ratio-Fixed assets turnover ratio-Debtors turnover Ratio-Creditors turnover Ratio, (C) Financial ratios – Current Ratio-liquidity ratio-Debt-equity ratio-Proprietary Ratio-Capital gearing Ration-Advantagesand Limitations of Ratios- Construction of Balance sheet using ratios.

Unit 4: Cost Flow Statement

Meaning, Definition, Uses and Limitations-Differences between funds flow statement and cash flow statement-Preparation of Cash flow statement (AS-7): Direct method and Indirect Method.

Unit 5: Marginal Costing

Definition - Basic concepts – Assumptions - Marginal Cost statement – Contribution-Break Even Analysis-P/V Ratio-Margin of Safety - Decision areas - Make or Buy and Pricing.

Unit 6: Budget and Budgeting Control

Definition - Basic Concepts - Budget Manual - Key factor - Classification of Budgets - Problems on cash budget, sales budget, Flexible Budget, Cash Planning and Motives for holding cash.

References:

1. Cost Accounting: N.K. Prasad
2. Cost Accounting: Nigam & Sharma :
3. Practical Costing: Khanna, Pandey & Ahuja
4. Cost Accounting: M.L. Agarwal
5.Cost Accounting: Jain & Narang
6.Cost Accounting: S.P. Iyengar

ENF33001

GROUP C

VI SEMESTER

DISCIPLINE SPECIFIC ELECTIVE

ORGANISATIONAL BEHAVIOUR

L: T: P-4:1:0

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail behaviour of employees and able to manage them efficiently

CO2: Identify in details employees performance and able to motivate for effective performance

CO3: Learn in depth and analyse the behaviour of employees

CO4: Understand in details key positions in an organisation and able to occupy them

CO5: Learn in details with examples frame policies and strategies in organisation

Unit 1: Introduction
Meaning, definition, historical development, fundamental principles of OB, contributing disciplines, approaches, challenges and opportunities.

Unit 2: Foundations of Individual Behaviour
Individual behaviour: Foundations of individual behaviour. Ability: Intellectual abilities, Physical ability, the role of disabilities. Personality: Meaning, formation, determinants, traits of personality, personality attributes influencing OB. Attitude: Formation, components of attitudes, relation between attitude and behaviour.

Unit 3: Perception and Emotions- Perception: Process of perception, factors influencing perception, link between perception and individual decision making. Emotions: Affect, mood and emotion and their significance, basic emotions, emotional intelligence, self-awareness, self-management, social awareness, relationship management.

Unit 4: Motivation and Leadership
Motivation- meaning, theories of motivation-needs theory, two factor theory, Theory X and Y, application of motivational theories. Leadership: Meaning, styles of leadership, leadership theories, trait theory, behavioural theories, managerial grid, situational theories-Fiedler's model, SLT, transactional and transformation leadership.

Unit 5: Group Behaviour
Definition, types, formation of groups, building effective teams. Conflict: Meaning, nature, types, process of conflict, conflict resolution. Power and politics: Basis of power, effectiveness of power tactics.

Unit 6: Emerging Challenges
Emerging challenges, managing diversity, globalisation, technology transformation, e - business, promoting ethical behaviour.

References:

1.Organisational behaviour, Stephen P Robbins, Timothy A. Judge, Neharika Vohra, 14th Edition, Pearson
2. Organization Behaviour – Ashwathappa, Himalaya Publication House

3. Organisational Behaviour: A modern approach - Arun Kumar and Meenakshi, Vikas Publishing House
4. Organisational Behaviour - Fred Luthans, 12/e, McGraw Hill International
5 Management and Organisational Behaviour - Laurie J Mullins, Pearson education
6. Fundamentals of Organisational Behaviour - Slocum/Hillriegel, Cengene Learning

B.COM

Question Paper Pattern

(For all courses except Quantitative Techniques, Computerised Accounting and E-filling of returns)

PART-A

Answer the following. Each question carries 15 marks. 2X15=30

1. …… ……

OR

2. ……..…….

3. ……..……..

OR

4. ……..…….

PART-B

Answer the following. Each question carries 10 marks. 2X10=20

5. …….…….

OR

1. …….……..……

7. …….…….

OR

8. …….…….

PART-C

Answer any four of the following. Each question carries 5 marks. 4X5=20

9. …….……

10. …….…….

11. …….…….

12. …….…….

13. …….…….

14 …….…….

****

B.COM

Question Paper Pattern
4.5 Quantitative Techniques

Time: 3 hrs **Max. Marks: 70**

Part-A

Answer the following. Each question carries two marks 10X2=20

1. a. …….
   b. …….
   c.……..
   d. ……....
   e.……..
   f.…….
   g.…….
   h. …….
   i. ……..
   j. ……..

Part-B

Answer any four of the following. Each question carries five marks 4X5=20

2. ……...

3. ……..……...

4. ……..……...

5. ……

6. ……...……

Part-C

Answer any three of the following. Each question carries ten marks 3X10=30

7. …..……

8. …….

9. ……..……

10. ……..…….

B.COM

Question Paper Pattern
Computerized Accounting System (SEC-1) / E-filling of returns (SEC-2)

Time: 3 hrs **Max. Marks:70**

Part-A

Answer the following. Each question carries two marks. 10X2=20

1. a. ……..……..
b. ……..……..
c. ……..……..
d. ……..……..
e. ……..……..
f. ……..……..
g. ……..……..
h. ……..……..
i. ……..……..
j. ……..……..

Part-B

Answer any four of the following. Each question carries five marks. 4X5=20

2. ……..……..
3. ……..……..
4. ……..……..
5. ….……
6. …….

Part-C

Answer any three of the following. Each question carries ten marks 3X10=30

5. ……..……
6. ……..……
7. ……..……
8. ……..……

JSS COLLEGE OF ARTS COMMERCE & SCIENCE

(Autonomous)

B.N Road, Mysuru – 25

DEPARTMENT OF COMMERCE AND MANAGEMENT

Syllabus

CHOICE BASED CREDIT SYSYTEM

BBA Programme

2017-18

Scheme of Study for BBA under CBCS Scheme implemented from 2017-18

YEAR	SEM	COURSE CODE	TITLE OF THE PAPER	NO. OF CREDITS			LECTURE/PRACTICAL HOURS /WEEK			TOTAL TEACHING HOUIRS		
				L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)
I	I	BDA21011	ENTREPRENEURSHIP DEVELOPMENT	3	1	0	3	1	0	48	16	0
		BDA22011	FINANCIAL ACCOUNTING AND ANALYSIS	4	1	1	4	1	2	64	16	32
		BDA23011	BUSINESS DECISIONS	5	1	0	5	1	0	80	16	0
	II	BDB23011	ORGANISATIONAL BEHAVIOUR	3	1	0	3	1	0	48	16	0
		BDB21011	STATISTICS FOR BUSINESS	5	1	0	5	1	0	80	16	0
		BDB22011	COST AND MANAGEMENT ACCOUNTING	5	1	0	5	1	0	80	16	0
II	III	BDC21011	INCOME TAX	4	1	1	4	1	2	64	16	32
		BDC22011	CORPORATE FINANCE	5	1	0	5	1	0	80	16	0
	IV	BDD22001	FINANCIAL MARKETS AND INSTITUTIONS	5	1	0	5	1	0	80	16	0
		BDD23001	QUANTITATIVE TECHNIQUES	5	1	0	5	1	0	80	16	0
		BDD21001	COMPUTER APPLICATIONS IN BUSINESS	2	0	2	2	0	4	32	0	64
III	V	BDE21001	INVESTMENT ANALYSIS AND PORTFOLIE MANAGEMENT	5	1	0	5	1	0	80	16	0
		BDE22001	GST AND CUSTOMS DUTY	5	1	0	5	1	0	80	16	0
			ELECTIVE -1 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								
			ELECTIVE -2 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								
	VI	BDF21001	CORPORATE RESTRUCTURING	5	1	0	5	1	0	80	16	0
		BDF22001	INTERNATIONAL FINANCIAL INSTITUTIONS	5	1	0	5	1	0	80	16	0
			ELECTIVE -3 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								
			ELECTIVE – 4 (ANY ONE FROM THE LIST **DSE** GROUP)	LIST GIVEN BELOW								

LIST OF COURSES IN DSE GROUP

YEAR	SEM	COURSE CODE	TITLE OF THE PAPER	NO. OF CREDITS			LECTURE/PRACTICAL HOURS /WEEK			TOTAL TEACHING HOUIRS		
				L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)	L (Hrs)	T (Hrs)	PRA (Hrs)
III	V	BDE23001	INVESTMENT BANKING AND FINANCIAL SERVICES	5	1	0	5	1	0	80	16	0
		BDE24001	CORPORATE ANALYSIS AND VALUATION	5	1	0	5	1	0	80	16	0
		BDE25001	RESEARCH METHODOLOGY	5	1	0	5	1	0	80	16	0
		BDE26001	INTERNATIONAL TRADE BLOCKS & MULTILATERAL AGENCIES	5	1	0	5	1	0	80	16	0
		BDE27001	HUMAN RESOURCE MANAGEMENT	5	1	0	5	1	0	80	16	0

	VI	BDF23001	STRATEGIC CORPORATE FINANCE	5	1	0	5	1	0	80	16	0
		BDF24001	MANAGEMENT OF FINANCIAL INSTITUTIONS	5	1	0	5	1	0	80	16	0
		BDF25001	FINANCIAL DERIVATIVES	5	1	0	5	1	0	80	16	0
		BDF26001	RESEARCH SOFTWAR PACKAGE	2	0	2	2	0	4	32	0	64
		BDF27001	COMPUTERISED ACCOUNTING SYSTEM	4	0	2	4	0	4	64	0	64
		BDF28001	PROJECT WORK	1	1	4	1	1	8	16	16	128

Proposed Scheme of Assessment for BBA under CBCS Scheme to be implemented from 2017-18

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C3								
				T	SDR	T	VIVA		TH	PR	IA	TH	PR	IA	TH	PR
I	I	BDA21011	ENTREPRENEURSHIP DEVELOPMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDA22011	FINANCIAL ACCOUNTING AND ANALYSIS	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**2h**
		BDA23011	BUSINESS DECISIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
	II	BDB23011	ORGANISATIONAL BEHAVIOUR	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDB21011	STATISTICS FOR BUSINESS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDB22011	COST AND MANAGEMENT ACCOUNTING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
II	III	BDC21011	INCOME TAX	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**2h**
		BDC22011	CORPORATE FINANCE	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
	IV	BDD22001	FINANCIAL MARKETS AND INSTITUTIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDD23001	QUANTITATIVE TECHNIQUES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDD21001	COMPUTER APPLICATIONS IN BUSINESS	**10**	**05**	**10**	**05**	**70**	50	70	30	**35**	**35**	**30**	**3h**	**2h**
III	V	BDE21001	INVESTMENT ANALYSIS AND PORTFOLIE MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE22001	GST AND CUSTOMS DUTY	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ELECTIVE -1 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												
			ELECTIVE -2 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												
	VI	BDF21001	CORPORATE RESTRUCTURING	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF22001	INTERNATIONAL FINANCIAL INSTITUTIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
			ELECTIVE -3 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												
			ELECTIVE – 4 (ANY ONE FROM THE LIST **DSE** GROUP)	**LIST GIVEN BELOW**												

LIST OF COURSES IN DSE GROUP

Year	SEM	COURSE CODE	TITLE OF THE PAPER	CONTINUOUS ASSESSMENT					MAX MARKS			PERCENTAGE			DURATION OF EXAM	
				C1		C2		C3								
				T	SDR	T	VIVA		TH	PR	IA	TH	PR	IA	TH	PR
III	V	BDE23001	INVESTMENT BANKING AND FINANCIAL SERVICES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE24001	CORPORATE ANALYSIS AND VALUATION	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE25001	RESEARCH METHODOLOGY	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE26001	INTERNATIONAL TRADE BLOCKS & MULTILATERAL AGENCIES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDE27001	HUMAN RESOURCE MANAGEMENT	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
	VI	BDF23001	STRATEGIC CORPORATE FINANCE	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF24001	MANAGEMENT OF FINANCIAL INSTITUTIONS	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF25001	FINANCIAL DERIVATIVES	**10**	**05**	**10**	**05**	**70**	70	-	30	**70**	**-**	**30**	**3h**	**-**
		BDF26001	RESEARCH SOFTWAR PACKAGE	**10**	**05**	**10**	**05**	**70**	50	70	30	**35**	**35**	**30**	**2h**	**2h**
		BDF27001	COMPUTERISED ACCOUNTING SYSTEM	**10**	**05**	**10**	**05**	**70**	70	70	30	**50**	**20**	**30**	**3h**	**3h**
		BDF28001	PROJECT WORK	**-**	**-**	**-**	**-**	**-**	-	70	30	**-**	**70**	**30**	**-**	**-**

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- A candidate appearing for the first time should submit a duly signed and certified practical record
- Practical record has to be valued for ***FIVE m*arks** by examiners at the time of examination
- ***FIVE marks*** for conducting viva-voce.
- Computer Lab exams are conducted for 70 marks for each candidates

EVALUATION OF PROJECT WORK:

Sl No	Component	Marks
1	Proposal of Project Work	15
2	PPT Presentation	15
TOTAL		**30**

Sl No	Component	Marks
1	Evaluation of Project by Internal and External Exainors	50
2	Viva Voce	20
	TOTAL	**70**

DEPARTMENT OF COMMERCE

Discipline Specific Course

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	I	BDA22011	FINANCIAL ACCOUNTINGAND ANALYSIS	4	1	1
2		BDA23011	BUSINESS DECISIONS	5	1	0
3	II	BDB21011	STATISTICS FOR BUSINESS	5	1	0
4		BDB22011	COST AND MANAGEMENT ACCOUNTING	5	1	0
5	III	BDC21011	INCOME TAX	4	1	1
6		BDC22011	CORPORATE FINANCE	5	1	0
7	IV	BDC22001	FINANCIAL MARKETS AND INSTITUTIONS	5	1	0
8		BDC23001	QUANTITATIVE TECHNIQUES	5	1	0
9	V	BDE21001	INVESTMENT ANALYSIS AND PORTFOLIE MANAGEMENT	5	1	0
10		BDE22001	GST AND CUSTOMS DUTY	5	1	0
11	VI	BDF21001	CORPORATE RESTRUCTURING	5	1	0
12		BDF22001	INTERNATIONAL FINANCIAL INSTITUTIONS	5	1	0

Generic Elective

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	I	BDA21011	ENTREPRENEURSHIP DEVELOPMENT	3	1	0
2	II	BDB23011	ORGANISATIONAL BEHAVIOUR	3	1	0

Skill Enhancement Course

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	IV	BDD21011	COMPUTER APPLICATON IN BUSINESS	2	0	2

Discipline Specific Elective

Sl. No	Sem	Course Code	Title of the paper	Total credits		
				L	T	P
1	V	BDE23001	INVESTMENT BANKING AND FINANCIAL	5	1	0

			SERVICES			
2		BDE24001	CORPORATE ANALYSIS AND VALUATION	5	1	0
3		BDE25001	RESEARCH METHODOLOGY	5	1	0
4		BDE26001	INTERNATIONAL TRADE BLOCKS & MULTILATERAL AGENCIES	5	1	0
5		BDE27001	HUMAN RESOURCE MANAGEMENT	5	1	0
6		BDF23001	STRATEGIC CORPORATE FINANCE	5	1	0
7		BDF24001	MANAGEMENT OF FINANCIAL INSTITUTIONS	5	1	0
8	VI	BDF25001	FINANCIAL DERIVATIVES	5	1	0
9		BDF26001	RESEARCH SOFTWAR PACKAGE	2	0	2
10		BDF27001	COMPUTERISED ACCOUNTING SYSTEM	4	0	2
11		BDF28001	PROJECT WORK	1	1	4

Programme code: BBA11

Programme Outcome:

This program could provide well trained dynamic personnel and professionals for

PO1: Industries and Multinational companies

PO2: Banking Sectors and Insurance Companies

PO3: Financing and Leasing Companies

PO4: Transport Agencies and Warehousing

PO5: Stock Markets and Foreign Trade,

This program could provide well trained professionals to practice and work as

PO6: Chartered accountants, advocates, cost accountants and company secretaries

PO7: Financial Analysts, Tax consultants, Tax Practitioners and Investment consultants

PO8: Financial and management accountants

PO9: Marketing Manager, Store manager, Purchase Manager and Sales Manager

PO10: Human Resources Manager, Counsellor

PO11: Retail Manager, Middle men and Customer relation manager

PO12: Decision Maker

PO13: Stock broker

PO14: Official receiver and Liquidator,

PO15: Market researcher, supply chain manger and Franchisee

PO16: Administrator of the different types of Business and Non-business organizations

Programme Specific Outcomes

The students at the end of the BBA programme can become a

PSO1: Business Entrepreneur
PSO2: Business Administrator
PSO3: Financial, Cost and Management Accountant
PSO4: Business Researcher
PSO5: Bank Manager
PSO6: Personal Secretary
PSO7: Project Manager

PSO8: Legal adviser
PSO9: Stock Broker

BDA22011

SEMESTER I

FINANCIAL ACCOUNTING AND ANALYSIS – DSC 1

(Credits: Lecture – 04, Tutorial – 01, Practical – 01)

Lectures: 64 Hrs
Tutorials: 16 Hrs
Practical: 32 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the characteristics of financial accountant and able to work as financial accountant

CO2: Learn the classification and characteristics and apply the principles of accounting in preparation of financial statements

CO3: Understand in details with application and generate financial statement using accounting software

CO4: Understand in details with examples become a financial analyst

CO5: Identify the characteristics of financial analyst and able to become financial analyst

Unit 1: **Introduction to Financial Accounting**:
Accounting as an Information System, Importance and Scope, Limitations; Users of accounting information, Concepts, Principles and Conventions. Generally Accepted Accounting Principles; The Accounting Equation; Nature of Accounts, Types of books (Primary and Secondary) and Rules of Debit and Credit; Recording Transactions in Journal; Preparation of Ledger Accounts; Opening and Closing Entries; Preparation of Trial Balance.

Unit 2: **Preparation of Financial Statements**:
Trading Account, Profit & Loss Account and Balance Sheet, Adjustment Entries, Understanding contents of financial statements of a joint stock company as per the Companies Act 2013; Understanding the contents of annual report of a company.

Unit 3: **Indian Accounting Standards (Ind-AS)**:
Concept, benefits, procedure for issuing Ind-AS in India, salient features of Ind-AS issued by ICAI; International Financial Reporting Standards(IFRS): Main features, uses and objectives of IFRS, IFRS issued by IASB and concept of harmonization and convergence, obstacle in harmonization and convergence, suggestions for increased convergence and harmonization.

Unit 4: Computerised Accounting Systems:26 Practical Lab
Computerised Accounting Systems: Computerized Accounts by using any popular accounting software: Creating a Company; Configure and Features settings; Creating Accounting Ledgers and Groups; Creating Stock Items and Groups; Vouchers Entry; Generating Reports – Cash Book, Ledger Accounts, Trial Balance, Profit and Loss Account, Balance Sheet, Funds Flow Statement, Cash Flow Statement. Selecting and shutting a Company; Backup and Restore data of a Company.

Unit 5: **Financial Statement Analysis:**
Objective of financial statement analysis, sources of information; Techniques of financial statement analysis: Horizontal analysis, Vertical analysis and Ratio Analysis; Financial Ratios: Meaning and Usefulness of Financial Ratios. Analysis of ratios from the perspective

of Stakeholders like Investors, Lenders, and Short-term Creditors. Liquidity Ratios, Solvency Ratios, Profitability Ratios, and Turnover Ratios; Limitation of ratios.

Reference:

1. Monga, J.R., Financial Accounting: Concepts and Applications, Mayur Paperbacks
2. Tulsian, P.C., Financial Accounting, Pearson
3. Maheshwari, S.N. &Maheshwari, S.K. , Financial Accounting for B. Com., CA, CS, & ICWA (Foundation) Courses, Vikas Publishing House Pvt. Ltd.
4. Ghosh, T.P., Financial Accounting for Managers, Taxmann Allied Services (P) Ltd.
5. Balwani, Nitin, Accounting and Finance for Managers

6. Gupta, Ambrish: Financial Accounting for Management
7. Bhattacharyya, Asish K., Financial Accounting for Business Managers 8. Jain, S.P. &Narang, K.L., Advanced Accountancy.
8. Charles T. Horngren, Gart L. Sundem, John A. Elliot and Donna R. Philbrick, Introduction to Financial Accounting, Pearson.

Note: Latest edition of the text books should be used.

BDA23011

SEMESTER I

BUSINESS DECISIONS – DSC 2

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Identify in detail the cost and income effect on business

CO2: Learn in depth the decision making areas and able to make appropriate business decisions

CO3: Understand in details with examples Analyse the behaviour of consumer

CO4: Learn in detail the characteristics of forecast and able to forecast the demand for products

CO5: Understand and analyse business problems and able to solve them

Unit 1: **Market Dynamics**:
Individual demand, market demand, individual supply, market supply, market equilibrium; Elasticity of demand and supply: Price elasticity of demand, income elasticity of demand, cross price elasticity of demand, elasticity of supply; Theory of consumer behaviour: cardinal utility theory, ordinal utility theory(indifference curves, budget line, consumer choice, price effect, substitution effect, income effect for normal, inferior and Giffen goods), revealed preference theory.

Unit 2: **Producer and optimal production choice:**
Optimizing behaviour in short run (geometry of product curves, law of diminishing margin productivity, three stages of production),optimizing behaviour in long run (isoquants, iso-cost line, optimal combination of resources) Costs and scale: traditional theory of cost (short run and long run, geometry of cost curves, envelope curves), modern theory of cost (short run and long run), economies of scale, economies of scope.

Unit 3: **Theory of firm and market organization**:
Perfect competition (basic features, short run equilibrium of firm/industry, long run equilibrium of firm/industry, effect of changes in demand, cost and imposition of taxes) ; monopoly (basic features, short run equilibrium, long run equilibrium, effect of changes in demand, cost and imposition of taxes, comparison with perfect competition, welfare cost of monopoly), price discrimination, multi plant monopoly; monopolistic competition (basic features, demand and cost, short run equilibrium, long run equilibrium, excess capacity) ; oligopoly (Cournot's model, kinked demand curve model,
dominant price leadership model, prisoner's dilemma

Unit 4: **Factor Market**:

Demand for a factor by a firm under marginal productivity theory (perfect competition in the product market, monopoly in the product market), market demand for a factor, supply of labour, market supply of labour, factor market equilibrium.

Reference:

1. Dominick Salvatore (2009). Principles of Microeconomics(5th ed.) Oxford University Press
2. Lipsey and Chrystal. (2008). Economics.(11th ed.) Oxford University Press
3. Koutosyannis (1979). Modern Micro Economics. Palgrave Macmillan
4. Pindyck, Rubinfeld and Mehta. (2009). Micro Economics. (7th ed.). Pearson.

Note: Latest edition of the text books should be used.

BDA21011

SEMESTER I

ENTREPRENEURSHIP DEVELOPMNET - GE 1

(Credits: Lecture – 03, Tutorial – 01, Practical – 0) Lectures: 48 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth qualities of an entrepreneur and able to become an entrepreneur

CO2: Write down the details of financial schemes offered by banks and government agencies and able to access them easily

CO3: Learn the details of mobilisation of resources

CO4: Learn in depth the characteristics of customer and able to identify the customer

Unit 1: Entrepreneurial Development Perspective:

Concept of entrepreneurship development and their dynamics. Importance of skill, knowledge and motivation in ED. Entrepreneurial Competition, generation of business, ideas and final selection of an activity. Market survey report and business plan preparation. Pooling of resources, forms enterprise ownership and their details.

Unit 2: Enterprise Management

Logistics and launching formalities, probable pitfalls, managing money, men, machinery, material and marketing. Support organization, entrepreneurial growth, following the law of the land and social obligation. Managing organisation for innovation and creativity. Importance of leadership, business ethics and business skills on good team building

Unit 3: Running A Family Business :

Concept, structure and kinds of family firms. Understanding its reputation and brand. Enhancing the knowledge and skill. Managing family and shareholders relationship. Managing leadership succession and understanding the group dynamics, encouraging family women into business. Identifying the changed customer needs and encouraging growth and change in the family business.

Unit 4: Social Entrepreneurship:

Introduction, Role and Characteristics of Social Entrepreneurs, Starting of a Non-profits Organization innovatively through local resources in a social context, sustainability, Business Strategies and Scaling up.

Unit 5: Role Of Government And Financial Institutions

Role of Central and State Government in promoting entrepreneurship. Types of schemes, loans, incentives, grants and subsidies. Different types of financial institutions, role of commercial banks, types of loans for MSMEs schemes, appraisal, sanctions, repayment.

Reference:

1. Entrepreneurship – Tata MC Graw hill
2. Entrepreneurship and Small Business – New Jersey: Palgrave
3. Creativity and Entrepreneurship – Jhon Kao
4. Corporate Creativity Tata MC Graw hill
5. Innovative Entrepreneurship – Practice and Principles – Drucker P.F.

Note: Latest edition of the text books should be used.

BDB23011

SEMESTER II

ORGANISATIONAL BEHAVIOUR - GE 2

(Credits: Lecture – 03, Tutorial – 01, Practical – 0) Lectures: 48 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail behaviour of employees and able to manage them efficiently

CO2: Identify in details employees performance and able to motivate for effective performance

CO3: Learn in depth and analyse the behaviour of employees

CO4: Understand in details key positions in an organisation and able to occupy them

CO5: Learn in details with examples frame policies and strategies in organisation

Unit 1: Introduction to Organisational Behaviour:
Organisation- Concept, features and types. Organisational Behaviour – concept, meaning, scope, characteristics and role. Evolution, challenges and opportunities for O.B.

Unit 2: Personality:
Personality – Meaning, characteristics and determinants. Theories – Psychoanalytical Theory. Erikson stages, CheisArgyeis's immateriality – Maturity Theory, Traits Theory and Self theory. Personality traits.

Unit 3: Perception, Attitude and Learning:
Perception – concept, nature, process and factors influencing perceptual set.
Attitudes – Meaning, definition, nature, components and sources.
Learning – concept, nature, theories of learning, principles and determinants of learning

Unit 4: Groups and Teams:
Groups – Definitions, types, reasons for group formation. Groups Dynamics – Definition and features. Teams – Meaning , Groups v/s Teams, features, importance and types.

Reference:

1. Koontz & Heinz Weihrich: Essential of management McGraw Hill (1999)
2. Kaul, Vijay kumar, Management- Text & Cases, Vikas Publishing, New Delhi, 2015
3.Stoner&Wankel:Management
4. Stephen P. Robbins and Mary Coulter:Management, Pearson
5. Y.K. Bhushan: Fundamentals of Business Organisation& Management X Edition
6. Richard L. Daft, Principles Of Management, CengageLearning,India
7. Robbins Stephen P. :OrganisationalBehaviour, Pearson Education, 12th Edition

Note: Latest edition of the text books should be used.

BDB21011

SEMESTER II

STATISTICS FOR BUSINESS - DSC 3

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:
CO1: Learn in details with examples Measures of Central tendency
CO2: Understand the classification and characteristics of Measures of dispersion
CO3: Learn in detail the correlation and determine the relation between two variables
CO4: Understand in depth regression and able to find unknown variable value based on known variable value
CO5: Learn the characteristics and components of time series analysis and able fit a trend line

Unit 1: **Measures of Central Value:**
Meaning, Need for measuring central value. Characteristics of an ideal measure of central value. Types of averages - mean, median, mode, harmonic mean and geometric mean. Merits, Limitations and Suitability of averages. Relationship between averages. Measures of Dispersion: Meaning and Significance. Absolute and Relative measures of dispersion - Range, Quartile Deviation, Mean Deviation, Standard Deviation, Moments, Skewness.

Unit 2: **Correlation Analysis:**
Meaning and significance. Types of correlation. Methods of studying simple correlation - Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient.
Regression Analysis: Meaning and significance, Regression vs. Correlation. Linear Regression, Regression lines (X on Y and Y on X) and Standard error of estimate.

Unit 3:Analysis of Time Series and Probability
Analysis of Time Series: Meaning and significance. Utility, Components of time series, Models (Additive and Multiplicative), Measurement of trend: Method of least squares, parabolic trend and logarithmic trend.
Probability: Meaning and need. Theorems of addition and multiplication. Conditional probability. Bayes' theorem, Random Variable- discrete and continuous. Probability Distribution: Meaning, characteristics (Expectation and variance) of Binomial, Poisson, and Normal distribution. s

Unit 4:Introduction to testing of Hypothesis:
Concept; Level of Significance; Process of testing; Test of hypothesis concerning Mean; Test of hypothesis concerning Proportion. Z -test, t – test for single mean and difference of means and ANNOVA – one way and two way.

Reference:

1. S.P. Gupta (S.P.) : Statistical Methods, Sultan Chand & Sons, 34th Edition

2. Richard Levin & David Rubin : Statistics for management, Prentice Hall
3. M. Wilson – Business Statistics
4. Sancheti&Kapoor – Business Statistics
5. C.B. Gupta - Business Statistics
6.Tulsian - Business Statistics

Note: Latest edition of the text books should be used.

BDB22011 **SEMESTER II**

COST AND MANAGEMENT ACCOUNTING - DSC 4

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO 1: Understand in depth budgetary control system and able to prepare different types of budgets

CO 2: Understand in detail the techniques of costing and able to become cost accountant

CO 3: Learn in detail the classification of cost and able to prepare cost sheet, tender and quotation

CO 4: Learn in depth variance analysis and able to determine Material, Labour and overhead variance

CO5: Learn in detail marginal costing techniques and able to determine BEP, desired profit

Unit 1: Cost concepts:
Meaning, Scope, Objectives, and Importance of Cost Accounting, Cost, Costing, Cost Control, and Cost Reduction. Elements of Cost, Components of total Cost, Cost sheet.
Classification of costs: Fixed, Variable, Semi-variable, and Step costs; Product, and Period costs; Direct, and Indirect costs; Relevant, and Irrelevant costs; Shut-down, and Sunk costs; Controllable, and Uncontrollable costs; Avoidable, and Unavoidable costs; Imputed / Hypothetical costs; Out-of-pocket costs; Opportunity costs; Expired, and Unexpired costs; Conversion cost. Cost Ascertainment: Cost Unit, Cost Center, Profit Center, Cost Allocation and Cost apportionment; Cost Reduction and Cost Control.

Unit 2: **Cost-Volume-Profit Analysis**:
Contribution, PV Ratio, Breakeven-point, Margin of safety, cost break-even-point, cash break-even-point, Composite break-even-point, Key Factor, Break-even Analysis. Relevant Costs and Decision Making: Pricing, Product Profitability, Make or Buy, Exploring new markets, Shut down or continue.
Process costing: Process losses and wastage, Abnormal effectives.

Unit 3: **Budgets and Budgetary Control**:
Meaning, Types of Budgets (sales, production, purchase raw material consumption, cash budget). Steps in Budgetary Control, Fixed and Flexible Budgeting, Responsibility Accounting.

Unit 4: **Standard Costing and Variance Analysis**:
Material, Labour & Overhead variances.

Reference:

1. Maheshwari, S.N., and Mittal, S.N. Cost Accounting: Theory and Problems**,** Shree Mahavir Book Depot (Publishers), Delhi.

2. M.N.Arora, Management Accounting, Theory, Problems and Solutions, Himalaya Publishing House
3. Horngren, C.T., Foster, G, and Datar, S.M**.,** Cost Accounting: A Managerial Emphasis**,** Prentice Hall of India Pvt. Ltd., New Delhi.
4. Henke, E.O., and Spoede, C.W., Cost Accounting: Managerial Use of Accounting Data,PWS-KENT Publishing Company, Boston.

Note: Latest edition of the text books should be used.

BDC21011

SEMESTER III

INCOME TAX - DSC 5

(Credits: Lecture – 04, Tutorial – 01, Practical – 01)

Lectures: 64 Hrs
Tutorials: 16 Hrs
Practical: 32 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth the procedure of online filing and able to file online income tax returns

CO2: Understand in depth Income Tax Act of 1961 and can become tax consultant practitioner

CO3: Deliberate in detail with examples and appear before IT tribunal on behalf of clients

CO4: Learn in detail different sections Under IT Act to reduce tax liability

CO5: Identify the different heads of income and able to compute tax liability

Unit 1: **Basic concepts**:
Income, agricultural income, person, asessee, assessment year, previous year, gross total income, total income, maximum marginal rate of tax. Residential status of persons and its effect on tax incidence .Exempted income under section 10(in relation to individuals).

Unit 2: **Computation of income under the heads**:
Salaries, Income from house property

Unit 3: **Computation of income under the heads**:
Profits and gains of business & profession, Capital gain, Income from other sources.

Unit 4: **Computation Total Income and Tax Liability**
Deductions under Chapter VI-A- Computation of total income and tax liability of individuals. Preparation of return of income manually and through software. Provision & Procedures of Compulsory online filing of returns for specified assesses.

Reference:

1. Dr.VinodkSinghania and Dr.MonicaSinghania; Students guide to income tax, Taxman Publications.
2. GirishAhuja and Ravi Gupta; Systematic Approach to Income Tax: Bharat Law House.
3. Mahesh Chandra, D.C Shukla; Income Tax Law and Practice: Pragati Publications.
4. S.P Goyal; Direct tax planning: SahityaBhawan
5. Finance Act for relevant Assessment Year
6. CBDT Circulars
7. Latest court judgements

Note: Latest edition of the text books should be used.

BDC22011

SEMESTER III

CORPORATE FINANCE - DSC 6

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:
CO1: Learn in details financial management and become financial adviser
CO2: Understand and analyse the interrelationship between finance and corporate
CO3: Learn in depth working capital management and able to estimate the working capital requirements
CO4: Understand in detail the various approaches to capital structure theories and able to design capital structure
CO5: Understand in depth long term investment decisions

Unit 1:Nature of Financial Management:
Finance and related disciplines; Scope of Financial Management; Profit Maximization, Wealth Maximization - Traditional and Modern Approach; Functions of finance – Finance Decision, Investment Decision, Dividend Decision; Objectives of Financial Management; Organisation of finance function; Concept of Time Value of Money: present value, future value, and annuity.

Unit 2: **Long-term investment decisions**:
Capital Budgeting - Principles and Techniques; Nature and meaning of capital budgeting; Estimation of relevant cash flows and terminal value; Evaluation techniques - Accounting Rate of Return, Net Present Value, Internal Rate of Return, Net Terminal Value, Profitability Index Method. Concept and Measurement of Cost of Capital: Explicit and Implicit costs; Measurement of cost of capital; Cost of debt; Cost of perpetual debt; Cost of Equity Share; Cost of Preference Share; Cost of Retained Earning; Computation of over-all cost of capital based on Historical and Market weights.

Unit 3: **Capital Structure**:
Approaches to Capital Structure Theories - Net Income approach, Net Operating Income approach, Modigliani-Miller (MM) approach, Dividend Policy Decision - Dividend and Capital; Irrelevance of dividends: General, MM hypothesis.
Leverage Analysis: Operating and Financial Leverage; EBIT -EPS analysis; Combined leverage.

Unit 4: **Working Capital Management**:
Management of Cash - Preparation of Cash Budgets (Receipts and Payment Method only); Cash management technique (Lock box, concentration banking), Receivables Management – Objectives; Credit Policy, Cash Discount, Debtors Outstanding and Ageing Analysis; Costs - Collection Cost, Capital Cost, Default Cost, Delinquency Cost, Inventory Management (Briefly) - ABC Analysis; Minimum Level; Maximum Level; Reorder Level; Safety Stock; EOQ (Basic Model), Determination of Working Capital.

Reference:

1. M.Y. Khan & P.K. Jain , Financial Management, Tata McGraw Hill Pubilshlng Co. Ltd.
2. Rustogi , Financial Management
3. I.M. Pandey , Financial Management
4. L.J. Gitman& C.J. Zutter, Managerial Finance.R.A. Brealey, S.C. Myers, F. Allen& P. Mohanty, Principles of Corporate Finance.
5. J.V. Horne & J.M. Wachowicz, Fundamentals of Financial Management.

Note: Latest edition of the text books should be used.

BDD22001

SEMESTER IV

FINANCIAL MARKETS AND INSTITUTIONS - DSC 7

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can;

CO1: Understand in details transaction in stock exchange and able to become inter-mediator

CO2: Learn in depth the classification and characteristics of financial markets and institutions and able to set up his own institution

CO3: Understand in detail characteristics of financial market and able to participate in financial market

CO4: Identify the government policies for investment and able apply them

Unit 1: **Indian Financial System**:
Indian Financial System – Meaning - Overview – needs – objectives, major reforms – issues in financial reforms –future agenda –role of RBI- Banking Companies Regulation Act 1949, services, Retail banking – Payment Banks. Corporate universal Banking system – CBS – RTG'S – MBFC – Internet banking.

Unit 2: **Financial Markets in India**:
Role and Importance of Financial Markets, Types of Financial Markets: Money Market; Capital Market; Factors affecting Financial Markets, Linkages Between Economy and Financial Markets, Integration of Indian Financial Markets with Global Financial Markets, Primary & secondary market, Currency Market, Debt Market- role and functions of these markets.

Unit 3: Primary Market:
Primary Market for Corporate Securities in India: Issue of Corporate Securities: Public Issue through Prospectus, Green shoe option, Offer for sale, Private Placement, Rights Issue, On-Line IPO, Book Building of Shares, Disinvestment of PSU, Employees Stock Options, Preferential Issue of Shares, Venture Capital, Private Equity Firms, Performance of Primary Market in India, Corporate Listings : Listing and Delisting of Corporate Stocks.

Unit 4: **Secondary Market in India**:
Introduction to Stock Markets, Regional and Modern Stock Exchanges, International Stock Exchanges, Raising of funds in International Markets: ADRs and GDRs, FCCB and Euro Issues; Indian Stock Indices and their construction, maintenance, adjustment for corporate actions (rights, bonus and stock split;) on index with numerical, free float v/s full float methodology, Classification of Securities to be included in the Index, Bulls and Bears in Stock Markets, Factors influencing the movement of stock markets, indicators of maturity of stock markets, Major Instruments traded in stock markets: Equity Shares, Debentures, Myths attached to Investing in Stock Markets.

Unit 5: Trading of Securities:
Trading of securities on a stock exchange; Selection of broker, capital and margin requirements of a broker, MTM and VAR Margins, kinds of brokers, opening of an account to trade in securities, DEMAT System, placing an order for purchase/sale of shares, margin trading and margin adjustment, contract note and settlement of contracts, Algorithmic trading, Demutualization of Securities, NSE and BSE: Sensex & Nifty -Settlement mechanism at BSE & NSE..

Unit 6: **Money & Debt Markets**:
Money Markets & Debt Markets in India: Money Market - Meaning, role and participants in money markets, Segments of money markets, Call Money Markets, Repos and reverse Repo concepts, Treasury Bill Markets, Market for Commercial Paper, Commercial Bills and Certificate of Deposit. Role of STCI and DFHI in money market, Secondary market for government securities. Over subscription and devolvement of Government Securities, Government securities issued by State Governments, Municipal Bonds.

Reference:

1. Saunders , Anthony & Cornett , Marcia Millon (2007). Financial Markets and Institutions (3rd ed.). Tata McGraw Hill
2. Khan, M Y. (2010). Financial Services (5th ed.). McGraw Hill Higher Education
3. Shahani, Rakesh(2011). Financial Markets in India : A Research Initiative. Anamica Publications
4. Goel, Sandeep. (2012). Financial services.PHI.
5. Gurusamy,S. (2010). Financial Services.TMH.

Note: Latest edition of the text books should be used

BDD23001

SEMESTER IV

QUANTITATIVE TECHNIQUES - DSC 8

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

After the completion this course the students are able to:

CO1: Understand in depth about OR techniques and solve the business problems
CO2: Learn in detail to convert the business problem into mathematical for optimum utilization of scare resources
CO3: Understand the details of elementary transportation and able to solve business problems
CO4: Learn in depth about Network analysis and able to construct network diagram
CO5: Learn the details of Decision Theory

Unit 1: **Linear Programming**:
Formulation of L.P. Problems, Graphical Solutions, Two Variables, introduction of slack variables and additional variables – Duality concept, formulation of LPP Model using slack and additional variables.

Unit 2: **Elementary Transportation**:
Formulation of Transport Problem, Solution by N.W. Corner Rule, Least Cost method, Vogel's Approximation Method (VAM), Modified Distribution Method. (Special cases: Multiple Solutions, Maximization case, unbalanced case, prohibited routes) Elementary Assignment: Hungarian Method, (Special cases: Multiple Solutions,
Maximization case, unbalanced case, Restrictions on assignment.)

Unit 3: **Network Analysis**:
Construction of the Network diagram, Critical Path- float and slack analysis (Total float, free float, independent float), PERT, Project Time Crashing.

Unit 4: **Decision Theory**:
Pay off Table, Opportunity Loss Table, Expected Monetary Value, Expected Opportunity Loss, Expected Value of Perfect Information and Sample Information Markov Chains: Predicting Future Market Shares, Equilibrium Conditions (Questions based on Markov analysis) Limiting probabilities, Chapman Kolmogrov equation.
Introduction to Game Theory: Pay off Matrix- Two person Zero-Sum game, pure strategy, Saddle point; Dominance Rule, Mixed strategy, Reduction of m x n game and solution of 2x2, 2 x s, and r x 2 cases by Graphical and Algebraic methods; Introduction to Simulation: Monte Carlo Simulation

Reference:

1. N. D. Vohra, Quantitative Management, Tata McGraw Hill
2. P. K. Gupta, Man Mohan, KantiSwarup, Operations Research, Sultan Chand
3. V. K. Kapoor, Operations Research, Sultan Chand & Sons
4. J. K. Sharma,Operations Research Theory & Applications, Macmillan India Limited.

Note: Latest edition of the text books should be used.

BDD21001

SEMESTER IV

COMPUTER APPLICATIONS IN BUSINESS – SEC - 2

(Credits: Lecture – 02, Tutorial – 0, Practical – 2) Lectures: 32 Hrs
Practical: 64 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn in depth and create business documents by using MS Word and Excel

CO2: Learn in details with application of PowerPoint and present of business information through PPTs

CO3: Write down the characteristics of BPOs and KPOs and able to work in BPOs and KPOs

CO4: Learn the classification and characteristics of chart and graphs using computers

CO5: Identify the characteristics of projects and develop projects using computer

Unit 1: Word Processing 3 Lectures, Practical Lab 6

Introduction to word Processing, Word processing concepts, Use of Templates, Working with word document: Creating and Editing Text, Find and replace text, Formatting, spell check, Autocorrect, Autotext; Bullets and numbering, Tabs, Paragraph Formatting, Indent, Page Formatting, Header and footer, Tables: Inserting/Drawing, filling and formatting a table; OLE concepts (Object Linking and Embedding) Inserting Pictures and Video; Mail Merge: including linking with Database; Printing documents

Creating Business Documents using the above facilities

Unit 2: Presentation Graphics 3 Lectures, Practical Lab 6

Presentation-Basic concepts, Creating/Editing slides, Formatting slides, Inserting drawings, Charts, Tables, Images, Symbols. Embedding media and animation. Preparing and presenting a slide show..

Creating Business Presentations using above facilities

Unit 3: Spreadsheets and its Business Applications10 Lectures, Practical Lab 20

Spreadsheet concepts, Managing worksheets; Formatting, Entering data, Editing, and Printing a worksheet; Handling operators in formula, Project involving multiple spreadsheets, Organizing Charts and graphs

Generally used Spreadsheet functions**:** Mathematical, Statistical, Financial, Logical, Date and Time, Lookup and reference, Database, and Text functions.

Unit 4: Creating Business Spreadsheet 10 Lectures, Practical Lab 20

Creating spreadsheet in the area of**:** Loan and Lease statement; Ratio Analysis; Payroll Processing and statements; Capital Budgeting; Depreciation Accounting; Graphical representation of data; Frequency distribution and its statistical parameters; Correlation and Regression.

Note:

1. The General Purpose Software referred in this course will be notified by the University Departments every three years. If the specific features, referred in the detailed course

above, is not available in that software, to that extent it will be deemed to have been modified.

2. Teaching arrangement need to be made in the computer Lab

Reference:
The suggested readings and guidelines shall be notified by the university department at least once in three years based on the selected software

BDE21001

SEMESTER V

INVESEMENT ANALYSIS & PORTFOLIO MANAGEMENT – DSC 9

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs

Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn in depth various financial models to analyse risk and return

CO2: Understand in depth share valuation

CO3: Identify and use different models for portfolio analysis

CO4: Learn in depth capital asset pricing model

Unit 1: **Basics of risk and return**:
Concept of returns, application of standard deviation, coefficient of variation, beta, alpha. Bonds : present value of a bond, yield to maturity, yield to call, yield to put, systematic risk, price risk, interest rate risk, default risk. Yield curve and theories regarding shape of yield curve. Unsystematic risk and non-risk factors that influence yields. Duration and modified duration, immunization of a bond portfolio. Fundamental analysis: EIC framework; Economic analysis: Leading lagging & coincident macro-economic indicators, Expected direction of movement of stock prices with macroeconomic variables in the Indian context; Industry analysis: stages of life cycle, Porter's five forces model, SWOT analysis, financial analysis of an industry; Company analysis.

Unit 2: **Share valuation**:
Dividend discount models- no growth, constant growth, two stage growth model, multiple stages; Relative valuation models using P/E ratio, book value to market value. Technical analysis: meaning, assumptions, difference between technical and fundamental analysis; Price indicators- Dow theory, advances and declines, new highs and lows- circuit filters. Volume indicators- Dow Theory, small investor volumes. Other indicators- futures, institutional activity, Trends: resistance, support, consolidation, momentum- Charts: line chart, bar chart, candle chart, point & figure chart. Patterns: head &shoulders, triangle, rectangle, flag, cup & saucer, double topped, double bottomed, Indicators: moving averages. Efficient market hypothesis; Concept of efficiency: Random walk, Three forms of EMH and implications for investment decisions. (No numerical in EMH and technical analysis)

Unit 3: **Portfolio analysis**:
Portfolio risk and return, Markowitz portfolio model: risk and return for 2 and 3 asset portfolios, concept of efficient frontier & optimum portfolio. Market Model: concept of beta systematic and unsystematic risk. Investor risk and return preferences: Indifference curves and the efficient frontier, and anticipated inflation. Asset allocation: Asset allocation pyramid, investor life cycle approach, Portfolio management services: Passive – Index funds, systematic investment plans. Active – market timing, style investing.

Unit 4: **Capital Asset Pricing Model (CAPM):**
Efficient frontier with a combination of risky and risk free assets. Assumptions of single period classical CAPM model. Characteristic line, Capital Market Line, Security market Line. Expected return, required return, overvalued and undervalued assets. Mutual Funds :Introduction, calculation of Net Asset Value (NAV) of a Fund, classification of

mutual fund schemes by structure and objective, advantages and disadvantages of investing through mutual funds. Performance Evaluation using Sharpe's Treynor's and Jensen's measures and Fama's Decomposition.

Reference:

1. Fischer, D.E. & Jordan, R.J. : Security Analysis & Portfolio Management ; PearsonEducation.
2. PrasannaChandra : Investment Analysis and Portfolio Management ;Tata Mcgraw HillEducation Private Limited

Note: Latest edition of the text books should be used

BDE22001

SEMESTER V

GST AND CUSTOMS DUTY – DSC 10

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn in depth the provisions of GST to handle TDS and POS online and off line more efficiently

CO2: Learn the details of computation of GST

CO3: Learn in detail the steps to be followed to determine the assessable value and customs duty

CO4: Understand the details of technology of GST and flow of return filing under GST

CO5: Learn in details and gain knowledge to practice as GST Consultant

Unit 1: **Introduction to GST**- Indirect tax Structure in India, Constitutional requirements, GST Council, Issues in Indirect Tax, Rationale for Transition to GST. GST- Meaning, Definition of GST - Structure of GST -Types of GST- Features of GST, Benefits of GST. Difficulties in implementation of GST.

GST Compliance requirement definitions of Dealer, Manufacturer and Trader. Registration under GST-Persons liable for registration, compulsory registration, Procedure for Registration, Rejection of application for registration, cancellation of Registration,

Unit 2: a) **GST Definitions** - Aggregate Turnover, Agriculturist, Business, Credit note and Debit note, Exempt Supplies, Input, Input service, Input Service Distributor, Intra-state supply of Goods, Job work, Invoice. Composition Levy, Mixed Supply, outward supply, Person, Turnover in State

b) **Levy and Collection of Tax**: Introduction, Supply- meaning and scope of supply, treatment of mixed and composite supply, Liability of tax payable person, Rate and value of tax, transactions without considerations, list of transactions for supply of goods and services and list of transactions for non-supply of goods and services, Reverse charge mechanism,.

Unit 3: **Time of supply and Value of taxable supply**

Time of Supply Introduction, time of supply-forward charge, reverse charge, residuary, special charges Time of supply of service- forward charge, reverse charge, Vouchers, Residuary, Special charges. Problems on determination of time of supply.

Value of taxable Supply-conditions, inclusions, Consideration not wholly in money, Supply between two related persons, Supply through agent, cost based value, Residual valuation, specific supplies, Service of pure agent. Problems on determination of value of supply.

Unit 4 : **Input tax credit and Returns**

Input tax credit- Meaning, conditions for taking credit, ineligible input tax credit, availability of credit in special circumstances, Input tax credit and change in constitution of registered person, Taking input tax credit in respect of inputs and capital goods sent for job work, Manner of Distribution of Credit by Input Service Distributor (ISD)

Returns-Furnishing details of outward supplies and inward supplies, a brief introduction to GST forms-1 to 8, Steps for filing forms, Levy of late fee.

Unit 5: **Customs Act 1962**

Meaning-Notified Goods-Specified goods-Prohibition of Importation and Exportation under section 11-Types of Customs duty. Computation of Assessable Value and Customs duty.

Suggested Readings:

1. GST and Customs Duty - Singhania

BDE23001

SEMESTER V
INVESTMENT BANKING & FINANCIAL SERVICES- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn the characteristics of Investment banking in India

CO2: Learn the details of Public Issue

CO3: Understand the details of types of leasing

CO4: Understand in detail the feature of Hire Purchase

CO5: Understand the classification and characteristics of Insurance

CO6: Learn in detail the history and evolution of venture Capital

CO7: Learn the details of Securitization

Unit 1: Introduction:
An Overview of Indian Financial System, Investment Banking in India, Recent Developments and Challenges ahead, Institutional structure and Functions of Investment /Merchant Banking; SEBI guidelines for Merchant Bankers, Registration, obligations and responsibilities of Lead Managers, Regulations regarding Continuance of association of lead manager with an issue

Unit 2: Issue Management:
Public Issue: classification of companies, eligibility, issue pricing, promoter's contribution, minimum public offer, prospectus, allotment, preferential allotment, private placement, Book Building process, designing and pricing, Green Shoe Option; RightIssue: promoter's contribution, minimum subscription, advertisements, contents of offer document, Bought out Deals, Post issue work & obligations, Investor protection, Broker, subbroker and underwriters

Unit 3: Leasing and Hire Purchase :
Concepts of leasing, types of leasing – financial & operating lease, direct lease and sales & lease back, advantages and limitations of leasing, Lease rental determination; Finance lease evaluation problems (only Lessee's angle), Hire Purchase interest & Installment, difference between Hire Purchase & Leasing, Choice criteria between Leasing and Hire Purchase mathematics of HP, Factoring, forfaiting and its arrangement, Housing Finance : Meaning and rise of housing finance in India, Fixing the amount of loan, repricing of a loan, floating vs. fixed rate, Practical problems on housing finance.

Unit 4: Venture Capital, **Insurance, Credit ratings and Securitization:**
Concept, history and evolution of VC, the venture investment process, various steps in venture financing, incubation financing.
Insurance: Concept, classification, principles of insurance, IRDA and different regulatory norms, operation of General Insurance, Health Insurance, Life Insurance.

Credit Ratings: Introduction, types of credit rating, advantages and disadvantages of credit ratings, Credit rating agencies and their methodology, International credit rating practices.
Securitization: Concept, securitization as a funding mechanism, Traditional and nontraditional mortgages, Graduated-payment mortgages (GPMs), Pledged-Account Mortgages(PAMs), Centralized Mortgage obligations (CMOs), Securitization of non mortgage assets, Securitization in India

Reference:

1. M.Y.Khan,-Financial Services‘ – Tata McGraw –Hill, 3 rd Edition, 2005.
2. Machiraju - Indian Financial System _- Vikas Publishing House, 2 nd Edition, 2002.
3. J.C.Verma - A Manual of Merchant Banking _, Bharath Publishing House, New Delhi,2001.
4. K.Sriram - Hand Book of Leasing, Hire Purchase & Factoring‘, ICFAI, Hyderabad, 1992.
Note: Latest edition of the text books should be used

BDE24001

SEMESTER V
CORPORATE ANALYSIS AND VALUATION- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Learn the details of Analysis of Corporate Financial Statements

CO2: Understand the details of various methods of valuation

CO3: Learn in details with application of Discounted Cash flow valuation method

CO4: Learn the classification of estimating discount rates

CO5: Understand in depth Relative valuation

CO6: Identify the details of Impact of inflation on valuation

Unit 1: Analysis of Corporate Financial Statements:
Income statements and Balance sheets through ratio analysis and analyzing the Chairman's statement, Directors' report, management discussion & analysis, report on corporate governance, auditor's report to evaluate the financial soundness of the company. Understanding financial statements of manufacturing and service organisations. Common size analysis and relevant ratios.

Unit 2: Introduction to Valuation:
Value and price, Balance sheet-based methods, Income statement-based methods, Multiples, Goodwill-based methods. Cash flow discounting-based methods. Deciding the appropriate cash flow for discounting. The free cash flow to the firm, free cash flow to equity. Forecasting Cash flows: simple model for forecasting income and cash flows. Earnings, Tax effect, Reinvestment needs, dividend.

Unit 3: **Discounted Cash flow Valuation**:
Valuation of a company with no growth, constant growth, variable growth and infinite life. Estimating discount rates-cost of equity, cost of debt, tax shield, weighted average cost of capital. The estimation of equity risk premium, calculation of beta, instability of beta, adjusted beta, levered and unleveredbeta, bottoms up beta.

Unit 4: **Relative Valuation:**
standard multiples, comparable companies, potential pitfalls; estimating multiples using regression. Valuation of brands and intellectual capital. Interest rates and company valuation. Impact of inflation on valuation. Reconciling relative and discounted cash flow valuation. Case studies in valuation.

Reference:

1. Foster, George Financial Statement Analysis, 2nd ed., Pearson Education Pvt Ltd
2. Damodaran, A. (2008). Damodaran on Valuation, Security Analysis for investment and CorporateFinance (2nd ed.). Wiley India Pvt. Ltd.
3. Chandra, P. (2011).Corporate Valuation and Value Creation, (1st ed). TMH
4. Pablo Fernandez, Valuation and Common Sense, free download from ssrn.

Note: Latest edition of the text books should be used

BDE25001

SEMESTER V

RESEARCH METHODOLOGY-DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in details with application of research methodology and become a good researcher

CO2: Learn the characteristics and classification of research Design

CO3: Understand in details with examples Sources of Data Collection

CO4: Learn the characteristics of sampling techniques

CO5: Understand in details with application of methods of analysis

CO6: Understand the details of research report

Unit 1: Business Research:
Meaning - Nature and Scope of Business Research – Role of Business Research in decision making. Applications of Business Research; The Research process – Steps in the research process; the research proposal; Problem Formulation: Management decision problem vs. Business Research problem. Research Design: Exploratory, Descriptive & Causal.

Unit 2: Primary Data Collection:
Survey v/s Observations. Random sample collection methods. Comparison of self-administered, telephone, mail, emails techniques. Qualitative Research
Tools: Depth Interviews focus groups and projective techniques.

Unit 3:Measurement& Scaling:
Primary scales of Measurement-Nominal, Ordinal, and Interval &Ratio. Scaling techniques paired comparison, rank order, constant sum, semantic differential, itemized ratings, Likert Scale; Questionnaire-form & design. Sampling: Sampling techniques, determination of sample size using statistical techniques, Cronbach's Alpha test for reliability(using software).

Unit 4: Data and the Methods of Analysis:
Analysis of Variance (ANOVA) One-Way & Two-Way, Chi square test (goodness of Fit).Multivariate Data Analysis: Factor Analysis (Principal Component Analysis), Discriminant Analysis. Above statistical test also to be explained using statistical software package. Report writing: Contents of a Research Report, Plagiarism in Business Research – Meaning and effects - Plagiarism detection software

Refercnce:
1. Zikmund, W.G., Babin, B.J., Carr, J.C. & Griffin, M. (2013). Business Research Methods (9th ed.). Cengage Learning.
2. Johnson, R.A. &Wichern, D.W. (1997) Business Statistics-Decision Making with Data (1st ed.). John Wiley & Sons.
3. Cooper, D.R. & Schindler, P.S. (2008) Business Research Methods (10th ed.). McGraw Hill Education.

4..Chawla, D, &Sondhi,N. (2011) Research Methodology Concepts and Cases (1st ed.). Vikas Publishing House
5. Malhotra, N & Dash. S (2010) Marketing Research An Applied Orientation (6th ed.). Pearson, Prentice Hall of India.

Note: Latest edition of the text books should be use

BDE26001

SEMESTER V

INTERNATIONAL TRADE BLOCKS AND MULTILATERAL AGENCIES- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO 1: Learn the details of Economic theory on international trade

CO2: Understand the characteristics of domestic, foreign, global environment and analyse their impact on international business decision

CO3: Understand the details of regional integration and trade blocks

CO4: Understand the characteristics and types of international investment

CO5: Identify the impact of reform on competitiveness of the Indian firms

CO6: Understand in depth economic institutions

Unit 1: **Review of Economic Theory on International Trade**:
Basis for international trade; gains from trade; distributional issues, policy instruments and their impact, political economy. Importance, nature and scope of international relation, modes of entry into international business, internationalization process and managerial implications; Domestic, foreign and global environments and their impact on international business decision; Growing concern for green trades.

Unit 2:**International economic & trading environment**:
Regional integration and trade blocks, regionalism v/s. multilateralism, European union, integration of developing countries -BRICS, ASEAN, SAARC, SAFTA, NAFTA, G-20; World trade in goods and services -Major trends and developments; World trade and protectionism - Tariff and non-tariff barriers ; Counter trade, UNCTAD, WTO, GATT, GATS, TRIM, TRIPS; India's role in facilitating trade relations under BRICS, SAARC, SAFTA, ASEAN and to WTO.

Unit 3: **International investment**:
Types and significance of foreign investments, factors affecting international investment, growth and dispersion of FDI, Cross border mergers and acquisition, foreign investment in India-Impact of reforms on competitiveness of the Indian Firms, EURO/ADR issues, ECBs; current economic crises in US/Europe/Asia and its impact on economic growth in India.

Unit 4: **Economic institutions**:
International Monetary Funds (IMF), World Bank (IBRD,IDA, IFC), Asian Development Bank, BRICS Development Bank, Bilateral funding arrangements with special reference to Japan International Cooperation Agencies (JICA),agencies of USA; Case studies on Bilateral financing arrangements of Indian projects like Delhi Metro, Dedicated Freight corridor, Nuclear Power Plant etc.

Reference:

1. Hill, W. L. Charles and Jain, A.K. (2008). International Business (6th ed.). India: McGrawHill.
2. Fernando, A.C. (2011) .Corporate Governance: Principles, Policies and Practices. India: Pearson Education.
3. Roger, Bennet (1999). International Business, Financial Times. London: Pitman Publishing.
4. Sharan, Vyuptakesh (2003). International Business (2nd ed.). India: Pearson Education.
5. Krueger, Anne O. (2002). Economic Policy Reforms and the Indian Economy.OUP.

Note: Latest edition of the text books should be used

BDE27001

SEMESTER V

HUMAN RESOURCE MANAGEMENT- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students are able to:

CO1: Understand in depth the techniques to manage Human Resources at work place and able to occupy a position of H R Manager

CO2: Deliberate the methods and techniques of training to train the Human Resources and create assets for the organisation

CO3: Understand in depth the methods of recruitment

CO4:Understand the basis and purpose of promotion

CO5: Learn the details of transfer

Unit 1: Human Resource Management

Meaning, Definition – objectives, Importance , Functions and process. HR policies, HR Manager- Duties and responsibilities – Recent trends in HRM

Unit 2: Human Resource Planning, Recruitment and Selection

Meaning – Importance of Human Resource Planning – Benefits of Human Resource Planning. Recruitment – Meaning – methods of recruitment. Selection – meaning – steps in selection process. Interview – meaning and types. Induction – Meaning, objectives and purposes.

Unit 3: Training and Development

Training – Need for training, benefits of training, identification of training needs and methods of training. Training v/s development, methods of development. Career Development.

Unit 4: Performance Appraisal and Compensation

Performance Appraisal – Meaning and Definition, objectives, methods, uses and limitation. Compensation – meaning and objectives. Fringe benefits.

Unit 5: Promotion and Transfers

Meaning and Definition of Promotion – purpose of promotion, basis of promotion, meaning of transfer, reasons for transfer, types of transfer, promotion v/s transfer.

Reference:

1. Gary Dessler. *A Framework* for *Human Resource Management*.Pearson Education.
2. DeCenzo, D.A. and S.P. Robbins, *Personnel/Human Resource Management*, Pearson Education.
3. Bohlendar and Snell, *Principles of Human Resource Management,* Cengage Learning
4. Ivancevich, John M. *Human Resource Management*. McGraw Hill.
5. Wreather and Davis. *Human Resource Management*.Pearson Education.
6. Robert L. Mathis and John H. Jackson.*Human Resource Management*.Cengage Learning.
7. TN Chhabra, *Human Resource Management,* DhanpatRai& Co., Delhi

8. BiswajeetPatttanayak, *Human Resource Management, PHI Learning*
9. NeeruKapoor*, Human Resource Management,* Taxmann Publication

Note: Latest edition of text books may be used.

BDF21001 **SEMESTER VI**

CORPORATE RESTRUCTURING – DSC 11

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand in detail the problems faced in joint ventures

CO2: Learn the types and structure of joint venture

CO3: Understand in detail the theories of Mergers and Acquisitions

CO4: Learn the details of legal frame work for mergers and acquisitions

CO5: Understand the methods and factors affecting Valuation

CO6: Understand the details of Post merger evaluation and its impact on shareholders' wealth

Unit 1: **Joint Ventures**:
Concept & Meaning of Joint Ventures, Need & Types of Joint Ventures, Structures & Problems faced in Joint Ventures, Joint Ventures and Strategic Alliance. Some relevant case study of successful and failed joined ventures.

Unit 2: **Mergers and Acquisitions**:
Introduction to mergers, types of mergers, theories of mergers & acquisitions; Cross-border mergers and acquisitions, issues and challenges in cross border M&A. Analysis of Post-Merger Performance. Demerger, types of demerger, reverse merger, buyback of shares, leverage buy-out strategy, merger strategy - growth, synergy, operating synergy, financial synergy, diversification. Takeover and its types, takeover strategy, takeover bids, legal framework for mergers and acquisitions, leverages and buyouts; Hostile tender offers and various anti-takeover strategies.

Unit 3: **Deal Valuation and Evaluation**:
Factors affecting valuation basics, methods of valuation, cash flow approaches, Economic Value Added (EVA), sensitivity analysis, valuation under takeover regulation, valuation for slump sale, cost-benefit analysis and swap ratio determination.

Unit 4: Post-Merger Evaluation:
Financial Evaluation of Mergers & Acquisitions, Impact on shareholders' Wealth; Methods of payment and financing options in mergers & acquisitions, financing decision, Merger, Acquisition and Competition law 2002, SEBI (Securities & Exchange Board of India) Takeover Code 2011 and criteria for negotiating friendly takeover.

Reference:

1. Weston, Fred; Chung, Kwang S. &Siu, Jon A.: Takeovers, Restructuring and Corporate Governance, (2nd ed.). Pearson Education
2. Gupta, Manju (2010): Contemporary Issues in Mergers and Acquisitions. Himalaya Publishing
3. Sundarsanam (2006); Creating Value from Mergers and Acquisitions, (1st ed.) Pearson Education
4. Ramanujan. S. (1999); Mergers: The New Dimensions for Corporate Restructuring, McGraw Hill

5. Narayankar, Ravi, (2013): Merger and Acquisitions Corporate Restructuring, Strategy and Practices, (2nd ed.). International Book House Pvt. Ltd.

Note: Latest edition of the text books should be used

BDF22001

SEMESTER VI

INTERNATIONAL FINANCIAL INSTITUTIONS – DSC 12

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the details of IFIS and their implications on business

CO2: Understand the characteristics of world bank

CO3: Learn the History and Organisational Structure of world bank

CO4: Understand in detail the functioning of IDA and IFC

CO5: Understand the steps taken by IMF to solve problems of international liquidity

CO6: Understand the Dispute Settlement facilities of international Centre for investment Disputes

Unit 1: International financial institutions
Meaning - objectives- need-functions. International liquidity: meaning, problems of international liquidity-IFIs and their implications on business.

Unit 2: International monitory fund (IMF):
Origin- objectives functions- membership- organization and structure- financial resources- role played by IMF in global business- steps taken by IMF to solve problems of international liquidity.

Unit 3: World Bank:
Origin-History –membership-organisational structure- capital resources- funding objectives- functions of World Bank in international business-loan provision: projects loans, sectoral loans and structural adjustment loans.

Unit 4: IDA and IFC:
IDA: Origin- history-objectives- membership -organizational structure-IDA assistance – Donor contributions.
IFC: Origin-history-objectives - organizational structure-funding mechanisms-Financial resources- Assistance to member countries.

Unit 5:UNCTAD and MIGA:
UNCTAD : Origin-history-functions-organisational structure-activities.
MIGA: Origin-history-functions-organisational structure-activities.

Unit 6:ADB and International Centre for Investment Disputes(ICID):
ADB: Origin- history-objectives- membership -organizational structure-Functions.
International centre for investment Disputes (ICID): Origin- history- membership - organizational structure-activities-Disputes settlement facilities.

Reference:

1. Principles & Practice of Banking – B.S. Raman
2. International Banking operations – Indian institute of Banking and finance
3. Corporate finance for Non finance Security – Prasanna Chandra

Note: Latest edition of the text books should be used

BDF23001

SEMESTER VI
STRATEGIC CORPORATE FINANCE- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can

CO1: Learn in detail the risk management choices

CO2: Understand the details of value enhancement tools and techniques

CO3: Learn the different types of financial strategy for shareholders wealth maximization of strategic corporate finance

CO4: Understand the significance of strategy in financial decision

CO5: Learn the details of Financial Distress and restructuring

CO6: Learn in depth capital structure and factors affecting the capital structure

Unit 1:Introduction to strategic corporate finance:
Strategy v/s Planning, significance of strategy in financial decisions, Different types of financial strategy for Shareholders Wealth Maximization, overall corporate value addition and Economic Value Addition. Strategic Cost Management: Traditional costing Vs Strategic Costing, Relevant costs v/s Irrelevant costs, Different types of strategic costing and their relevance- Target Costing, Activity based Costing, Life Cycle Costing, Quality Costing, Zero Based Budgeting, Strategic cost reduction techniques and value chain analysis. Valuing Real assets in the presence of risk: tracking portfolios and Real Asset valuation, Different Approaches of Valuing Real Assets, Capital Budgeting and Strategic policy.

Unit 2: **Fundraising**:
Identification of different sources of development capital, determination of capital structure and factors affecting the capital structure, cost of capital and cost saving strategy, production of a business plan and financial forecasts to enable potential funders to assess the proposition. Alternative sources of financing – alternative sources of financing, Different approach to infrastructure projects financing- Public Private Partnership (PPP) and its relevance. Managing credit ratings. Dividend v/s share repurchase policy, problem of too much cash. The issues of stock liquidity and illiquidity.
Financial Distress and restructuring: Meaning of Bankruptcy, Factors leading to bankruptcy, symptoms and predictions of bankruptcy, reorganization of distressed firms, liquidation of firms. Company disposals: retirement sale or the sale of a non-core subsidiary, planned exit, forceful retirement and other disposals. Exit strategy- most appropriate exit route, valuation, timing of sale and tax planning opportunities, identification of potential purchasers, approaching the potential purchaser, negotiate with potential acquirers and selection of a preferred purchaser. Real options: Financial and real options compared, various types of real options, application of Real options, Drawbacks of Real options

Unit 3:Company Valuation:
An overview of valuation, valuation principles and practices more, the impact of "what if" scenarios, the key financial and commercial factors affecting the business. Value enhancement tools & techniques, the link between valuation and corporate finance Management Buy-outs: Establishing feasibility of the buy-out, Negotiating the main terms of

the transaction with the vendor including price and structure, Developing the business plan and financial forecasts in conjunction with the buy-out team for submission to potential funders, negotiations with potential funders so that the most appropriate funding offers are selected. Management Buy-ins: Management Buy-in/Buy-outs ("BIMBOs"), Vendorinitiatedbuy-outs/buy-ins. Due Diligence: financial due diligence for both purchasers and financial institutions.

Unit 4: Strategic risk management:

Strategic risk management, the substitutability of capital structure and risk management choices, such as process control efforts, financial, physical, and operational hedging, value-based management.

Reference:

1.AswathDamodaran: Corporate finance theory and practice; John willey& sons, Inc.
2.AswathDamodaran: Strategic Risk Taking:A Framework for Risk Management ; Prentice Hall
3.IMPandey: Financial Management; Vikas Publishing House
4.Strategic Financial Management: Prasanna Chandra; McGraw Hill Education (India) Private
Limited

Note: Latest edition of text books may be used.

BDF24001

SEMESTER VI
MANAGEMENT OF FINANCIAL INSTITUTIONS- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:
On successful completion of this course the students can:

CO1: Learn the details of financial institution and its kind
CO2: Understand and analyse the financial statement of Financial institutions
CO3: Identify the financial strength and weakness of Financial institutions
CO4 :Understand the details of capital adequacy norms
CO5: Learn the classification of Institutional risk and the theories of interest rate
CO6: Understand the causes of liquidity risk

Unit 1 Financial Intermediation;
Kinds of Intermediation; Financial Institution and its kinds; An overview of the Indian financial system; Regulation of Banks, NBFCs & FIs; Products offered by Banks and FIs. CRR & SLR management; Capital Adequacy: Capital adequacy norms; Basel agreement-II&III; effect of capital requirements on bank operating policies

Unit 2 Statement of Financial Sector:
Flow of Funds Accounts – Sector wise and Instrument wise. Statements of Financial Institution: Analyzing Bank's Financial Statement: The balance sheet; income statement; Cash Flow Statement; profitability, liquidity and solvency analysis; Performance Analysis of banks: CAMELS Risk system; KPIs; Data Envelopment Analysis. Asset Liability Management: RBI guidelines on asset liability management

Unit 3 Institutional Risk Management:
Interest Rate Risk; Market Risk; Credit Risk; Liquidity Risk; Operational Risk. Determination of Interest Rate. Theories of Interest Rates: Classical Theory; Loan able Funds Theory; Liquidity Preference Theory; Term Structure of Interest Rates. Interest Rate Risk Management: Measurement of Interest Rate Risk; Duration and its kinds; Convexity. Managing Interest Rate Risk: Reprising Gap Model, Maturity Matching Model, Duration Gap Model, Cash Flow Matching Model; Convexity Adjustments.

Unit 4: Credit & Liquidity Risk Management:
Types of Assets, NPA & its types, Management of NPA, Measurement of Credit Risk – Qualitative and Quantitative models. Modelling Credit Risk; Term Structure of Credit Risk; Managing Credit Risk: Credit Analysis and kinds of Loans; Pricing of Loans. Liquidity Risk Management: Measurement of Liquidity Risk; Measures of Liquidity Exposure; Causes of Liquidity risk: Asset-Side and Liability-Side; Managing Liquidity Risk :Purchased Liquidity management and Stored Liquidity management; Liquidity Planning;
Deposit Insurance; Discount Window

Reference:

1. Saunders & Cornett – “Financial Institutions Management – A risk management approach” Tata McGraw Hill
2. Resti & Sironi – “Risk management and shareholders’ value in banking” John Wiley
3. Rose & Hudgins – “Bank management and financial services”
4.IIBF-“Bank Financial Management ”
5.Paul& Suresh – “Management of Banking and Financial Services ”
6.Subramanyam – “Investment Banking ”
7. Madhuvij -- “Management of financial institutions”
8. http://nptel.iitm.ac.in/courses/110106040/
Note: Latest edition of text books may be used.

BDF25001

SEMESTER VI
FINANCIAL DERIVATIVES- DSE

(Credits: Lecture – 05, Tutorial – 01, Practical – 0) Lectures: 80 Hrs
Tutorials: 16 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the classification and characteristics of financial derivatives in India

CO2: Identify and study the relationship between derivatives and other variables

CO3:Learn the characteristics of options and factors affecting option prices

CO4 :Understand the various types of SWAPS

CO5:Understand in depth forward and future contracts and play an important role in dealing with these contract

Unit 1: **Introduction:**
History of derivatives - origin of derivatives in India - the classification of derivatives – the important features of derivatives – Early delivery, extension and cancellation of forward contracts –financial derivatives market in India.

Unit 2:Forward and Future Contracts:
Meaning of forwards and futures – difference between forwards and futures – Clearing house mechanism - Margin requirements: Initial margin, maintenance margin and margin call – Making to Market – pricing of futures (Problems in preparation of Margin Accounts and Pricing of futures) – Valuation of futures contracts.

Unit 3: Options:
Meaning – Types of Option contracts – factors affecting option prices – Distinction between futures and options. Prices – Upper bounds and lower bounds, early exercise, pul-call parity – Time value and Intrinsic value of options – Concept of options In the money, At the money and Out of the money – Computation of Gross pay off and Net pay off from options contracts – Graphical representation of Pay off from options contracts.

Unit 4:Understanding of SWAPS:
Meaning and types – Interest rates swap – Currency Swaps; Credit Derivatives: Credit ratings, Credit Default Swaps.

Reference:
1. Ruey S. Tsay (2005). Analysis of Financial Time Series (2nd ed.). John Wiley.
2. John C. Hull. Options, Futures and Other Derivatives (7th ed.). Pearson Education.
3. JurgenFranke, Wolfgang Hardle and Christian Hafner. Introduction to Statistics of Financial
Markets.
4. R. Madhumathi, M. Ranganatham. Derivatives and risk management (1st ed.)
Redhead, K. Financial Derivatives- An introduction to futures, forwards, options, swaps Prentice Hall of India
5. Kotreshwar – Derivative Market

Note: Latest edition of text books may be used

BDF26001

SEMESTER VI

RESEARCH SOFTWARE PACKAGE- DSE

(Credits: Lecture – 02, Tutorial – 0, Practical – 02) Lectures: 32 Hrs

Practical: 64 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Understand the details of EVIEWS

CO2: Learn the details of importing data to EVIEWS

CO3: Understand the details of estimating a Multiple Regression Equation by Ordinary Least Squares using software

CO4: Identify the details of printing output and graph

CO5 : Understand the details of estimating Logit and Probit equation

A Brief Introduction to EVIEWS (Econometric Views)
A. Importing Data to EVIEWS
B. Executing Simple Procedures
i. Showing Data
ii. Graphing Data
iii. Descriptive Statistic of data
iv. Estimating a Multiple Regression Equation by Ordinary Least Squares
v. Testing of Homoscedasticity
vi. Testing of Error Term
vii. Testing of Multicollinearity
viii. Testing of stationarity
ix. Estimating a Logit and Probit Equation
x. "Views" of the Regression Equation
C. Printing Output and Graph

Readings:

http://www.eviews.com/illustrated/EViews_Illustrated.pdf

Note: Latest edition of text books may be used.

BDF27001

SEMESTER VI
COMPUTERISED ACCOUNTING SYSTEM- DSE

(Credits: Lecture – 04, Tutorial – 00, Practical – 02) Lectures: 64 Hrs
Tutorials: 64 Hrs

Course Outcome:

On successful completion of this course the students can:

CO1: Learn the details of Processing and preparing ledgers, trial balance using SQL query and report modules

CO2: Understand the details of designing accounting support system

CO3: Understand the details of auditing in computerized accounting system using Generic Software

CO4: Learn in detail the creation of sample Data base using view, query and report modules

Unit-1: Computerized Accounting: Using Generic Software (12 Lectures, 12 Practical Lab)

Taxation: TDS, VAT and Service Tax Auditing in Computerized Accounting system: Statutory Audit, Voucher verification, Verification of related party transaction, CAAT: Various Tools

Unit-2: Introduction to DBMS(10 Lectures, 10 Practical Lab)

DBMS - concepts-DBMS Modules - Table, Form, View, Query and Report. Familiarising with SQL. Creating a sample data base and using view, query and report modules.

Unit -3 **Designing Computerised Accounting System (14 Lectures, 14 Practical Lab)**

Requirement Analysis, Designing Main Tables. Creating Voucher entry form, Populating the data base, Processing and preparing ledgers, Trial Balance using SQL query and report modules,

Unit-4 : Designing Accounting Support System (16 Lectures, 16 Practical Lab)

Designing Bills Payable and Bills Receivable Systems for Accounting using Form, Query and Report Modules. Designing Payroll System for Accounting using Form, Query and Report Modules.

Note:

1. The General Purpose Software referred in this course will be notified by the University Departments every three years. If the specific features, referred in the detailed course above, is not available in that software, to that extent it will be deemed to have been modified.

2. Teaching arrangements need to be made in the computer Lab

Reference:

The suggested readings and guidelines shall be notified by the university department at least once in three years based on the selected software.

Note: Latest edition of text books may be used.

BDF28001

SEMESTER VI
Project Work- DSE

(Credits: Lecture – 01, Tutorial – 01, Practical – 04)

Lectures: 16 Hrs
Tutorials: 16 Hrs
Practical: 128 Hrs

Course Outcome:

On successful completion of the project work the students are able to:

CO1: Understand in depth to fill the gap between theory and practical through internship

CO2: Understand in detail with examples the procedure and able to write a report on the problems of human resources, Production, Marketing purchase, financial, consumer's preferences and behaviour, pricing, competition etc of the organisations

CO3: Specify the details in depth and able to communicate effectively

CO4: Learn in detail and able to absorb as an employee by the employer

CO5: Specify and analyse the components of project report and prepare the report effectively

C1 – Proposal of Project Work - 15 Marks
C2 – Progress of Project Work - 15 Marks
Viva - 20 Marks
Valuation of Report – 50 Marks

JSS COLEGE OF ARTS COMMERCE & SCIENCE
(Autonomous)
BN Road, Mysuru – 25
Department of Commerce and Management

Model Question Paper
(For all courses except QT, computer Applications in Business, Computerized Accounting System, Research Software Package)

BBA Programme

Time 3 hrs **Maximum marks: 70**

Allocation of marks and Model Question Paper Commerce

I. The question paper carries 70 marks.

II. It is divided into 3 Parts, Part A, Part B and Part C

III. Part A carries 30 marks. …….. 2x15=30

IV. Part B, carries 20 marks…….……. 2x10=20

V. Part C, carries 20 marks……..……. 4x5=20

BBA

Question Paper Pattern- 2017-18 (CBCS)

(For all courses except QT, computer Applications in Business, Computerized Accounting System, Research Software Package)

PART-A

Answer the following. Each question carries 15 marks. 2X15=30

1. …… ……

OR

2. ……..…….

3. ……..……..

OR

4. ……..…….…….

PART-B

Answer the following. Each question carries 10 marks.
2X10=20

5. …….…….

OR

6. ……..……...……

7. …….…….

OR

8.…….……

PART-C

Answer any four of the following. Each question carries 5 marks.4X5=20

9. …….……

10. …….…….…….

11…….…….
…….

12.…….…….…….……

13.…….…….…….

****

BBA

Question Paper Pattern
4.4 Quantitative Techniques

Time: 3hrs **Max. Marks: 70**

Part-A

Answer the following. Each question carries two marks10X2=20

1. a. …….
   b. …….
   c. ……..
   d. ……....
   e. ……..
   f. …….
   g. …….
   h. …….
   i. ……..
   j. ……..

Part-B

Answer any four of the following. Each question carries five marks 4X5=20

2. ……...

3. ……..……..

4. ……..……..

5. ……

6. ……...……

Part-C

Answer any three of the following. Each question carries ten marks3X10=30

7. ……

8. …….

9. ……

10. ……..…….

****

BBA

Question Paper Pattern
4.5 Computer Application in Business / DSE – Research Software Package

Time: 2 hrs **Max. Marks: 50**

Part-A

Answer the following. Each question carries two marks.10X2=20

1. a. ……..……..
   b. ……..……..
   c. ……..……..
   d. ……..……..
   e. ……..……..
   f. ……..……..
   g. ……..……..
   h. ……..……..
   i. ……..……..
   j.……..……..

Part-B

Answer any two of the following. Each question carries five marks.
2X5=10

2.……..……..

3. ……..……..

4.……..…….

Part-C

Answer any two of the following. Each question carries ten marks
2X10=20

5. ……

6.…….

7. ……..……

****

BBA

Question Paper Pattern
DSE – Computerized Accounting System

Time: 3 hrs **Max. Marks:70**

Part-A

Answer the following. Each question carries two marks.10X2=20

1. a. ……..……..
   b. ……..……..
   c. ……..……..
   d. ……..……..
   e. ……..……..
   f. ……..……..
   g. ……..……..
   h. ……..……..
   i. ……..……..
   j. ……..……..

Part-B

Answer any four of the following. Each question carries five marks.
4X5=20

2. ……..……..
3. ……..……..
4. ……..……..
5. ……
6. ……

Part-C

Answer any three of the following. Each question carries ten marks
3X10=30

7. ……..……
8. ……..……
9. ……..……
10. ……..……

****

JSS COLLEGE OF ARTS, COMMERCE & SCIENCE

(An Autonomous College of University of Mysore)

Re-accredited by NAAC with 'A' grade

OOTY ROAD, MYSORE-570 025, KARNATAKA

SYLLABUS

Programme: B. Voc. (Software Development)

B.Voc. (SD) Scheme:

Year	Sem	Course Code	Title	L:T:P	Theory Hours	Tutorial Hours	Practical Hours	Total Hours	Total Credits
1 Year	Sem 1	SDA 020	Communication Language Kannada	3:0:0	45	0	0	45	3
		SDA 510	Basic Mathematics	3:0:0	45	0	0	45	3
		SDA 520	C Programming	2:0:1	30	0	15	45	3
		SDA 530	Digital Electronics	2:0:1	30	0	15	45	3
	Sem 2	SDB 510	Discrete Mathematics	3:0:0	45	0	0	45	3
		SDB 540	Communication Language English	3:0:0	45	0	0	45	3
		SDB 520	Algorithms & Data Structure	2:0:1	30	0	15	45	3
		SDB 550	Microcontroller & Embedded System	2:0:1	30	0	15	45	3
									24
2 Year		SDC 510	Advanced calculus	3:0:0	45	0	0	45	3
		SDC 520	Differential equation	3:0:0	45	0	0	45	3
		SDC 530	Software Architecture and SDLC & Process	2:0:1	30	0	15	45	3
		SDC 550	Indian Constitution	3:0:0	45	0	0	45	3
	Sem 4	SDD 510	Numerical Analysis & Statistics	3:0:0	45	0	0	45	3
		SDD 520	Operation Research	3:0:0	45	0	0	45	3
		SDD 530	Software Modeling & Software Quality Assurance	2:0:1	30	0	15	45	3
		SDD560	Environmental Studies	3:0:0	45	0	0	45	3
									24
3 Year	Sem 5	SDE 510	Project Management	2:0:2	30	0	30	60	4
		SDE 520	Configuration Management	3:0:1	45	0	15	60	4
		SDE 530	Human Computer Interaction	3:0:1	45	0	15	60	4
	Sem 6	SDF 510	Operating System	3:0:1	45	0	15	60	4
		SDF 550	Database Design	3:0:1	45	0	15	60	4
		SDF 520	CN & Security Fundamentals	3:0:1	45	0	15	60	4
									24

Scheme of Assessment:

Semester-I:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	Pr	Total	T	P	Total
1	SDA 020	Communication Language Kannada	3:0:0	03	70	15	15	-	100	03	-	03
2	SDA 510	Basic Mathematics	3:0:0	03	70	15	15	-	100	03	-	03
3	SDA 520	C Programming	2:0:1	03	70	15	15	70	170	02	01	03
4	SDA 530	Digital Electronics	2:0:1	03	70	15	15	70	170	02	01	03

Semester-II:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	Pr	Total	T	P	Total
1	SDB 540	Communication Language English	3:0:0	03	70	15	15	-	100	03	-	03
2	SDB 510	Discrete Mathematics	3:0:0	03	70	15	15	-	100	03	-	03
3	SDB 520	Algorithms & Data Structure	2:0:1	03	70	15	15	70	170	02	01	03
4	SDB 550	Microcontroller &Embedded System	2:0:1	03	70	15	15	70	170	02	01	03

Semester-III:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDC 510	Advanced Calculus	4:0:0	04	70	15	15	-	100	04	-	04
2	SDC 520	Differential Equation	2:0:0	02	70	15	15	-	100	02	-	02
3	SDC 530	Software Architecture and SDLC & Process	2:0:1	03	70	15	15	70	170	02	01	03
4	SDC 550	Indian Constitution	3:0:0	03	70	15	15	-	100	03	-	03

Semester-IV:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDD 510	Numerical Analysis & Statistics	4:0:0	04	70	15	15	-	100	04	-	04
2	SDD 520	Operation Research	2:0:0	02	70	15	15	-	100	02	-	02
3	SDD 530	Software Modelling & QA	2:0:1	03	70	15	15	70	170	02	01	03
4	SDD560	Environmental Science	3:0:0	03	70	15	15	-	100	03	-	03

Semester-V:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDE 510	Project Management	2:0:2	04	70	15	15	70	170	02	02	04
2	SDE 520	Configuration Management	3:0:1	04	70	15	15	70	170	03	01	04
3	SDE 530	Human Computer Interaction	3:0:1	04	70	15	15	70	170	03	01	04

Semester-VI:

Sl. no	Course Code	Course Name	Credits		Marks					Hours Per Week		
			L:T:P	Total	Th	C1	C2	P	Total	T	P	Total
1	SDF 510	Operating System	3:0:1	04	70	15	15	70	170	03	01	04
2	SDF 550	Database Design	3:0:1	04	70	15	15	70	170	03	01	04
3	SDF 520	Computer Networks & Security Fundamentals	3:0:1	04	70	15	15	70	170	03	01	04

Program Outcome:

After completing the graduation in Software Development, the students are able to:

PO1. Contribute to the design of software products and applications

PO2. Develop software code to specification

PO3. Provide data/information in standard formats

PO4. Develop their knowledge, skills and competence

PO5. Create documents for Knowledge Sharing

PO6. Develop media content and graphic designs for software products and applications

PO7. Appreciate the engineering nature of software development

PO8. Describe key activities in software development and the role of modelling

PO9. Explain key concepts in software development such as risk and quality

PO10. Explain the basics of an object-oriented approach to software development

Program Specific Outcome:

After completing the graduation in Software Development, the students are able to:

PSO1. Apply standard Software Engineering practices and strategies in real-time software project development

PSO2. Acquaint with the contemporary trends in industrial/research settings and thereby innovate novel solutions to existing problems

PSO3. Understand, analyze and develop computer programs of varying complexity

PSO4. Apply standard Software Engineering practices and strategies in software project development

PSO5.Acquaint with the contemporary issues, latest trends in technological development

PSO6. Develop software code to specification

PSO7. Manage their work to meet requirements

PSO8. Develop their skills and competence

General Component Syllabus

SDA 020

SEMESTER I

Communication Language Kannada

Credits: 3 (45 hours)

(3 Hours of Theory per week)

¸Á» vÀåUÀ¼ÀÄ

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in depth Putta Vidhave

CO2. Learn the details of Rangoli

CO3. Specify in depth Mumbai Jathaka

CO4. Learn in details with examples Mahiti Tantradnyan

CO5. Understand in details with examples Mudanambikegala Bedinali

1. PÁªÀå 12 UÀAmÉUÀ¼ÀÄ

1. AiÀiÁªÀ PÀÆ®zÀ ±Á¸ÀÛçªÀ£ÀÄ º ÉüÀzÀ ¥ÀzÀ - PÀĪÉA¥ÀÄ
2. ¥ÀÄlÖ «zsÀªÉ - ¨ÉÃAzÉæ
3. gÀAUÉÆðð - ¥ÀÄwæ£À
4. ªÀÄÄA¨ÉÊ eÁvÀPÀ - f J¸ïJ¸ï
5. CqÀÄUÉªÀÄ£ÉAiÀÄ º ÀqÀÄV - ªÉÊzÉÃ»
6. £ÀªÀÄä£ÀĽ¹ - ¹zÀÝ°AUÀAiÀÄå

2. UÀzÀå 12 UÀAmÉUÀ¼ÀÄ

1. ¤gÀAvÀgÀªÁV UÁAiÀÄ ¤AvÀªÀ¼ÀÄ - £ÁUÉÃ±ï º ÉUÀqÉ
2. ªÀiÁ» wAvÀæeÁÕ£ÀzÀ ¸ÀªÀÄ¸Éå £É¯ÉUÀ¼ÀÄ - f .J£ï. £ÁUÀgÁd ªÀÄÆwð
3. ªÀÄÆqÀ£ÀA©PÉUÀ¼À ¨ÉÃrPÉ - ¨ÁgÀUÀÆgÀÄ º ÉUÀqÉ
4. ¨ÉÃqÀzÀ ChUÀ¼ÀÄ - J J£ï ªÀÄÆwð gÁAiÀÄgÀÄ

¨sÁµÁUÀÄZÀÒ

3. DqÀ½vÀ ªÀÄvÀÄÛ ¸ÀA ºÀ£À PÀ£ÀßqÀ 21 UÀAmÉUÀ¼ÀÄ

1. DqÀ½vÀ ¨sÁµÉAiÀiÁV PÀ£ÀßqÀ ¸ÀgÀPÁj ¥ÀvÀæ ªÀåªÀºÁgÀ
2. ¸ÀPÁðj ¥ÀvÀæUÀ¼À ¸ÀégÀÆ¥À ªÀÄvÀÄÛ ¸ÀégÀÆ¥À £ÀªÀÄÆ£É

3. ««zÀj ÃwAiÀÄ Cf ðUÀ¼À£ÀÄß - gÀzÉ¥Àr¸À®Ä ±À¸ÀvÀ §r¹ ¥ÀæzÁ£ÀªÁV EvÀgÉ
4. ªÀÄt ÚåPÀ¼À£ÀÄß ¸ÀgÀ¼À ¥ÀªÀÄvÀÛÀ®PÉÌ
5. ªÀÄt ÚåªÀÄzÀè ««zÀCAUÀUÀ¼ÀÄ
ªÀÄt ÚåªÀÄuÉÀÄÀ «ZÁgÀuÁ ¥ÀæPÀæDz±ÀðÀ¥ÀæPÀæGzjÀ¥ÀæPÀæªÀ¸ÀÌº ¥ÀæPÀæ ¥jÀZÀiÀÄ ¥ÀæPÀæ¥gÀÁªÀÄ±ÀðÀ£À¥ÀæPÀæªÀ¸ÀºÀ ÁgÉÃÃ ÓªÀ£À¥ÀæPÀæ¥jÀ¥ÀæPÀæ
6. UÀ PÀ¯Àè PÀ¼À¢ÀPÀ¼À¢ÀCAvÀåÀ Áð® vÀÄt UÀÄÄ £Àr¸ §gÀ¾À- ¥Áj¨ÁµÀPÀ ¥ÀæUÀ¼ÀÄ
7. ¨ÁµuÁAvÀgÀ ¸gÀÀE¥ÀªÀÄvÀÛÀ®PÉÌ- PÀ¼À¢ÀAzÀEAV¶U É EAV¶¤AzÀ PÀ¼À¢ÀÉ

¥gÀÁªÀÄ±ÀðÀ£ÀUÀæAxÀUÀ¼ÀÄ

1. ¸ªÀÄUÀæPÀªÀ£À	-	f J¸ï ²ªÀgÀÄzÀæ¥Àà
2. ©AzÀÄ©A¢UÉ	-	ªÉÆzÀÆ
3. ¥ÀæPÁ²	-	PÀÄªÉA¥ÀÄ
4. ¸ªÀÄUÀæPÀªÀ£À	-	¨ÉÃAzÉæ
5. ±ÀæªÀ®èÀ¸ªÀÄgÀ	-	£ÁUÉÃ±ïº ÉUÉØ
6. ªÁåªÀÁj PÀ£ÀßqÀ	-	JZï J¸ï PÉ
7. Dq½vÀ PÀ£ÀßqÀ	-	qÁC±ÉÆÃPïPÀÄ¼ÀÄgïgÀæÉÃgÀ ªÀÄvÀÛEvÀgÀgÀÄ
8. PÀ£ÉÆ PÉ r	-	PÀÄªÉA¥ÀÄ PÀ¼À¢ÀCzsÀåAiÀÄ£À ¸À¸ÉÜ
9. ¯ÉR£PÀ ÀÉ	-	J¸ï ¥ÀæPÁ±ïgÁªï
10. Dq½vÀ ÀµuÉPÀ®ªÀÅ «ªÀgÀUÀ¼ÀÄ	-	¥ÀæPÀµ£ÀUÀ¼ÀgÁzsÀæÀ

SDA 510

BASIC MATHEMATICS

Credits: 3 (45 Hours)

(3 Hours of Theory per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in depth Polynomials

CO2. Write down the details of Cardon's Method

CO3. Identify the details of Pair of straight lines

CO4. Deliberate in details with examples Circle

CO5. Specify in details with examples Radian Measure

CO6. Learn in depth Complex Numbers

Unit 1: Algebra1 **15 Hours**

- Theory of Equations: Polynomials – Relations between the roots and coefficients – Symmetric functions –Synthetic division-Descartes' rule of signs –Cubic equations- Cardon's method.

Unit 2: Analytical Geometry –I **15 Hours**

- Two dimensional coordinate geometry – straight line (Revision), Pair of straight lines – standard results and simple problems.
- Circle: Equations of circles, Tangent and normal, radical axis and radical centers.
- Conic: Parabola – Ellipse- Hyperbola (Equations in standard form and problems)

Unit 3: Trigonometry **15 Hours**

- Radian measure-Trigonometric ratios –Trigonometric functions of compound angle, multiple angles and half angles-Inverse trigonometric functions-complex numbers.

.

Reference:

1. Algebra –Natarajan
2. Algebra – Hardy and Wright
3. Algebra –Shanthi Narayan
4. Algebra -Manicavachagam Pillay
5. Elements of Analytical Solid geometry – Shanti Narayan
6. Elements of Analytical Solid geometry –S.L.Loney
7. Differential Calculus –Shanthi Narayan
8. Trigonometry –S.L.Loney

SDA 520

C PROGRAMMING

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in details with examples Problem Design
CO2. Learn in details with examples Algorithms
CO3. Deliberate the details of Data Definition Structure
CO4. Learn the details of Control Structures
CO5. Learn the details of Functions
CO6. Identify in details with examples Abstract Data Types

Unit 1 **15 Hours**

Problem Solving Technique: Problem definition, Problem analysis, Problem Design, Algorithms, Flow charts, Coding, Debugging, Program documentation, Program maintenance and Basic programming construct

Data Definition Structure: Types, constants, variables, keywords and identifiers.

Operators and Expressions: Arithmetic, Relational, Logical, operator precedence rules; input and output statement and Assignment statement

Unit 2 **15 Hours**

Control Structures: Sequential, Selection (one way, two way), looping (while, do while, for), combinations

Functions: Definition and passing (function depth look), Prototypes: parameter definition and passing (scope: local and global variables)

Data Structures: One and Two dimensional arrays

Abstract data types: Records (Structure definition statement); Strings: Use of main operations, string functions (concatenates string copy and compare etc).

Reference:

- Programming with ANSI C by: E. Balaguruswamy
- Let us C - Yashwanth kanetkar
- Computer concepts and C programming by - P. B. Kotur

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDA 530

DIGITAL ELECTRONICS

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in detail with application, logic gates

CO2. Learn the classification and characteristics of combinational digital circuits

CO3. Deliberate the classification and characteristics of sequential digital circuits

CO4. Learn in details with application, flip flop

Unit 1 **15 Hours**

Representation of Information: Number system, integer and floating point representation, character codes (ASCII, EBCDIC)

Number Systems: Introduction to decimal, binary and hexadecimal number systems. Inter-conversion of decimal, binary and hex numbers

Binary Arithmetic and codes: Addition, multiplication and division in binary systems. Subtraction in binary systems –one's and two's complement methods. Subtraction of binary numbers by one`s and two`s complement methods. Concept of signed and unsigned numbers

Alphanumeric codes- ASCII and EBCDIC, concept of parity, error detection and correction

Logic Gates: Logic values and variables, positive and negative logic, AND, OR, NOT, NAND, NOR, AND, XOR gates, symbols and truth table. Definition of universal gates, NAND & NOR gates as universal gates

Boolean algebra: Laws of Boolean algebra. Principle of duality. DeMorgan's theorems. Simplification of Boolean expressions. Boolean expression for logic circuits and vice versa SOP and POS notations. Canonical Expressions. Conversion from SOP to POS form and vice versa. Reduction of Boolean expressions (three/ four variables with don't care conditions) using Karnaugh maps

Unit 2 **15 Hours**

Combinational Circuits: Half Adder, Full Adder, Half subtractor, Full subtractor, Encoders (Decimal to BCD) and decoders (BCD to Decimal), 4 X 1 Multiplexer and 1 X 4 demultiplexer - symbol and truth table

Sequential Circuits: RS flip flop, D flip flop. JK flip flop. Race around condition & T flip-flops. Shift registers –SISO, SIPO, PISO, PIPO registers. Brief explanation with Block diagrams. Counter - Synchronous and Asynchronous - Binary ripple counter and modulo counter

Semiconductor Memories: Idea of different types of Semiconductor memories (RAM, ROM, PROM, EPROM, EEPROM), process of data storage and retrieval, organization of memory, concept of PLA and PAL

Basic Building Blocks: ALU: arithmetic and logic unit operations, organization of control units, memory: types and organization, peripheral devices: I/O devices (video terminals and printers) and controllers, storage devices (tapes and disks), Programmed and interrupt control mechanism, I/O controllers, and bus bandwidths

Reference:

- Digital Electronic – Introduction to Theory & Practice by Gothmann
- Modern Digital Electronic (3rd Ed.) by Jain.
- Digital Principles & applications (6th Ed.) by Leech, Malvino and Saha.
- Digital Electronic by Thomas Floyd.
- The 8086 / 8088 Family Design, Programming & Interfacing by John Uffenbeck.
- 8086 Microprocessors Programming & Interfacing by Duglos V Hall.
- Intel Microprocessors Architecture, Programming & Interfacing (6th Ed.) by Barry B Bery.

Practicals

(1Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDB 540

SEMESTER II

COMMUNICATIVE LANGUAGE ENGLISH

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Voice

CO2. Specify in details with examples Articles

CO3. Learn in depth Speech

CO4. Deliberate the details of Writing Skills

CO5. Learn in depth Speaking Skills

Module – 1 Grammar

		Marks	Hrs/ Week
1.	Subject and Verb Agreement	5	6
2.	Voice	5	5
3.	Articles	5	3
4.	Speech	5	6
5.	Question tag	5	5
6.	Framing of Questions	5	3+2=05

Module – 2 Writing Skills

1.	Letter Writing Letter of Application/Letter of Grievances/Resume Preparation	10	4
2.	Comprehension	10	3
3.	Essay Writing	10	3

Module – 3 Speaking Skills

1.	Greeting		
2.	Requesting		
3.	Enquiring		
4.	Explaining	10	03+2=05
5.	Reporting		
6.	Permission		
7.	Thanking		
		70	**45**

SDB 510

DISCRETE MATHEMATICS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Matrices and Determinants

CO2. Learn the details of Hamilton Theorem

CO3. Understand in details with examples Graph Theory

CO4. Understand the details of Calculus

CO5. Identify in details with examples Definite and Indefinite Integrals

Unit 1: Matrices and Determinants **15 Hours**

Algebra of Matrices and determinants –Elementary row operations- Rank of a matrix – Linear dependence of row and column vectors- System of Homogeneous linear equations-System of non homogeneous linear equations-Characteristic equations –Eigen values and Eigen vectors-Cayley –Hamilton theorem-Inverse of a matrix

Unit 2: Basics of graph theory **15 Hours**

Definition-paths-matrix representation of graphs –planar graphs-non planar graphs-Coloring of graphs-chromatic number of graphs-Independent number

Unit 3: Calculus **15 Hours**

Limits–Derivatives-Rules of differentiation-problems-differentiation of implicit Parametric and inverse functions-logarithmic differentiation and derivatives of second order Indefinite and definite integrals-simple problems

Reference:

1) Discrete Mathematics – Hari Kishan and Shiv Rajpundir
2) Matrices – Frank Ayers, Schaum publishing company
3) Text book of Matrices – Shanti Narayan and P k Mittal
4) Differential Calculus – Shanti Narayan
5) Differential Calculus and Integral Calculus – Piskunov
6) F.Harary – Graph Theory, Addition Wesley Reading Mass, 1969
7) Calculus – Volumes I & II.

SDB 520

ALGORITHMS AND DATA STRUCTURES

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Algorithms and Data Structures
CO2. Learn in depth Arrays
CO3. Learn in details with examples Binary Search Trees
CO4. Deliberate the characteristics of Heaps
CO5. Specify the characteristics of Sorting Algorithms
CO6. Learn the details of Shortest Path

Unit 1: **15 Hours**

Algorithms and Data Structures: Asymptotic and Algorithm Analysis, Properties of data, Asymptotic Analysis, Algorithm Analysis.

Abstract Lists and Implementations: Linked lists and arrays, Stacks, Queues, De-queues.

Abstract Sorted Lists and Implementations: General trees, binary (including binary and complete trees), N-array trees and tree traversals, Abstract Sorted Lists, Binary search trees, Balanced search trees, AVL trees, B-Trees.

Unit 2: **15 Hours**

Abstract Priority Queues: Heaps.

Abstract Sets/Maps: Chained Hash Tables, Linear Probing, Double Hashing.

Sorting Algorithms: Insertion and bubble sort, Heap, merge and quick sort, Bucket and radix sort

Graph and Direct Acyclic Graph Algorithms: Topological sort, Minimum spanning trees and shortest path.

Reference:

1. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2nd Ed., Prentice-Hall of India, 2006.
2. Robert L. Kruse and A.J. Ryba, Data Structures and Program Design in C++, Prentice Hall, Inc., NJ, 1998.

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDB 550

INTRODUCTION TO MICROCONTROLLERS AND EMBEDDED SYSTEMS

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the architecture of 8051 microcontroller

CO2. Write down the instruction set and simple programs of 8051 microcontroller

CO3. Learn the details of 8051 microcontrollers

CO4. Specify the characteristics of embedded system

Unit 1: Microcontrollers **15 Hours**

Microcontroller 8051 - Introduction, block diagram of microprocessor, block diagram of microcontroller, comparison between microprocessor & microcontroller, Architecture of 8051 and pin out diagram of 8051.

Addressing modes - Data moves, Types of addressing modes - register addressing, immediate addressing, direct addressing, indirect addressing mode.

Instructions set - Data transfer instructions, arithmetic instructions, jump and call instructions.

PIC microcontroller - Core feature and over view of series.

Unit 2: Embedded Systems **15 Hours**

Introduction to Embedded Systems - Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Hardware Side - introduction, The Core Level, Representing Information, Understanding Numbers, Addresses, Instructions, Registers. An Instruction Set View, Embedded Systems- A Register View, Register View of a Microprocessor

The Hardware Side: Storage Elements and Finite-State Machines - Theoretical model.

Reference:

- Microcontroller – K J Ayala.
- Introduction to Embedded Systems - Shibu K.V, McGraw Hill.
- Microcontroller – Mazadi.

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDC 510

SEMESTER III
ADVANCED CALCULUS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn in depth Sequences

CO2. Specify the details of Series

CO3. Understand in details with examples Rolle's Theorem

CO4. Deliberate in details with examples Taylor's Theorem

CO5. Identify the details of Partial derivatives

Unit 1: Sequences and Series: 15 Hours

Sequences-Bounded and monotonic sequences-convergent, divergent and oscillatory sequences- standard results and simple problems

Infinite series-nth partial sum- geometric series-convergence of $\sum \frac{1}{n^p}$- comparison test and ratio test-simple problems-alternating series

Unit 2: Calculus 15 Hours

Mean value theorems-Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorems (Statements and Geometrical interpretations)-Taylor's theorem – Maclaurin's expansion (Statement) and problems.

Unit 3: Partial derivatives 15 Hours

Limit and continuity of functions of two and three variables, Partial differentiation, Change of variables, Partial derivation and differentiability of real-valued functions of two and three variables, Euler's theorem on homogeneous functions. Taylor's theorem for functions of two and three variables - Jacobians

Reference:

1. A First Course in Real Analysis – Asharani Singhal.
2. Real Analysis – S.C. Malik.
3. Principles of Mathematical Analysis – Shanthinarayan
4. Calculus ,Volume -1 and Volume -2

SDC 520

DIFFERENTIAL EQUATIONS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in details with examples linear differential equations

CO2. Write down in details with examples nonlinear differential equations

CO3. Understand in details with examples Homogeneous linear differential equations

CO4. Learn the details of Non homogeneous linear differential equations

CO5. Specify the details of Partial differential equations

Unit 1: Linear and nonlinear differential equations 15 Hours

Elimination of arbitrary constant-solutions of linear differential equations - separation of variables –Homogeneous equations-exact equations- equations of the form $\frac{dy}{dx} + Py = Q$- Integrating factor, Equations solvable for x, y, p. Clairaut's form and singular solutions

Unit 2: Homogeneous and non homogeneous linear differential equations 15 Hours

Homogeneous Linear differential equations with constant coefficients.-non homogeneous linear differential equations –inverse differential operators-Cauchy's homogeneous linear differential equations- Second order linear differential equations-variation of parameters and exact equations.

Unit 3: Partial differential equations 15 Hours

Total differential equations-simultaneous equations- partial differential equations-Lagranges form of linear partial differential equations-charpit's method.

Reference:

1. A short course in differential equations – Rainville and Bedient
2. Advanced Engineering Mathematics – Kreyszig
3. Higher Engineering Mathematics – Grewal
4. Laplace Transform –Murry R Speigel
5. Applications of Differential equations –Martin Brown

SDC 530

SOFTWARE ARCHITECTURE AND SDLC& PROCESSES

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in depth Software Process
CO2. Deliberate in details with examples SDLC
CO3. Learn in depth Data Modeling
CO4. Understand the details of UML and ER Models
CO5. Specify the details of Loose Coupling

Unit 1: **15 Hours**

SDLC & Processes: Software Process, Software Development Life Cycle, Object-Oriented Concepts: connections between design and implementation, Software Testing, Object-Oriented Architecture and Design, Requirements analysis, Safety Critical Software.

Unit 2: **15 Hours**

Software Architecture: Introduction to enterprise software architecture, the role of middleware, Cloud computing = SaaS + Utility Computing, Data Modeling, UML and E-R models. XML, Schemas, XML Schemas, Data Processing. Strategies for data processing, introduction to XQuery. JSON and JAXB, Domain-Driven Architecture. Domain-driven, design (DDD), Object-relational mapping (ORM), Service-oriented Architecture (SOA), Standardized service contract, Loose coupling, Service abstraction, Service-oriented Architecture (SOA),

Reference:

1. Designing Software Architectures: A Practical Approach (SEI Series in Software Engineering) 1st Edition, Kindle Edition by Humberto Cervantes
2. Just Enough Requirements and Sdlc: Requirements Documentation, Waterfall, and Agile Paperback – Import, 10 Mar 2017 by Ed Crook shanks

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDC 550

INDIAN CONSTITUTION

Credits: 3 (45 Hours)

(3 Hours of Theory per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn the details of Features of Indian Constitution
CO2. Understand the details of Fundamentals Rights
CO3. Identify the details of Role of Prime Minister
CO4. Learn the details of Power and Functions of Lok Sabha
CO5. Specify the details of Power and Functions of Chief Minister

Unit 1 **08 Hours**

a) Preamble of the Indian Constitution
b) Salient features of Indian Constitution

Unit 2 **10 Hours**

a) Fundamental Rights
b) Fundamental Duties
c) Directive principles of State Policy

Unit 3 **14 Hours**

a) President – Election Method, Powers and Functions
b) The Role of the Prime Minister
c) The Parliament – Structure, Power and Functions(Lok Sabha and Rajya Sabha)
d) Supreme Court – Organization and Jurisdiction

Unit 4 **13 Hours**

a) The Role of Governor in the Administration of State
b) Powers and Functions of the Chief Minister
c) Composition , Powers and Functions of both the Houses of State Legislature
d) High Court – Organization and Jurisdiction

Reference:

1. M.V. Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI Learning Pvt. Ltd., New Delhi, 2011.
3. Latest Publications of Indian Institute of Human Rights, New Delhi.

SDD 510

SEMESTER IV
NUMERICAL ANALYSIS AND STATISTICS

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Bisection Method

CO2. Identify in details with examples Range Kutta IV Order Method

CO3. Learn the details of Finite differences

CO4. Understand in depth Numerical Integration

CO5. Identify in details with examples Linear programming

Unit 1: Numerical techniques **15 Hours**

Numerical solutions of algebraic equations-Bisection method -Newton Raphson method, Regula Falsi method -iteration method-Euler method, Range kutta IV order methods

Unit 2: Finite differences and Numerical integration **15 Hours**

Finite differences-Interpolation-Newton Gregory forward interpolation formula-Lagranges interpolation formula-Numerical integration: Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule Weddle's rule.

Unit 3: Linear programming **15 Hours**

Linear programming –Requirements for a linear programming problem, Examples on the Applications of linear programming, Formulation of a linear programming, Standardization, Solving LPP by Graphical Method, Simplex Method (up to two variables)

Reference:

1. Numerical methods: S.S. Sastry.
2. Probability and statistics for engineers and Scientists – Ronald E .Walpole and Raymond H Mayers.
3. Mathematical Statistics - John Freund (Prentice Hall India PVT .Ltd)

SDD 520

OPERATION RESEARCH

Credits: 3 (45 Hours)

(3 Hours of Theory per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Different phases of operation research
CO2. Deliberate in depth Simplex method
CO3. Identify in depth Duality theorems
CO4. Understand the details of Sequencing problems
CO5. Learn in depth Transportation model problems
CO6. Understand the details of Assignment problems

Unit 1: **15 Hours**

Definition of the term Operation Research -Different phases of operation research Advantages and limitations of O.R. Linear programming –Requirements for a linear programming problem , Examples on the Applications of linear programming ,Formulation of a linear programming , Standardization , Solving LPP by Graphical Method ,Simplex Method (up to two variables)

Unit 2: **15 Hours**

Big M method revised simplex method, Dual simplex method, Duality theorems.
Sequencing problems: Processing 'n' jobs through two machines –Travelling salesman problems as an application of sequencing

Unit 3: **15 Hours**

Transportation Model problems – Formulating, Solution –North West Corner Rule, Least Cost method, Row Minima method, Column minima method and Vogel's approximation.
Assignment problem: formulating, method of finding initial basic feasible solution to Assignment problem using Hungarian method.

Reference:

1. 'Operation Research' by Kanthiswarup, Guptha, Manmohan – Sultan chand and sons Educational publishers, New Delhi,1996
2. 'Operation Research' by H. A.Taha Prentice Hall of India Ltd 1998
3. 'Operation Research' by S .D Sharma Kedarnath Ramnath and co (publishers)1997

SDD 530

SOFTWARE MODELING AND SOFTWARE QUALITY ASSURANCE

Credits: 3 (45 Hours)

(2 Hours of Theory and 1 Hour of Practical per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate in details with examples Classes and Relationships
CO2. Specify the details of State diagrams
CO3. Identify in details with examples Events
CO4. Deliberate in details with examples Software quality assurance
CO5. Understand the details of Software quality assurance

Unit 1: **15 Hours**

Software Modeling: What is Modeling?, Classes, Relationships, Common Mechanisms, Diagrams, Class Diagrams, Advanced Relationships, Instances, Object Diagrams, Use Cases, Interaction/Activity Diagrams, Events, State Machines, Time, Space, State Diagrams and Events

Unit 2: **15 Hours**

Software Quality Assurance: Software Quality, Quality Assurance, Testing Concepts and Issues, Testing Activities, Testing Techniques. Other Techniques, Defect Prevention/Process Improvement, Inspection, Refactoring, CRC, Software Reliability Engineering, Quality Models and Measurements

Reference:

1. Modeling for Software Quality Assurance (English, Paperback, Srivyshnavi Pagadala)
2. Modeling for Software Quality Assurance Paperback – Import, 16 Nov 2013 by Srivyshnavi Pagadala

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDD560

ENVIRONMENTAL STUDIES

Credits: 3 (45 Hours)

(3 Hours of Theory per week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate the details of Components of environment
CO2. Specify the details of Ecology and Ecosystems
CO3. Identify in details with examples Natural resources
CO4. Learn the details of Biodiversity
CO5. Specify in details with examples Environmental pollution
CO6. Identify the details of Environmental issues and policies

Unit 1: Environment and natural systems **4 Hours**

- Introduction to Environment and Environmental Studies
- Definition and Components of Environment, Relationship between the different components of Environment
- Man and Environment relationship
- Impact of technology on Environment, Environmental Degradation
- Multidisciplinary nature of the Environment studies
- Its scope and importance in the present day Education System

Unit 2: Ecology and Ecosystems **5 Hours**

- Introduction: Ecology- Objectives and Classification
- Concept of an ecosystem- structure and functions of ecosystem
- Components of ecosystem- Producers, Consumers, Decomposers
- Bio-Geo- Chemical Cycles- Hydrologic Cycle, Carbon cycle, Energy Flow in Ecosystem, Food Chains, Food webs, Ecological Pyramids
- Major Ecosystems: Forest Ecosystem, Grassland Ecosystem, Desert Ecosystem, Aquatic Ecosystem, Estuarine Ecosystem**.**

Unit 3: Natural Resources **6 Hours**

Renewable and Non-renewable resources, exploitation and conservation,

- Water resources: Surface and Ground water sources, Indian and Global scenario.
- Land as a resource, land use change and land degradation
- Forest resources: Definition and Classification of Forests
  Ecological and Economic importance and benefits of forest, Indian scenario
  Deforestation: causes and effects, case studies remedial measures
- Food resources: Sources of food, Global and Indian food demand scenario
  Limits of food production, Environmental effects of Agriculture
- Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies
- Mineral resources: Definition and Classification of minerals, mining issues
  Case studies
- Role of individual in conservation of natural resources.

Unit 4: Biodiversity and its Conservation 7 Hours

- Biodiversity: Definition, Levels of biological diversity: genetic, species and ecosystem diversity
- Bio geographic zones of India
- Hot spots of biodiversity
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational values
- Biodiversity patterns
- India as a mega-biodiversity nation
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit 5: Environmental pollution 6 Hours

- Types of Environmental Pollution:
- Water Pollution: Introduction – Water Quality Standards, Sources of Water Pollution: Industrial Agricultural, Municipal; Classification of water pollutants, Effects of water pollutants, Eutrophication.
- Marine pollution: Causes, effects and control.
- Air Pollution: Composition of air, Structure of atmosphere, Ambient Air Quality Standards, Classification of air pollutants, Sources of common air pollutants like PM, SO2, NOX, Natural & Anthropogenic Sources, Effects of common air pollutants
- Soil Pollution: causes, effects and control.
- Noise Pollution: Introduction, Sound and Noise, Noise measurements, Causes and Effects
- Thermal Pollution: Causes, effects and control.
- Nuclear hazards and human health risks.
- Solid waste management: Control measures of urban and industrial waste.
- Role of individual in the prevention of pollution, Pollution case studies.

Unit 6: Sustainable development and Environmental issues and Policies 7 Hours

- Sustainable development: Meaning, changes in resource utilization.
- Water conservation: watershed management and Rain water harvesting.
- Environmental issues: Climate change, global warming, acid rain, ozone layer depletion.
- Disaster management: floods, drought, earthquake, cyclones and landslides.
- Wasteland reclamation.
- Environment Protection Act: Air, Water, Wildlife (Prevention and Control of Pollution)
- Forest Conservation Act.
- Issues involved in enforcement of environmental legislation.
- Environment: rights and duties**.**

Unit 7: Human Population and the Environment **5 Hours**

- Population growth, Explosion, demographic variation among nations.
- Family welfare Program.
- Environment, human health and welfare; infectious and lifestyle diseases in contemporary world.
- Value Education: Environmental ethics.
- HIV/AIDS
- Women and Child welfare.
- Role of information technology in Environment and human health

Unit 8: Field visit **5 Hours**

- Field work Visit to an area to document environmental assets river/ forest/ grassland/ hill/ mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Visit to the solid waste treatment plant and water treatment plant.
- Video: The one degree (Equal to 5 lectures)

Reference:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition, 2013 Publisher: Universities Press (India) Private Ltd, Hyderabad.
2. Basics of Environmental Studies by Prof Dr N S Varandani,2013 Publisher: LAP – Lambert Academic Publishing, Germany.
3. Environmental Studies by Anindita Basak, 2009 Publisher: Drling Kindersley (India) Pvt. Ltd Pearson
4. Textbook of Environmental Studies by Deeksha Dave & S S Kateva, Cengage Publishers.
5. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons.
6. Environmental Studies by R. Rajagopalan, Oxford University Press
7. Environmental Studies by Benny Joseph, TMH publishers
8. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by: S K Kataria & Sons New Delhi
9. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill.
10. Environmental Studies by N. Arumugam & V.Kumaresan, Sara's publication.

SDE 510

SEMESTER V

PROJECT MANAGEMENT

Credits: 4 (60 Hours)

(2 Hour of Theory and 2 Hours of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand in depth Project plan
CO2. Identify the details of User controlled scheduling
CO3. Deliberate the details of Adding tasks
CO4. Understand in details with examples Adding work resources
CO5. Learn the details of Calendar

Unit 1: **15 Hours**

Creating a Project Plan
User-Controlled Scheduling
Adding Tasks
Resolving Common Scheduling Issues

Unit 2: **15 Hours**

Adding Work Resources
Adding Material and Cost Resources
Defining a Calendar
Viewing and Tracking Project Information Gantt Charts

Reference:

1. Project Management for Dummies, 5ed Paperback – 2017 by Stanley E. Portny
2. Project Management 3rd Edition (English, Paperback, Maylor)

Practicals

(2 Hours per week X 15 Weeks = 30 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDE 520

CONFIGURATION MANAGEMENT

Credits: 4 (60 Hours)

(3 Hour of Theory and1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Specify in depth Configuration management

CO2. Understand the details of Configuration management planning

CO3. Deliberate the details of Configuration control

CO4. Learn in details with examples Configuration status accounting

CO5. Identify the details of Configuration audits

Unit 1: **15 Hours**

DEFINING CONFIGURATION MANAGEMENT: CM principles and standards, the recent growth of CM

CM PLANNING: Program phasing and milestones, Creating the CM organization, Defining CM system requirements, CM job classifications

CONFIGURATION IDENTIFICATION: First tasks of CM, Configurations & Baselines, Requirements traceability, Item identification and numbering

Unit 2: **15 Hours**

ENGINEERING RELEASE: Control of technical data, the document control process, Development vs. formal release

CONFIGURATION CONTROL: Defining a closed-loop process, Change classifications, Review boards and CCBs, Processing changes and RDWs

INTRODUCTION TO SOFTWARE CONFIGURATION MANAGEMENT: Specific software CM tasks, SEI evaluation criteria

Unit 3: **15 Hours**

CONFIGURATION STATUS ACCOUNTING: Defining CSA tasks and tailoring, Status accounting elements, Understanding the impact

CM PLANS: CMP preparation techniques, Software CMPs, Assessments and Plans

General procedures and work flow

CONFIGURATION AUDITS: Internal and informal audits, developing the audit plan, The Functional and Physical Audits

Reference:

1. Jessica Keyes, Software Configuration Management, Auerbach Publications, 2004
2. Anne Hass , Configuration Management Principles and Practice, Addison Wesley, 2002

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDE 530

HUMAN COMPUTER INTERACTION

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Learn the details of Introduction of human computer interface

CO2. Understand the details of Human consideration in screen design

CO3. Identify in details with examples Windows

CO4. Deliberate in depth Multimedia and coloring

CO5. Specify in details with examples Hypermedia

Unit 1: 20 Hours

Introduction-Importance-Human-Computer interface-characteristics of graphics interface-Direct manipulation graphical system - web user interface-popularity-characteristic & principles. User interface design process- obstacles-usability-human characteristics in design - Human interaction speed-business functions-requirement analysis-Direct-Indirect methods-basic business functions-Design standards-system timings - Human consideration in screen design - structures of menus - functions of menus-contents of menu-formatting -phrasing the menu - selecting menu choice-navigating menus-graphical menus.

Unit 2: 13 Hours

Windows-Characteristics-components-presentation-styles-types-managements-organizations-operations-web systems-device-based controls: characteristics-Screen -based controls: operate control - text boxes-selection control-combination control-custom control-presentation control.

Unit 3: 12 Hours

Text for web pages - effective feedback-guidance & assistance-Internationalization-accesssibility-Icons-Image-Multimedia –coloring, Windows layout-test: prototypes - kinds of tests - retest - Information search - visualization - Hypermedia - www - Software tools.

Reference:

1. Human-Computer Interaction, 3e Paperback – 2004 by Dix
2. Human Computer Interaction Paperback – 2014 by Meena K
3. Human-Computer Interaction Third Edition Paperback – Import, 24 Aug 2018 by Gerardus Blokdyk

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDF 510

SEMESTER VI

OPERATING SYSTEM

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Identify the Characteristics of operating system
CO2. Deliberate in depth Scheduling algorithms
CO3. Learn in depth Semaphores
CO4. Specify the details of Message passing
CO5. Understand the details of Deadlock
CO6. Identify in details with examples File organisation

Unit 1: **15 Hours**

Overview of operating systems, functionalities and characteristics of OS
Hardware concepts related to OS, CPU states, I/O channels, memory hierarchy and microprogramming
The concept of a process, operations on processes, process states, concurrent processes, process control block, process context
UNIX process control and management, PCB, signals, forks and pipes
Interrupt processing, operating system organisation, OS kernel FLIH and dispatcher.
Job and processor scheduling, scheduling algorithms, process hierarchies.
Problems of concurrent processes, critical sections, mutual exclusion, synchronisation, deadlock.

Unit 2: **15 Hours**

Mutual exclusion, process co-operation, producer and consumer processes.
Semaphores: definition, init, wait, signal operations.
Use of semaphores to implement mutex, process synchronisation etc., implementation of semaphores, Critical regions, Conditional Critical Regions, Monitors, Ada Tasks
Interprocess Communication (IPC), Message Passing, Direct and Indirect

Unit 3: **15 Hours**

Deadlock: prevention, detection, avoidance, banker's algorithm.
Memory organisation and management, storage allocation
Virtual memory concepts, paging and segmentation, address mapping.
Virtual storage management, page replacement strategies
File organisation: blocking and buffering, file descriptor, directory structure, File and Directory structures, blocks and fragments, directory tree, inodes, file descriptors, UNIX file structure.

Reference:

1. D.M Dhamdhere: Operating systems - A concept based Approach, 3rd Edition, Tata McGraw- Hill, 2012.
2. P.C.P. Bhatt: Introduction to Operating Systems Concepts and Practice, 3rd Edition, PHI, 2010.
3. Harvey M Deital: Operating systems, 3rd Edition, Pearson Education, 2011.

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDF 550

DATABASE DESIGN

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Understand the details of Database terminology and information types
CO2. Specify in depth Database planning and designing
CO3. Learn the details of Cloud computing
CO4. Specify the details of Sets and normalization
CO5. Specify in depth Report writing
CO6. Understand in details with examples Customer service management

Unit 1 **15 Hours**

Database Basics
Introduction to Devise Digital Storage
Database Terminology & Database Information Types
Microsoft Excel versus Microsoft Access
Database Planning
Database Objects – Creating Fields and Tables
Planning and Designing a Database

Unit 2 **15 Hours**

Introduction to Cloud Computing
Database Relationships
Designing for the Business Case
Introduction to Data Security & Data Archives
Managing the Database
Database Relationship Development
Introduction to Visual Data Analytics
Introduction to Sets & Normalization
Database Extractions

Unit 3 **15 Hours**

Database Queries and Basic SQL
Emergence of Social Media Databases
Database Distribution
Report Writing
Introduction to Customer Service Management
Computing Databases
Database Inputs
Form Development

Reference:

1. Korth, Slberchatz, Sudarshan:"Database System Concepts", 6th Edition, McGraw – Hill
2. Elmasri and Navathe: "Fundamentals of Database Systems", 5thEdition, PEARSON Education.
3. Peter Rob and Carlos Coronel: "Database Systems Design, Implementation and Management", Thomson Learning, 5th Edition.

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

SDF 520

COMPUTER NETWORKS & SECURITY FUNDAMENTALS

Credits: 4 (60 Hours)

(3 Hours of Theory and 1 Hour of Practical per Week)

Course Outcome:

After completion of the course, the students are able to:

CO1. Deliberate the details of OSI model
CO2. Learn the details of Switches
CO3. Understand the details of Protocols and services
CO4. Identify in depth Security
CO5. Learn in depth Encryption
CO6. Specify the details of E-mail and server protection

Unit 1 **15 Hours**

COMPUTER NETWORKS
Network Infrastructure - Internet, intranet, and extranet.
Understand the OSI model.
TCP/IP
Local area networks (LANs), Wide area networks (WANs).
Network topologies and access methods
Network Hardware - switches.

Unit 2 **15 Hours**

Routers, media types
Protocols and Services
Understand IPv4 & IPv6.
Addressing names resolution & networking services.
SECURITY
Understanding Security Layers Principles, Physical, Wireless, Internet & Operating System Security

Unit 3 **15 Hours**

User authentication, permissions, password, audit policies, encryption, malware,
Network Security & dedicated firewalls.
Network Access Protection (NAP), network isolation, Protocol security, client, e-mail & server protection

Reference:

1. Fundamentals of Computer Networks Kindle Edition by SUDAKSHINA KUNDU
2. Introduction to Computer and Network Security Hardcover – 21 Aug 2013 by Richard R. Brooks

Practicals

(1 Hour per week X 15 Weeks = 15 Hours)

Experiments are based on topics mention in the Paper designed by concerned Faculty

QUESTION PAPER SCHEME

JSS MAHAVIDYAPEETHA
JSS College of Arts, Commerce & Science
(Autonomous)
Ooty Road, Mysore - 570 025
Title of the paper with code

Time: 3 Hours **Max Marks: 70**

Part – A

I Answer any five Questions (out of six) 2x5=10

a)

b)

c)

d)

e)

f)

Part – B

Answer any two questions from each main

II a) 2x5=10

b)

c)

III a) 2x5=10

b)

c)

IV a) 2x5=10

b)

c)

Part – C

Answer any one question from each main

V	a)		1x10=10
	Or		
	b)		
VI	a)		1x10=10
	Or		
	b)		
VII	a)		1x10=10
	Or		
	b)		

Question numbers V, VI and VII internal split-up (5+5, 7+3, 2+8 etc.)

QUESTION PAPER SCHEME

TIME: 3 Hrs **MAX MARKS: 70**

Instructions to Students: All sections are compulsory.

SECTION A

I Fill in the blanks with correct form of verbs 5 X 1 = 05

a)
b)
c)
d)
e)

II Change the voice of the following sentences 5 X 1 = 05

a)
b)
c)
d)
e)

III Fill in the blanks with suitable article 5 X 1 = 05

a)
b)
c)
d)
e)

IV Change the speech of the following 5 X 1 = 05

a)
b)
c)
d)
e)

V Add question tag to the following 5 X 1 = 05

a)
b)
c)
d)
e)

VI Frame questions so as to get the underlined words as answers 5 X 1 = 05

a)
b)
c)
d)
e)

SECTION B

VII 10 X 1 = 10

1. Write a letter of application
   Or
2. Prepare a Resume.

VIII Read the following essay carefully and answer the questions. 10 X 1 = 10

a)
b)
c)
d)
e)

IX Write an essay on one of the following: 10 X 1 = 10

a)
b)
c)

X Answer the following (Dialogue writing) 5 X 2 = 10

1)
2)

QUESTION PAPER PATTERN

Section A

Q1: Six questions of two marks each .Five questions to be answered $5 \times 2 = 10$

1.
2.
3.
4.
5.
6.

Section B

Answer any four questions from each main. Each main carries 20 marks 3 X 20 = 60

Q2: Five sub questions of 5 marks each from unit 1

Q3: Five sub questions of 5 marks each from unit 2

Q4: Five sub questions of 5 marks each from unit 3

Skill Component Syllabus

Model Curriculum

JUNIOR SOFTWARE DEVELOPER

JUNIOR SOFTWARE DEVELOPER

SECTOR:	**IT-ITeS**
SUB-SECTOR:	**IT Services**
OCCUPATION:	**Application Development**
REFERENCE ID:	**SSC/Q0508, version 1.0**
NSQF LEVEL:	**4**

IT - ITeS SSC NASSCOM

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Table of Contents

Junior Software Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Junior Software Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Junior Software Developer**		
Qualification Pack Name & Reference ID.	Junior Software Developer SSC/Q0508, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	10th Standard		
Training Outcomes	**After completing this programme, participants will be able to:** • assist in performing software construction and software testing entry-level tasks in the IT Services industry • manage work to meet requirements • maintain a healthy, safe and secure working environment		

The Course encompasses all six National Occupational Standards (NOS) of **Junior Software Developer SSC/Q0508** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Basics of IT	05:00	15:00	Candidates will be able to: • Demonstrate basic computer and internet literacy including operating a computer, describing its major components and how they work, using Windows and Linux OS, operating a browser, searching the internet, managing mails and using social internet media.	SSC/N0506	Refer to Unique Equipment Required section
2	Problem Solving and Program Design	30:00	60:00	Candidates will be able to: • Demonstrate aptitude for analysing information and making logical conclusions.	SSC/N0506	Refer to Unique Equipment Required section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Demonstrate knowledge of the foundational mathematical concepts in computing.		
3	Basic Algorithms and Application Development	30:00	60:00	Candidates will be able to: • Design algorithms to solve problems and convert them into code using the appropriate programming language constructs. • Read and execute a test case and record the outcome in the appropriate template. • Communicate effectively with appropriate people w.r.t. assigned roles in simple English – both oral and written.	SSC/N0506	Refer to Unique Equipment Required section
4	Self and work Management	30:00	70:00	Candidates will be able to: • Establish and agree work requirements with appropriate people • Keep immediate work area clean and tidy • Utilize time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of job role • Obtain guidance from appropriate people, where necessary • Ensure work meets the agreed requirements	SSC/N9001	Refer to Unique Equipment Required section
5	Team Work and Communication	12:00	38:00	Candidates will be able to: • Obtain guidance from appropriate people to agree the analysis to be performed on the data • Obtain advice and guidance from appropriate people on issues with data analysis	SSC/N9002	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				outside their area of competence or • Review the results of their analysis with appropriate people • Undertake modifications to your analysis based on inputs from appropriate people • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • Carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out your commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues		
6	Managing Health and Safety	12:00	38:00	Candidates will be able to: • Comply with organization's current health, safety and security policies and procedures • Report any identified breaches in health, safety, and security policies and procedures to the designated person • Identify and correct any hazards that can deal with	SSC/N9003	Refer to Unique Equipment Required section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				safely, competently and within the limits of authority • Report any hazards that one is not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their organization's emergency procedures promptly, calmly, and efficiently • Identify and recommend opportunities for improving health, safety, and security to the designated person • Complete any health and safety records legibly and accurately		
7	Data and Information Management	15:00	35:00	Candidates will be able to: • Establish and agree with appropriate people the data/information they need to provide, the formats in which you need to provide it, and when they need to provide it • Obtain the data/information from reliable sources • Check that the data/information is accurate, complete and up-to-date • Obtain advice or guidance from appropriate people where there are problems with the data/information • Carry out rule-based analysis of the data/information, if required • Insert the data/information into the agreed formats • Check the accuracy of work, involving colleagues where required • Report any unresolved anomalies in the	SSC/N9004	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				data/information to appropriate people • Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		
8	Learning and Self Development	05:00	20:00	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop your knowledge, skills and competence • Identify accurately the knowledge and skills they need for your job role • Identify accurately their current level of knowledge, skills and competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address their learning needs • Undertake learning and development activities in line with their plan • Apply new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them • Review their knowledge, skills and competence regularly and take appropriate action	SSC/N9005	Refer to Unique Equipment Required Section
	Total Duration:	**114:00**	**286:00**	**Unique Equipment Required:** Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome.		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				For Domain NOS, For NOS SSC/N0506 – HTML, C++ / Java, IDE General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning • White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • Presentation Tools to support learning activities: • Intranet • Email • IMs • Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities • Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets • For IT Lab sessions: Computer Lab with 1:1 PC : trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client and chat tools. • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition. • Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This Syllabus/Curriculum has been approved by **IT-ITeS Sector Skills Council NASSCOM**.)*

Notes from IT-ITeS Sector Skills Council NASSCOM

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.
2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required to document program structure and code (in SSC/N0506) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,
    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure1: Assessment Criteria

Assessment Criteria for Junior Software Developer	
Job Role	**Junior Software Developer**
Qualification Pack	**SSC/Q0508**
Sector Skill Council	**IT-ITeS**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	**Assessment criteria** (PC)	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
1.SSC/N0506 (Deal remotely with customer queries - Domestic)	PC1. greet customers and verify details, following your organization's procedures	**120**	12.5	2.5	10
	PC2. read carefully, summarize, and obtain **customer** confirmation of, your understanding of queries		12.5	2.5	10
	PC3. express your concern for any difficulties caused and your commitment to resolving queries		15	0	15
	PC4. record and categorize queries accurately using your organization's query management tool		5	0	5
	PC5. refer queries outside your area of competence or authority promptly to appropriate people		2.5	0	2.5
	PC6. access your organization's knowledge base for solutions to queries, where available		2.5	0	2.5
	PC7. resolve queries within your area of competence or authority in line with organizational guidelines and service level agreements (SLAs)		15	0	15
	PC8. obtain advice and guidance from appropriate people, where necessary		2.5	0	2.5
	PC9. obtain confirmation from **c**ustomers that queries have been resolved to satisfaction		10	0	10

	PC10. record the resolution of queries accurately using your organization's query management tool		35	15	20
	PC11. comply with relevant standards, policies, procedures and guidelines when dealing remotely with customer queries		7.5	0	7.5
		NOS Total	**120**	**20**	**100**
2.SSC/N9001 (Manage your work to meet requirements)	PC1. establish and agree your work requirements with appropriate people	**40**	10	5	5
	PC2. keep your immediate work area clean and tidy		5	0	5
	PC3. utilize your time effectively		5	5	0
	PC4. use resources correctly and efficiently		5	2.5	2.5
	PC5. treat confidential information correctly		5	0	5
	PC6. work in line with your organization's policies and procedures		2.5	0	2.5
	PC7. work within the limits of your job role		2.5	0	2.5
	PC8. obtain guidance from appropriate people, where necessary		2.5	0	2.5
	PC9. ensure your work meets the agreed requirements		2.5	0	2.5
		NOS Total	**40**	**12.5**	**27.5**
3.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with your organization's current health, safety and security policies and procedures	**40**	10	5	5
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		5	0	5
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		10	5	5
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		5	0	5
	PC5. follow your organization's emergency procedures promptly, calmly, and efficiently		5	0	5
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		2.5	0	2.5
	PC7. complete any health and safety records legibly and accurately		2.5	0	2.5
		NOS Total	**40**	**10**	**30**

Annexure2: Trainer Prerequisites for Job role: Junior Software Developer mapped to Qualification Pack: SSC/Q0508

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0508.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum 12th Standard; Preferred Master's degree in any discipline
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0508. Additional certification in customer orientation, dealing with difficult customers, written communication etc. will be an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70% per NOS.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

IT - ITeS SSC
NASSCOM

4E-Vandana Building (4th Floor)
11, Tolstoy Marg
New Delhi-110001
Phone: 91-11- 4151 9230/60
Fax: 91-11- 4151 9240
Email: ssc@nasscom.in

Model Curriculum

WEB DEVELOPER

WEB DEVELOPER

SECTOR: **IT-ITeS**
SUB-SECTOR: **IT Services**
OCCUPATION: **Application Development**
REFERENCE ID: **SSC/Q0503, version 1.0**
NSQF LEVEL: **5**

IT - ITeS SSC NASSCOM

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Table of Contents

Web Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Web Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Web Developer**		
Qualification Pack Name & Reference ID.	Web Developer SSC/Q0503, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	Graduate degree/ diploma in web design/ media design or any other related field		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop media content and graphic designs for software products and Applications • Manage their work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop their knowledge, skills and competence		

The Course encompasses all seven National Occupational Standards (NOS) of **Web Developer SSC/Q0503** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1	Programming for the Web	20:00	30:00	Candidates will be able to: • Design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD	SSC/N0501	Refer to Unique Equipment Required Section
2	Analysis and Design of Web based Applications	20:00	30:00	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS)/User	SSC/N0501	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				Requirements Specification (URS) with appropriate people • Check their understanding of the Software Requirements Specification (SRS) with appropriate people • Check their understanding of High Level Design (HLD) with appropriate people • Review their designs with appropriate people • Analyse inputs from appropriate people to identify, resolve and record design defects and inform future designs • Document their designs using standard templates and tools • Comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		
3	Media Content and Graphics Design	20:00	80:00	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • Access reusable components, media and graphical packages and tools from their organization's knowledge base	SSC/N0503	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Convert requirements into media content and graphic designs, leveraging reusable components where available • Review media content and graphic designs with appropriate people and analyze their feedback • Record any defects and corrective actions taken to inform future work • Rework media content and graphic designs, incorporating feedback • Submit media content timely and graphic designs for approval by appropriate people • Update their organization's knowledge base with their experiences of the media content and graphic designs developed • Comply with their organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		
4	Self and work Management	12:00	38:00	Candidates will be able to: • Establish and agree their work requirements with appropriate people • Keep their immediate work area clean and tidy • utilize their time effectively	SSC/N9001	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of their job role • Obtain guidance from appropriate people, where necessary • Ensure their work meets the agreed requirements		
5	Team Work and Communication	12:00	38:00	Candidates will be able to: • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out their commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues	SSC/N9002	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
6	Managing Health and Safety	05:00	20:00	Candidates will be able to: • Comply with their organization's current health, safety and security policies and procedures • Report any identified breaches in health, safety, and security policies and procedures to the designated person • Identify and correct any hazards that they can deal with safely, competently and within the limits of their authority • Report any hazards that they are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their organization's emergency procedures promptly, calmly, and efficiently • Identify and recommend opportunities for improving health, safety, and security to the designated person • Complete any health and safety	SSC/ N 9003	
7	Data and Information Management	15:00	35:00	Candidates will be able to: • Establish and agree with appropriate people the data/information they need to provide, the formats in which they need to provide it, and when they need to provide it	SSC/N9004	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Obtain the data/information from reliable sources • Check that the data/information is accurate, complete and up-to-date • Obtain advice or guidance from appropriate people where there are problems with the data/information • Carry out rule-based analysis of the data/information, if required • Insert the data/information into the agreed formats • Check the accuracy of their work, involving colleagues where required • Report any unresolved anomalies in the data/information to appropriate people • Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		
8	Learning and Self Development	5:00	20:00	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop their knowledge, skills and competence • Identify accurately the knowledge and skills they need for their job role • Identify accurately their current level of knowledge, skills and	SSC/N9005	Refer to Unique Equipment Required Section

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address their learning needs • Undertake learning and development activities in line with their plan • Apply their new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their knowledge and skills and how effectively they apply them • Review their knowledge, skills and competence regularly and take appropriate action		
	Total Duration:	**109:00**	**291:00**	**Unique Equipment Required**: Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome. For Domain NOSs: • NOS SSC/N0501: HTML5, Javascript, CSS, SQL, Web Builder, Word Press, Joomla and modelling tools such as Visio, UML • NOS SSC/N0503: HTML5, CSS, Flash, Photoshop, Windows media player, Eclipse, XAMPP General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required

				• White Board, Markers and Eraser
				• Projector with screen
				• Flip chart with markers
				• Faculty's PC/Laptop with latest configuration and internet connection
				• Supporting software / applications for projecting audio, video, recording,
				• Presentation Tools to support learning activities:
				  ○ Intranet
				  ○ Email
				  ○ IMs
				  ○ Learning management system e.g. Moodle, Blackboard to enable blended learning
				• Microphone / voice system for lecture and class activities
				• Handy Camera
				• Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets
				• For IT Lab sessions: Computer Lab with 1:1 PC:trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook/ other Email Clients
				• Assessment and Test Tools for day to day online Tests and Assessments
				• For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition.
				• Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This Syllabus/Curriculum has been approved by **IT-ITeS Sector Skills Council NASSCOM**.)*

Notes from IT-ITeS Sector Skills Council

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.
2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required write design specifications (in SSC/N0501) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,
    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration, and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure 1: Assessment Criteria

Assessment Criteria for Web Developer	
Job Role	**Web Developer**
Qualification Pack	**SSC/Q0503**
Sector Skill Council	**IT-ITeS**

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	**ASSESSMENT CRITERIA** (PC)	**TOTAL MARKS**	**OUT OF**	**THEORY**	**SKILLS PRACTICAL**
1. SSC/N0501 (Contribute to the design of software products and applications)	PC1. check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check their understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check their understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review their designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	5	10
	PC7. document their designs using standard templates and tools		10	0	10
	PC8. comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	40	60
2. SSC/N0503 (Develop media	PC1. check their understanding of the Business Requirements Specification (BRS), Software	**100**	10	10	0

content and graphic designs for software products and Applications)	Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people				
	PC2. access reusable components, media and graphical packages and tools from their organization's knowledge base		10	0	10
	PC3. convert requirements into media content and graphic designs, leveraging reusable components where available		20	0	20
	PC4. review media content and graphic designs with appropriate people and analyze their feedback		10	5	5
	PC5. record any defects and corrective actions taken to inform future work		10	0	10
	PC6. rework media content and graphic designs, incorporating feedback		10	5	5
	PC7. submit media content and graphic designs for approval by appropriate people		10	0	10
	PC8. update their organization's knowledge base with their experiences of the media content and graphic designs developed		10	0	10
	PC9. comply with their organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		10	0	10
		Total	100	20	80
3.SSC/N9001 (Manage their work to meet requirements)	PC1. establish and agree their work requirements with appropriate people		7.5	0	7.5
	PC2. keep their immediate work area clean and tidy		15	7.5	7.5
	PC3. utilize their time effectively		15	7.5	7.5
	PC4. use resources correctly and efficiently		15	7.5	7.5
	PC5. treat confidential information correctly	**100**	7.5	0	7.5
	PC6. work in line with their organization's policies and procedures		15	0	15
	PC7. work within the limits of their job role		7.5	0	7.5
	PC8. obtain guidance from appropriate people, where necessary		7.5	0	7.5
	PC9. ensure their work meets the agreed requirements		10	0	10
		Total	100	22.5	77.5
4.SSC/N9002 (Work effectively with colleagues)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate their work effectively with theirs		10	0	10

	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out their commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	100	20	80
5.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with their organization's current health, safety and security policies and procedures	**100**	20	10	10
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of their authority		20	10	10
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		10	0	10
	PC5. follow their organization's emergency procedures promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	100	30	70
6.SSC/N9004 (Provide data/information in standard formats)	PC1. establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it	**100**	15	15	0
	PC2. obtain the data/information from reliable sources		15	0	15
	PC3. check that the data/information is accurate, complete and up-to-date		15	5	10
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		5	5	0
	PC5. carry out rule-based analysis of the data/information, if required		20	0	20

	PC6. insert the data/information into the agreed formats		10	0	10
	PC7. check the accuracy of their work, involving colleagues where required		10	0	10
	PC8. report any unresolved anomalies in the data/information to appropriate people		5	5	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		5	0	5
		Total	100	30	70
7.SSC/N9005 (Develop their knowledge, skills and competence)	PC1. obtain advice and guidance from appropriate people to develop their knowledge, skills and competence		20	7	13
	PC2. identify accurately the knowledge and skills you need for their job role		14	7	7
	PC3. identify accurately their current level of knowledge, skills and competence and any learning and development needs		14	0	14
	PC4. agree with appropriate people a plan of learning and development activities to address their learning needs	**100**	7	0	7
	PC5. undertake learning and development activities in line with their plan		12	0	12
	PC6. apply their new knowledge and skills in the workplace, under supervision		12	0	12
	PC7. obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them		7	0	7
	PC8. review their knowledge, skills and competence regularly and take appropriate action		14	7	7
		Total	100	21	79

Annexure 2: Trainer Prerequisites for Job role: Web Developer mapped to Qualification Pack: SSC/Q0503

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0503.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum Graduate degree/ diploma in web design/ media design or any other related field; Preferred Master's Degree in Media Design
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0503. Certification in relevant software competencies: Software Development Certifications in C++, Embedded, C#, C, Java etc., is an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/1402". Minimum accepted score is 70%.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

IT-ITES SECTOR SKILLS COUNCIL NASSCOM

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Web Developer' QP No. 'SSC/Q0503 NSQF Level 5'

Date of issuance: December 31st, 2015

Valid up to*: December 31st, 2016

* Valid up to the next review date of the Qualification Pack

Authorised Signatory
Lakshmi Narayan
(Chairman, IT-ITeS Sector Skills Council NASSCOM)

4E-Vandana Building (4th Floor)
11, Tolstoy Marg
New Delhi-110001
Phone: 91-11- 4151 9230/60
Fax: 91-11- 4151 9240
Email: ssc@nasscom.in

Model Curriculum

Software Developer

SECTOR: IT-ITES
SUB-SECTOR: IT SERVICES
OCCUPATION: DATA SCIENTISTS
REF. ID: SSC/Q0401, VERSION 1.0
NSQF LEVEL: 7

Skill India

IT - ITeS SSC
NASSCOM

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

IT-ITES SECTOR SKILLS COUNCIL NASSCOM

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Software Developer**' QP No. '**SSC/Q0501 NSQF Level 7**'

Date of issuance: December 31st, 2015

Valid up to*: December 31st, 2016

* Valid up to the next review date of the Qualification Pack

Authorised Signatory
Lakshmi Narayan
(Chairman, IT-ITeS Sector Skills Council NASSCOM)

TABLE OF CONTENTS

Software Developer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of **Software Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies in the learner.

Program Name	**Software Developer**		
Qualification Pack Name & Reference ID.	Software Developer SSC/Q0501, version 1.0		
Version No.	1.0	**Version Update Date**	31/12/2015
Pre-requisites to Training	BSc (Stat, Math, Physics, Chemistry, Geology) or BE/ BTech		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop software code to specification • Manage their work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop their knowledge, skills and competence		

The Course encompasses all seven National Occupational Standards (NOS) of Software Developer SSC/Q0501 Qualification Pack issued by IT-ITeS Sector Skills Council NASSCOM.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Programming and Algorithms** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** SSC/N0501	Candidates will be able to: • Design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD	Refer to Unique Equipment Required Section
2	**Analysis and Design of Software Applications** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** SSC/N0501	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people • Check their understanding of the Software Requirements Specification (SRS) with appropriate people • Check their understanding of High Level Design (HLD) with appropriate people • Review their designs with appropriate people • Analyse inputs from appropriate people to identify, resolve and record design defects and inform future designs • Document designs using standard templates and tools • Comply with organization's policies, procedures and guidelines when contributing to the design of software products and applications	Refer to Unique Equipment Required Section
3	**Application Development** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 80:00 **Corresponding NOS Code** SSC/N0502	Candidates will be able to: • Check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • Access reusable components, code generation tools and unit testing tools from their organization's knowledge base • Convert technical specifications into code to meet the requirements, leveraging reusable components, where available • Create appropriate unit test cases (UTCs) • Review codes and UTCs with appropriate people • Execute UTCs and document results • Rework the code and UTCs to fix identified defects	Refer to Unique Equipment Required Section

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		• Analyse inputs from appropriate people to inform future designs • Record corrective actions for identified defects to inform future designs • Submit tested code timely for approval by appropriate people • Update their organization's knowledge base with their experiences of the code developed • Comply with their organization's policies, procedures and guidelines when developing software code to specification	
4	**Self and work Management** **Theory Duration** (hh:mm) 12:00 **Practical Duration** (hh:mm) 38:00 **Corresponding NOS Code** SSC/N9001	Candidates will be able to: • Establish and agree their work requirements with appropriate people • Keep their immediate work area clean and tidy • utilize their time effectively • Use resources correctly and efficiently • Treat confidential information correctly • Work in line with organization's policies and procedures • Work within the limits of their job role • Obtain guidance from appropriate people, where necessary • Ensure their work meets the agreed requirements	Refer to Unique Equipment Required Section
5	**Team Work and Communication** **Theory Duration** (hh:mm) 12:00 **Practical Duration** (hh:mm) 38:00 **Corresponding NOS Code** SSC/N9002	Candidates will be able to: • Communicate with colleagues clearly, concisely and accurately • Work with colleagues to integrate their work effectively with them • Pass on essential information to colleagues in line with organizational requirements • Work in ways that show respect for colleagues • carry out commitments they have made to colleagues • Let colleagues know in good time if they cannot carry out their commitments, explaining the reasons • Identify any problems they have working with colleagues and take the initiative to solve these problems • Follow the organization's policies and procedures for working with colleagues	Refer to Unique Equipment Required Section
6	**Managing Health and Safety** **Theory Duration** (hh:mm) 05:00	Candidates will be able to: • Comply with their organization's current health, safety and security policies and procedures • Report any identified breaches in health, safety, and security policies and procedures to the designated person • Identify and correct any hazards that they can deal	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 20:00 **Corresponding NOS Code** SSC/ N 9003	with safely, competently and within the limits of their authority • Report any hazards that they are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • Follow their organization's emergency procedures promptly, calmly, and efficiently • Identify and recommend opportunities for improving health, safety, and security to the designated person • Complete any health and safety	
7	**Data and Information Management** **Theory Duration** (hh:mm) 15:00 **Practical Duration** (hh:mm) 35:00 **Corresponding NOS Code** SSC/N9004	Candidates will be able to: • Establish and agree with appropriate people the data/information they need to provide, the formats in which they need to provide it, and when they need to provide it • Obtain the data/information from reliable sources • Check that the data/information is accurate, complete and up-to-date • Obtain advice or guidance from appropriate people where there are problems with the data/information • Carry out rule-based analysis of the data/information, if required • Insert the data/information into the agreed formats • Check the accuracy of their work, involving colleagues where required • Report any unresolved anomalies in the data/information to appropriate people • Provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time	Refer to Unique Equipment Required Section
8	**Learning and Self Development** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 20:00 **Corresponding NOS Code** **SSC/N9005**	Candidates will be able to: • Obtain advice and guidance from appropriate people to develop their knowledge, skills and competence • Identify accurately the knowledge and skills they need for their job role • Identify accurately their current level of knowledge, skills and competence and any learning and development needs • Agree with appropriate people a plan of learning and development activities to address their learning needs • Undertake learning and development activities in line with their plan • Apply their new knowledge and skills in the workplace, under supervision • Obtain feedback from appropriate people on their	Refer to Unique Equipment Required Section

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		knowledge and skills and how effectively they apply them • Review their knowledge, skills and competence regularly and take appropriate action	
	Total Duration **Theory Duration** **109:00** **Practical Duration** **291:00**	**Unique Equipment Required:** Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome. **For Domain NOSs:** • For NOS SSC/N0501: C/C++, UML tools such as Rational suite • For NOS SSC/N0502: JDK / Eclipse General: • Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning • White Board, Markers and Eraser • Projector with screen • Flip chart with markers • Faculty's PC/Laptop with latest configuration and internet connection • Supporting software / applications for projecting audio, video, recording, • **Presentation Tools to support learning activities:** o Intranet o Email o IMs o Learning management system e.g. Moodle, Blackboard to enable blended learning • Microphone / voice system for lecture and class activities • Handy Camera • Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets • For IT Lab sessions: Computer Lab with 1:1 PC: trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook/ other Email Clients • Assessment and Test Tools for day to day online Tests and Assessments • For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition. • Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.	

Grand Total Course Duration: 400 Hours 0 Minutes
(This Syllabus/Curriculum has been approved by IT-ITeS Sector Skills Council NASSCOM.)

Notes from IT-ITeS Sector Skills Council

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan.OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.

2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. For example, writing skills required to communicate results of testing (in SSC/N0501) are different from the writing skills required to prepare a time plan (in SSC/N9001). Training providers are advised to,

    a. Embed such skills development in the learning pedagogy for each expected outcome
    b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
    c. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training, optimal duration, and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Trainer Prerequisites for Job role: Software Developer mapped to Qualification Pack: SSC/Q0501

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0501.
2	**Personal Attributes**	Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in this field.
3	**Minimum Educational Qualifications**	Minimum Bachelor's Degree in Computer Science or any related field; Preferred Master's Degree in Computer Science
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in QP SSC/Q0501. Certification in relevant software competencies: Software Development Certifications in C++, Embedded, C#, C, Java etc., is an added advantage.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70%.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

Annexure: Assessment Criteria

Assessment Criteria for Software Developer	
Job Role	Software Developer
Qualification Pack	SSC/Q0501
Sector Skill Council	IT-ITeS

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
1.SSC/N0501 (CONTRIBUTE TO THE DESIGN OF SOFTWARE PRODUCTS AND APPLICATIONS)	PC1. check their understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check their understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check their understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review their designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	0	15
	PC7. document their designs using standard templates and tools		10	0	10
	PC8. comply with their organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	35	65
2.SSC/N0502 (DEVELOP SOFTWARE CODE TO SPECIFICATION)	PC1. check their understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	5	5	0
	PC2. access reusable components, code generation tools and unit testing tools from their organization's knowledge base		5	0	5
	PC3. convert technical specifications into code to meet the requirements, leveraging reusable components, where available		30	0	30
	PC4. create appropriate unit test cases (UTCs)		10	0	10
	PC5. review codes and UTCs with appropriate people		5	5	0
	PC6. execute UTCs and document results		5	0	5
	PC7. rework the code and UTCs to fix identified defects		10	0	10
	PC8. analyze inputs from appropriate people to inform future designs		5	5	0
	PC9. record corrective actions for identified defects to inform future designs		10	0	10
			5	5	0

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
	PC10. submit tested code for approval by appropriate people				
	PC11. update their organization's knowledge base with their experiences of the code developed		5	0	5
	PC12. comply with their organization's policies, procedures and guidelines when developing software code to specification		5	0	5
		Total	100	20	80
3.NOS/N9001 (MANAGE THEIR WORK TO MEET REQUIREMENTS)	PC1. establish and agree their work requirements with appropriate people	**100**	6.25	0	6.25
	PC2. keep their immediate work area clean and tidy		12.5	6.25	6.25
	PC3. utilize their time effectively		12.5	6.25	6.25
	PC4. use **resources** correctly and efficiently		18.75	6.25	12.5
	PC5. treat confidential information correctly		6.25	0	6.25
	PC6. work in line with their organization's policies and procedures		12.5	0	12.5
	PC7. work within the limits of their job role		6.25	0	6.25
	PC8. obtain guidance from appropriate people, where necessary		6.25	0	6.25
	PC9. ensure their work meets the agreed requirements		18.75	6.25	12.5
		Total	**100**	**25**	**75**
4.SSC/N9002 (WORK EFFECTIVELY WITH COLLEAGUES)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate their work effectively with theirs		10	0	10
	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out their commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	**100**	**20**	**80**
5.SSC/N9003 (MAINTAIN A	PC1. comply with their organization's current health, safety and security policies and procedures	**100**	20	10	10

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
HEALTHY, SAFE AND SECURE WORKING ENVIRONMENT)	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of their authority		20	10	10
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		10	0	10
	PC5. follow their organization's emergency procedures promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	**100**	**30**	**70**
6.SSC/N9004 (PROVIDE DATA/INFORMATION IN STANDARD FORMATS)	PC1. establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it	**100**	12.5	12.5	0
	PC2. obtain the data/information from reliable sources		12.5	0	12.5
	PC3. check that the data/information is accurate, complete and up-to-date		12.5	6.25	6.25
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		6.25	0	6.25
	PC5. carry out rule-based analysis of the data/information, if required		25	0	25
	PC6. insert the data/information into the agreed formats		12.5	0	12.5
	PC7. check the accuracy of their work, involving colleagues where required		6.25	0	6.25
	PC8. report any unresolved anomalies in the data/information to appropriate people		6.25	6.25	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		6.25	0	6.25
		Total	**100**	**25**	**75**
7.SSC/N9005 (DEVELOP THEIR KNOWLEDGE, SKILLS AND COMPETENCE)	PC1. obtain advice and guidance from appropriate people to develop their knowledge, skills and competence	**100**	10	0	10
	PC2. identify accurately the knowledge and skills you need for their job role		10	0	10
	PC3. identify accurately their current level of		20	10	10

				MARKS ALLOCATION	
ASSESSMENT OUTCOME (NOS CODE AND DESCRIPTION)	ASSESSMENT CRITERIA (PC)	TOTAL MARKS	OUT OF	THEORY	SKILLS PRACTICAL
	knowledge, skills and competence and any learning and development needs				
	PC4. agree with appropriate people a plan of learning and development activities to address their learning needs		10	0	10
	PC5. undertake learning and development activities in line with their plan		20	10	10
	PC6. apply their new knowledge and skills in the workplace, under supervision		10	0	10
	PC7. obtain feedback from appropriate people on their knowledge and skills and how effectively you apply them		10	0	10
	PC8. review their knowledge, skills and competence regularly and take appropriate action		10	0	10
		Total	**100**	**20**	**80**

Skill India
कौशल भारत-कुशल भारत

सत्यमेव जयते
GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT
& ENTREPRENEURSHIP

N·S·D·C
National
Skill Development
Corporation
Transforming the skill landscape

IT-ITeS Sector Skill Council
4E-Vandana Building (4th Floor) 11, Tolstoy Marg, New Delhi-110001

Model Curriculum

User Interface (UI) Developer

User Interface (UI) Developer

SECTOR: **IT-ITeS**
SUB-SECTOR: **IT Services**
OCCUPATION: **Application Development**
REFERENCE ID: **SSC/Q0502**
NSQF LEVEL: **7**

IT - ITeS SSC NASSCOM

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Table of Contents

User Interface (UI) Developer

Curriculum / Syllabus

This program is aimed at training candidates for the job of a **User Interface (UI) Developer** in the **IT-ITeS** Sector/Industry and aims at building the following key competencies amongst the learner.

Program Name	**User Interface (UI) Developer**		
Qualification Pack Name & Reference ID.	User Interface (UI) Developer SSC/Q0502		
Version No.	1.0	**Version Update Date**	31/01/2015
Pre-requisites to Training	Bachelor's Degree in Science/Technology/Computers or any graduate course		
Training Outcomes	**After completing this programme, participants will be able to:** • Contribute to the design of software products and applications • Develop software code to specification • Develop media content and graphic designs for software products and applications • Manage your work to meet requirements • Work effectively with colleagues • Maintain a healthy, safe and secure working environment • Provide data/information in standard formats • Develop your knowledge, skills and competence		

This course encompasses all Eight National Occupational Standards (NOS) of **User Interface (UI) Developer** Qualification Pack issued by **IT-ITeS Sector Skills Council NASSCOM**.

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
1.	Contribute to the design of software products and applications	17:00	33:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people • check your understanding of the Software Requirements Specification (SRS) with appropriate people • check your understanding of High Level Design (HLD) with appropriate people • design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD • review your designs with appropriate people	SSC/N0501	Refer to Unique Equipment Required

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs • document your designs using standard templates and tools • comply with your organization's policies, procedures and guidelines when contributing to the design of software products and applications		
2.	Develop software code to specification	20:00	80:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • access reusable components, code generation tools and unit testing tools from your organization's knowledge base • convert technical specifications into code to meet the requirements, leveraging reusable components, where available • create appropriate unit test cases (UTCs) • review codes and UTCs with appropriate people • execute UTCs and document results • rework the code and UTCs to fix identified defects • analyze inputs from appropriate people to inform future designs • record corrective actions for identified defects to inform future designs • submit tested code for approval by appropriate people • update your organization's knowledge base with your experiences of the code developed • comply with your organization's policies, procedures and guidelines when developing software code to specification	SSC/N0502	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
3.	Develop media content and graphic designs for software products and applications	12:00	38:00	Candidates will be able to: • check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people • access reusable components, media and graphical packages and tools from your organization's knowledge base • convert requirements into media content and graphic designs, leveraging reusable components where available • review media content and graphic designs with appropriate people and analyze their feedback • record any defects and corrective actions taken to inform future work • rework media content and graphic designs, incorporating feedback • submit media content and graphic designs for approval by appropriate people • update your organization's knowledge base with your experiences of the media content and graphic designs developed • comply with your organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications	SSC/N0503	
4.	Manage your work to meet requirements	12:00	38:00	Candidates will be able to: • establish and agree your work requirements with appropriate people • keep your immediate work area clean and tidy • utilize your time effectively • use resources correctly and efficiently • treat confidential information correctly • work in line with your organization's policies and procedures • work within the limits of your job role • obtain guidance from appropriate people, where necessary • ensure your work meets the agreed requirements	SSC/N9001	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
5.	Work effectively with colleagues	10:00	40:00	Candidates will be able to: • communicate with colleagues clearly, concisely and accurately • work with colleagues to integrate your work effectively with theirs • pass on essential information to colleagues in line with organizational requirements • work in ways that show respect for colleagues • carry out commitments you have made to colleagues • let colleagues know in good time if you cannot carry out your commitments, explaining the reasons • identify any problems you have working with colleagues and take the initiative to solve these problems • follow the organization's policies and procedures for working with colleagues	SSC/N9002	
6.	Maintain a healthy, safe and secure working environment	7:00	18:00	Candidates will be able to: • comply with your organization's current health, safety and security policies and procedures • report any identified breaches in health, safety, and security policies and procedures to the designated person • identify and correct any hazards that you can deal with safely, competently and within the limits of your authority • report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected • follow your organization's emergency procedures promptly, calmly, and efficiently • identify and recommend opportunities for improving health, safety, and security to the designated person	SSC/N9003	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• complete any health and safety records legibly and accurately		
7.	Provide data/information in standard formats	12:00	38:00	Candidates will be able to: • establish and agree with appropriate people the data/information you need to provide, the formats in which you need to provide it, and when you need to provide it • obtain the data/information from reliable sources • check that the data/information is accurate, complete and up-to-date • obtain advice or guidance from appropriate people where there are problems with the data/information • carry out rule-based analysis of the data/information, if required • insert the data/information into the agreed formats • check the accuracy of your work, involving colleagues where required • report any unresolved anomalies in the data/information to appropriate people • provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time	SSC/N9004	
8.	Develop your knowledge, skills and competence	5:00	20:00	Candidates will be able to: • obtain advice and guidance from appropriate people to develop your knowledge, skills and competence • identify accurately the knowledge and skills you need for your job role • identify accurately your current level of knowledge, skills and competence and any learning and development needs • agree with appropriate people a plan of learning and development activities to address your learning needs • undertake learning and development activities in line with your plan • apply your new knowledge and skills in the workplace, under supervision • obtain feedback from appropriate people on your knowledge and skills and how effectively you apply them	SSC/N9005	

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• review your knowledge, skills and competence regularly and take appropriate action		

	Total Duration:	**95:00**	**305:00**	**Unique Equipment Required:**
				Training room should be fully furnished with the following equipment / tools / accessories. Additional / specific resources, wherever applicable (e.g. Hardware, software) are indicated in the main text corresponding to relevant learning outcome.
				
				Domain NOS requirements
				• Visio, UML, freeminds, mockingbird
				• HTML 5, CSS, Java Script and SQL
				• IDEs such as Web Builder, Word Press, Joomla
				• Wordpress, psdGraphics etc.
				• HTML, CSS, Flash, Photoshop, Windows media player, Eclipse, XAMPP
				
				Common requirements
				• Comfortable seats with adequate lighting, controlled temperature and acoustics for training and learning
				• White Board, Markers and Eraser
				• Projector with screen
				• Flip chart with markers
				• Faculty's PC/Laptop with latest configuration and internet connection
				• Supporting software / applications for projecting audio, video, recording,
				• Presentation Tools to support learning activities:
				  ○ Intranet
				  ○ Email
				  ○ IMs
				  ○ Learning management system e.g. Moodle, Blackboard to enable blended learning
				• Microphone / voice system for lecture and class activities
				• Handy Camera
				• Stationery kit – Staples, Glue, Chart Paper, Sketch Pens, Paint Box, Scale, A4 Sheets
				• For IT Lab sessions: Computer Lab with 1:1 PC:trainee ratio and having internet connection, MS Office / Open office, Browser, Outlook / Any other Email Client and chat tools.
				• Assessment and Test Tools for day to day online Tests and Assessments
				• For team discussions: Adequate seating arrangement in full / half circle format for one or more teams as per planned team composition.		

Sr. No.	Module	Theory Duration (hh:mm)	Practical Duration (hh:mm)	Key Learning Outcomes	Corresponding NOS Code	Equipment Required
				• Reading Resources: Access to relevant sample documents and learning forums to enable self-study before and after each training session.		

Grand Total Course Duration: **400 Hours 0 Minutes**

*(This syllabus/ curriculum has been approved **IT-ITeS Sector Skills Council NASSCOM**.)*

Notes from IT-ITeS Sector Skills Council NASSCOM

1. This document outlines the broad scope of coverage. This should be linked with OBF and training delivery plan. OBF (Outcome based framework) reflects the pedagogy used to ensure an expected outcome. Training delivery plan focuses on the sequence of delivery.
2. Though many NOSs have some seemingly common outcomes, notably core/generic, professional and technical skills, it is imperative to understand the contextual difference between them. Training providers are advised to,
   a. Embed such skills development in the learning pedagogy for each expected outcome
   b. Prepare a detailed session plan for training delivery with focus on sequence and duration of training
3. Run a diagnostic test to assess prior learning of students and help trainers / students identify the need for gap training and suitable training methodology. Accordingly, more introductory level sessions may be included in guided or self-paced mode of learning. E.g. adding some sessions on Functional English or Use of Internet and MS Office.

Annexure1: Assessment Criteria

Assessment Criteria for <QP Name>	
Job Role	**User Interface (UI) Developer**
Qualification Pack	**SSC/Q0502**
Sector Skill Council	**IT-ITeS**

Sr. No.	**Guidelines for Assessment**
1	Criteria for assessment for each Qualification Pack (QP) will be created by the Sector Skill Council (SSC). Each performance criteria (PC) will be assigned Theory and Skill/Practical marks proportional to its importance in NOS.
2	The assessment will be conducted online through assessment providers authorised by SSC.
3	Format of questions will include a variety of styles suitable to the PC being tested such as multiple choice questions, fill in the blanks, situational judgment test, simulation and programming test.
4	To pass a QP, a trainee should pass each individual NOS. Standard passing criteria for each NOS is 70%.
5	For latest details on the assessment criteria, please visit www.sscnasscom.com.

Assessable Outcomes	**Assessment criteria for the outcome**	**Total Mark**	**Out of**	**Theory**	**Skills Practical**
1. SSC/N0501 (Contribute to the design of software products and applications)	PC1. check your understanding of the Business Requirements Specification (BRS)/User Requirements Specification (URS) with appropriate people	**100**	10	10	0
	PC2. check your understanding of the Software Requirements Specification (SRS) with appropriate people		10	10	0
	PC3. check your understanding of High Level Design (HLD) with appropriate people		10	10	0
	PC4. design basic programming structures to implement functionality in line with requirements defined in BRS/URS, SRS and HLD		30	0	30
	PC5. review your designs with appropriate people		5	5	0
	PC6. analyze inputs from appropriate people to identify, resolve and record design defects and inform future designs		15	0	15
	PC7. document your designs using standard templates and tools		10	0	10
	PC8. comply with your organization's policies, procedures and guidelines when contributing to the design of software products and applications		10	0	10
		Total	100	35	65
2. SSC/N0502 (Develop software code to specification)	PC1. check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	5	5	0
	PC2. access reusable components, code generation tools and unit testing tools from your organization's knowledge base		10	0	10

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
	PC3. convert technical specifications into code to meet the requirements, leveraging reusable components, where available		10	0	10
	PC4. create appropriate unit test cases (UTCs)		10	0	10
	PC5. review codes and UTCs with appropriate people		5	5	0
	PC6. execute UTCs and document results		10	0	10
	PC7. rework the code and UTCs to fix identified defects		10	0	10
	PC8. analyze inputs from appropriate people to inform future designs		5	5	0
	PC9. record corrective actions for identified defects to inform future designs		10	0	10
	PC10. submit tested code for approval by appropriate people		5	5	0
	PC11. update your organization's knowledge base with your experiences of the code developed		10	0	10
	PC12. comply with your organization's policies, procedures and guidelines when developing software code to specification		10	0	10
		Total	100	20	80
3. SSC/N0503 (Develop media content and graphic designs for software products and Applications)	PC1. check your understanding of the Business Requirements Specification (BRS), Software Requirements Specification (SRS), High Level Design (HLD) and Low Level Design (LLD) with appropriate people	**100**	10	10	0
	PC2. access reusable components, media and graphical packages and tools from your organization's knowledge base		10	0	10
	PC3. convert requirements into media content and graphic designs, leveraging reusable components where available		25	0	25
	PC4. review media content and graphic designs with appropriate people and analyze their feedback		10	10	0
	PC5. record any defects and corrective actions taken to inform future work		10	0	10
	PC6. rework media content and graphic designs, incorporating feedback		10	0	10
	PC7. submit media content and graphic designs for approval by appropriate people		5	5	0
	PC8. update your organization's knowledge base with your experiences of the media content and graphic designs developed		10	0	10
	PC9. comply with your organization's policies, procedures and guidelines when developing media content and graphic designs for software products and applications		10	0	10
		Total	100	25	75
4.SSC/N9001 (Manage your work to meet requirements)	PC1. establish and agree your **work requirements** with **appropriate people**	**100**	6.25	0	6.25
	PC2. keep your immediate work area clean and tidy		12.5	6.25	6.25
	PC3. utilize your time effectively		12.5	6.25	6.25
	PC4. use **resources** correctly and efficiently		18.75	6.25	12.5

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
	PC5. treat confidential information correctly		6.25	0	6.25
	PC6. work in line with your organization's policies and procedures		12.5	0	12.5
	PC7. work within the limits of your job role		6.25	0	6.25
	PC8. obtain guidance from **appropriate people**, where necessary		6.25	0	6.25
	PC9. ensure your work meets the agreed requirements		18.75	6.25	12.5
		Total	**100**	**25**	**75**
5.SSC/N9002 (Work effectively with colleagues)	PC1. communicate with colleagues clearly, concisely and accurately	**100**	20	0	20
	PC2. work with colleagues to integrate your work effectively with theirs		10	0	10
	PC3. pass on essential information to colleagues in line with organizational requirements		10	10	0
	PC4. work in ways that show respect for colleagues		20	0	20
	PC5. carry out commitments you have made to colleagues		10	0	10
	PC6. let colleagues know in good time if you cannot carry out your commitments, explaining the reasons		10	10	0
	PC7. identify any problems you have working with colleagues and take the initiative to solve these problems		10	0	10
	PC8. follow the organization's policies and procedures for working with colleagues		10	0	10
		Total	**100**	**20**	**80**
6.SSC/N9003 (Maintain a healthy, safe and secure working environment)	PC1. comply with your organization's current health, safety and security policies and procedures	**100**	20	10	10
	PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person		10	0	10
	PC3. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		20	10	10
	PC4. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		10	0	10
	PC5. follow your organization's **emergency procedures** promptly, calmly, and efficiently		20	10	10
	PC6. identify and recommend opportunities for improving health, safety, and security to the designated person		10	0	10
	PC7. complete any health and safety records legibly and accurately		10	0	10
		Total	**100**	**30**	**70**
	PC1. establish and agree with appropriate people the data/information you need to provide, the formats	**100**	12.5	12.5	0

Assessable Outcomes	Assessment criteria for the outcome	Total Mark	Out of	Theory	Skills Practical
7.SSC/N9004 (Provide data/information in standard formats)	in which you need to provide it, and when you need to provide it				
	PC2. obtain the data/information from reliable sources		12.5	0	12.5
	PC3. check that the data/information is accurate, complete and up-to-date		12.5	6.25	6.25
	PC4. obtain advice or guidance from appropriate people where there are problems with the data/information		6.25	0	6.25
	PC5. carry out rule-based analysis of the data/information, if required		25	0	25
	PC6. insert the data/information into the agreed formats		12.5	0	12.5
	PC7. check the accuracy of your work, involving colleagues where required		6.25	0	6.25
	PC8. report any unresolved anomalies in the data/information to appropriate people		6.25	6.25	0
	PC9. provide complete, accurate and up-to-date data/information to the appropriate people in the required formats on time		6.25	0	6.25
		Total	**100**	**25**	**75**
8.SSC/N9005 (Develop your knowledge, skills and competence)	PC1. obtain advice and guidance from appropriate people to develop your knowledge, skills and competence	**100**	10	0	10
	PC2. identify accurately the knowledge and skills you need for your job role		10	0	10
	PC3. identify accurately your current level of knowledge, skills and competence and any learning and development needs		20	10	10
	PC4. agree with appropriate people a plan of learning and development activities to address your learning needs		10	0	10
	PC5. undertake learning and development activities in line with your plan		20	10	10
	PC6. apply your new knowledge and skills in the workplace, under supervision		10	0	10
	PC7. obtain feedback from appropriate people on your knowledge and skills and how effectively you apply them		10	0	10
	PC8. review your knowledge, skills and competence regularly and take appropriate action		10	0	10
		Total	**100**	**20**	**80**

Annexure2: Trainer Prerequisites for Job role: User Interface (UI) Developer mapped to Qualification Pack: SSC/Q0502

Sr. No.	Area	Details
1	**Job Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack SSC/Q0502.
2	**Personal Attributes**	Aptitude to conduct training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field. The individual should be result oriented. The individual should also be able to demonstrate skills for communication, creative and logical thinking.
3	**Minimum Educational Qualifications**	Bachelor's Degree in Science/Technology/Computers or any graduate course
4a	**Domain Certification**	Minimum accepted score in SSC Assessment is 90% per NOS being taught in SSC/Q0502. Additional certification in computers/technology/ animation/graphics
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer" mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted score is 70% per NOS.
5	**Experience**	Field experience: Minimum 2 years' experience in the same domain Training experience: 1 year preferred

IT-ITeS Sector Skills Council NASSCOM
4E-Vandana Building (4th Floor), 11, Tolstoy Marg, New Delhi-110001
T +91 11 41519230/60 | F +91 11 41519240
www.sscnasscom.com | www.nasscom.in

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF COMPUTER SCIENCE

Syllabus

CHOICE BASED CREDIT SYSTEM

For BCA PROGRAMME

Bachelor of Computer Applications

2017-18

CBCS Syllabus - BCA for 2017-2018 onwards

		Course	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T: P	C1	C2			Marks
I Year	I Semester	DCA 21001	Computer Fundamentals & MIS	4	4	4:0:2	15	15	70	3 Hours	100
		DCA 23001	Computer System Organization and Architecture	4	4	4:0:2	15	15	70	3 Hours	100
		DCA 25001	Object Oriented Programming In C++	4	4	4:0:2	15	15	70	3 Hours	100
	II Semester	DCB 21001	Data Structures and File Processing	4	4	4:0:2	15	15	70	3 Hours	100
		DCB 23001	Operating Systems with Linux	4	4	4:0:2	15	15	70	3 Hours	100
		DCB 25001	Programming in JAVA	4	4	4:0:2	15	15	70	3 Hours	100
II Year	III Semester	DCC 21001	Discrete Mathematics & Logic Computation	5	1	5:1:0	15	15	70	3 Hours	100
		DCC 23001	Database Management Systems	4	4	4:0:2	15	15	70	3 Hours	100
		DCC 25001	Web Technologies	4	4	4:0:2	15	15	70	3 Hours	100
	IV Semester	DCD 21001	Numerical Analysis And Statistics	4	4	4:0:2	15	15	70	3 Hours	100
		DCD 23001	J2EE	4	4	4:0:2	15	15	70	3 Hours	100
		DCD 25001	Software Engineering & Software Testing	4	4	4:0:2	15	15	70	3 Hours	100
		DCD 31001	Mathematics	3	1	3:1:0	15	15	70	3 Hours	100
		DCD 33001	Business Mathematics	3	1	3:1:0	15	15	70	3 Hours	100
		DCD 35001	Accountancy & Financial Management	3	1	3:1:0	15	15	70	3 Hours	100
		DCD 37001	Entrepreneurship Development	3	1	3:0:1	15	15	70	3 Hours	100

		Course	Title	Hours / Week		Credits	Maximum Marks			Exam Duration	Total
							IA		Exam		
				L	T/ P	L:T:P	C1	C2			Marks
III Year	V Semester	DCE 21001	Data Communication and Computer Networks	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 23001	Computer Graphics	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 25001	Multimedia Systems and Applications	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 31001	ASP. Net	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 33001	Visual Programming	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 35001	Artificial Intelligence and Expert Systems	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 41001	Cloud Computing	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 43001	Enterprise Resource Planning	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 45001	Data Mining & Warehousing	4	3	4:0:1	15	15	70	3 Hours	100
		DCE 51001	Object Oriented Modelling& Design With UML	3	3	3:0:1	15	15	70	3 Hours	100
		DCE 53001	Analysis and Design of Algorithms	3	3	3:0:1	15	15	70	3 Hours	100
		DCE 55001	E-Commerce Technologies	3	3	3:0:1	15	15	70	3 Hours	100
	VI Semester	DCF 31001	Operation Research	4	3	4:0:1	15	15	70	3 Hours	100
		DCF 33001	System Software & Compiler design	4	3	4:0:1	15	15	70	3 Hours	100
		DCF 35001	Digital Image Processing	4	3	4:0:1	15	15	70	3 Hours	100
		DCF 40001	Project	0	12	0:0:6	15	15	70	3 Hours	100
		DCF 51001	PHP Programming	1	2	1:0:1	15	15	70	3 Hours	100
		DCF 53001	Computer Simulations	1	2	1:0:1	15	15	70	3 Hours	100
		DCF 55001	Information Security & Cyber Law	1	2	3:0:1	15	15	70	3 Hours	100

GENERAL RECOMMENDATIONS:

- Teacher who handles theory is completely responsible to prepare the lab exercise well in advance which has to be placed before the department meeting for approval.
- Related practical programs' skeleton has to be discussed in the theory class.
- Lab instructors

Assessment Maximum marks - 100

Course Type	C1		C2		C3 Exam Marks		Assigned Marks (Percentage)			Total
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab	IA	
DSC	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE (non practical)	**15**	**-**	**15**	**-**	**70**	**-**	**70**	**--**	**30**	**100**
SEC	**15**	**-**	**15**	**-**	**50**	**-**	**70**	**--**	**30**	**100**

Note:

1. **C1 will be conducted for 20 Marks (Theory) with one hour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.**
2. **C2 will be conducted for 20 Marks (Theory) with one hour duration - 10 Marks (Lab) with continuous assessment and it will be reduced to assigned marks.**
3. **C3 will be conducted for 70 Marks (Theory) with three hours duration - 70 Marks (Lab) with 3 hours duration and to be reduced to assigned marks.**
4. **For non-practical course C3 will be conducted for 70 Marks (Theory) with three hours duration.**
5. **In case of SEC, C1 and C2 will be conducted for 15 Marks each with one hour duration and C3 will be conducted for 50 Marks with 2 hours duration.**

Programme Outcomes

After completing the graduation in the Bachelor of Computer Applications the students are able to:

PO1. Get expected skills to be placed in IT sector and self-employment.
PO2. To develop abilities for data analysis and interpretation using ICT.
PO3. Acquire comprehensive knowledge with equal emphasis on theory and practice.
PO4. Analyze and apply latest technologies to solve problems in the areas of computer applications.
PO5. Develop the basic programming skills to enable students to build Utility tools.
PO6. Get the foundation knowledge for higher studies in the field of Computer Application.
PO7. Analyze and synthesis computing systems through quantitative and qualitative techniques
PO8. Develop practical skills to provide solutions to industry, society and business.
PO9. Work effectively both as an individual and a team leader on multidisciplinary projects.
PO10. Improves communication skills so that they can effectively present technical information in oral and written reports
PO11. To integrate ethics and values in designing computer application.

Programme Specific Outcomes

After completing the graduation in the Bachelor of Computer Applications the students are able to:

PSO1. Knowledge of contemporary and emerging issues in computer science

PSO2. Ability to identify, critically analyse, formulate and develop computer application

PSO3. Learn techniques, skills and modern hardware and software tools necessary for innovative software solutions

PSO4. Devise and conduct experiments, interpret data and provide well informed conclusions.

PSO5. Information about computer, technology, organization and management.

PSO6. Know various computer applications and latest development in IT and communication system.

PSO7. Act as software programmer, system and Database administrator, web designer, faculty for computer science and computer applications.

PSO8. Design and conduct experiments, analyze and interpret data.

DCA21001

I SEMESTER

DSC 1A: Computer Fundamentals & MIS
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the details of computer system
CO2. Learn the classification and characteristics of computer system
CO3. Understand in details with examples software
CO4. Identify the characteristics of devices
CO5. Learn the classification and characteristics of software
CO6. Understand the classification and characteristics of Memory units
CO7. Learn the classification and characteristics of CPU
CO8. Identify the characteristics of Computer Components
CO9. Understand the classification and characteristics of Computer Technologies
CO10. Learn the details of Computer Application in Education and research
CO11. Identify in details with examples MIS
CO12. Specify in depth MIS

Unit - 1 **15 Hours**

Introduction: Introduction to computer system, uses, types.

Human Computer Interface: Types of software, Operating system as user interface, utility programs

Devices: Input and output devices (with connections and practical demo), keyboard, mouse, joystick, scanner, OCR, OMR, bar code reader, web camera, monitor, printer, plotter

Unit - 2 **15 Hours**

Memory: Primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disks, optical disks

Computer Organization and Architecture: C.P.U., registers, system bus, main memory unit, cache memory, Inside a computer, SMPS, Motherboard, Ports and Interfaces, expansion cards, ribbon cables, memory chips, processors.

Unit - 3 **15 Hours**

Overview of Emerging Technologies: Bluetooth, cloud computing, big data, data mining, mobile computing and embedded systems.

Use of Computers in Education and Research: Data analysis, Heterogeneous storage, e-Library, Google Scholar, Domain specific packages such as SPSS, Mathematical etc.

Unit - 4 **15 Hours**

MANAGEMENT INFORMATION SYSTEM: Introduction to data and information, Types of Information, Types of information System. Impact of MIS, Role and Importance, Managers and Activities in IS, Types of Computers Used by Organizations in Setting up MIS, Hardware support for MIS.

Reference Books:

1. A. Goel, Computer Fundamentals, Pearson Education, 2010.
2. P. Aksoy, L. DeNardis, Introduction to Information Technology, Cengage Learning, 2006
3. P. K.Sinha, P. Sinha, Fundamentals of Computers, BPB Publishers, 2007

Computer Fundamentals & MIS Lab

LIST OF EXPERIMENTS

1. Study and Identification of standard desktop personal computer
2. Understanding of Motherboard and its interfacing components
3. Install and configure computer drivers and system components.
4. Disk formatting, partitioning and Disk operating system commands
5. Install, upgrade and configure Windows operating systems.
6. Remote desktop connections and file sharing.
7. Identify, Install and manage network connections Configuring IP address and Domain name system
8. Install, upgrade and configure Linux operating systems.
9. Installation Antivirus and configure the antivirus.
10. Installation of printer and scanner software.
11. Disassembly and Reassembly of hardware.
12. Trouble shooting and Managing Systems

DCA23001

I SEMESTER

DSC 2A: Computer System Organization and Architecture
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples Boolean algebra and logic circuits

CO2. Learn the details of Data Representation and Computer Arithmetic

CO3. Learn in depth Computer Organization and Design

CO4. Learn the details of architecture of CPU

CO5. Deliberate the classification and characteristics of Basic Computer Programming Concepts

CO6. Write down in depth Basic Computer Programming Concepts

CO7. Learn the classification and characteristics of Input -Output organization

Unit - 1 **15 Hours**

Introduction: Logic gates, Boolean algebra, combinational circuits, circuit simplification, flip-flops and sequential circuits, decoders, multiplexors, registers, counters and memory units.

Data Representation and basic Computer Arithmetic: Number systems, complements.

Unit - 2 **15 Hours**

Fixed and floating point representation, character representation, addition, subtraction, magnitude comparison.

Basic Computer Organization and Design: Computer registers, bus system, instruction set

Unit - 3 **15 Hours**

Timing and control, instruction cycle, memory reference, input-output and interrupt.

Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, micro programmed control.

Unit - 4 **15 Hours**

Programming the Basic Computer: Instruction formats, addressing modes, instruction codes, Machine language, and Assembly language, input output programming.

Input-output Organization: Peripheral devices, I/O interface, Modes of data transfer, direct memory access.

Reference Books:

1. M. Mano, Computer System Architecture, Pearson Education 1992.
2. A. J. Dos Reis, Assembly Language and Computer Architecture using C++ and JAVA, Course Technology, 2004
3. W. Stallings, Computer Organization and Architecture Designing for Performance, 8th Edition, Prentice Hall of India, 2009
4. Digital Design, M.M. Mano, Pearson Education Asia, 1979

Computer System Organization and Architecture Lab

1. Verification of Basic gates(AND,OR,NOT)
2. Verification of Universal gates(NAND,NOR,EX-OR)
3. Verification of NAND gate as a Universal gate
4. Verification of NOR gate as a Universal gate
5. Verification of DeMorgan's theorem
6. Verification of Half adder & Full Adder
7. Verification of Half subtractor& Full Subtractor
8. Verification of Half adder & Half subtractor using NAND gate
9. Conversion of Binary to Gray &gray to Binary Code
10. Simplification of Boolean Expressions
11. Simplification of Boolean Expressions using K-Map
12. Flip-Flops: SR FF (clock, without clock)
13. JK FF
14. Toggle FF
15. Delay FF
16. Multiplexer
17. De-multiplexer
18. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
    a. ADD f. BSA
    b. AND g. ISZ
    c. LDA
    d. STA
    e. BUN

19. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
20. Modify the machine created in Practical 1 according to the following instruction format:

Instruction format

0 2	3 4	15
Opcode	I	address

a. The instruction format contains a 3-bit opcode, a 1-bit addressing mode and a 12-bit address. There are only two addressing modes, I = 0 (direct addressing) and I = 1(indirect addressing).
b. Create a new register I of 1 bit.

C. Create two new microinstructions as follows:

i. Check the opcode of instruction to determine type of instruction (Memory Reference/Register Reference/Input-Output) and then jump accordingly.
ii. Check the I bit to determine the addressing mode and then jump accordingly.

DCA25001

I SEMESTER

DSC 3A: Object Oriented Programming in C++
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the classification and characteristics of Basic of Problem Solving Techniques
CO2. Understand the details of Basic of Problem Solving Techniques
CO3. Learn in depth Basic concepts of OOPs and C++ Programming Language
CO4. Deliberate the details of Program Development using OOPs Concepts
CO5. Specify in details with application and Use of Polymorphism Concepts
CO6. Specify the details of implements of Inheritance Using C++

Unit - 1 15 Hours

Problem solving aspects: Introduction, Problem definition, Problem analysis, Design of problem solution, Algorithm, Flowchart, Coding, Debugging, Types of errors in programming, Program Documentation and Program maintenance.

Techniques of Problem Solving: Flowcharting, decision table, algorithms, structured programming concepts, Programming methodologies viz- top-down and bottom-up programming

Introduction to C++: Concepts of Object-oriented programming, benefits of OOP, Structure of C++ program & Applications of OOP.

Fundamentals: Tokens, Keywords, Identifiers and constants, Basic Data Types, User-defined data types, Derived data Types, Symbolic constants, Declaration of variables.

Operators in C++: Scope resolution operator, Memory management operators, Manipulators, Type cast operator, Expressions and their types.

Unit - 2 15 Hours

Control structures & Functions: The main function, Function prototyping, Call by Reference, Return by Reference, Inline functions, Function overloading, Friend and Virtual functions.

Object Oriented Concepts: Abstraction, encapsulation, objects, classes, methods, constructors, inheritance, polymorphism, static and dynamic binding, overloading.

Classes and Objects: Specifying a Class, Defining member functions, Making an Outside function Inline, Nesting of member functions, Private member functions, Arrays within a Class, Static data members, Static member functions, Arrays of Objects.

Unit - 3 **15 Hours**

Program Development: Object oriented analysis, design, unit testing & debugging, system testing & integration, maintenance.

Constructors and Destructors: Constructors, Parameterized constructors, copy constructor, Dynamic constructor and Destructor.

Unit - 4 **15 Hours**

Operator overloading and Type Conversions: Defining operator overloading, Overloading unary operators, Overloading Binary operators, Rules for overloading operators, Type conversions.

Inheritance- introduction, defining derived classes, single inheritance, making a private member inheritable, multilevel inheritance, hierarchical inheritance and hybrid inheritance.

Polymorphism – introduction, pointers, pointers to objects, this pointer, pointers to derived classes, virtual functions, pure virtual functions.

Reference Books:

1. P. K. Sinha&PritiSinha, "Computer Fundamentals", BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. Object Oriented Programming with C++ , M.T. Somashekara, D.S. Guru, H.S.
4. Nagendraswamy, K.S. Manjunatha, PHI Learning, New Delhi, 2012
5. Object Oriented Programming with C++ by E. Balagurusamy
6. Richard Johnson, An Introduction to Object-Oriented Application Development, Thomson Learning, 2006
7. B. Stroupstrup, the C++ Programming Language, Addison Wesley, 2004.

Object Oriented Programming in C++ Lab

PART-A

1. PROGRAM TO FIND THE ROOTS OF A QUADRATIC EQUATION
2. PROGRAM TO FIND WHETHER GIVEN NUMBER IS EVEN OR NOT
3. PROGRAM TO FIND LARGEST OF 3 NOS USING NESTED IF
4. PROGRAM TO DISPLAY RAINBOW COLOURS USING SWITCH STATEMENT
5. PROGRAM TO CALCULATE SIMPLE & COMPOUND INTEREST
6. PROGRAM TO FIND MINIMA & MAXIMA IN 1-DIMENSIONAL ARRAY
7. PROGRAM TO GENERATE FIBONACCI SERIES OF A GIVEN NO
8. PROGRAM TO FIND FACTORIAL OF A GIVEN NO
9. PROGRAM TO SEARCH AN ELEMENT IN 1-DIMENSIONAL ARRAY
10. PROGRAM TO DISPLAY N NATURAL NUMBERS & THEIR SUM

PART-B

1. PROGRAM TO SWAP TWO NOS USING CALL BY REFERENCE
2. PROGRAM TO ILLUSTRATE INLINE FUNCTION
3. PROGRAM TO ILLUSTRATE FRIEND FUNCTION
4. PROGRAM TO ILLUSTRATE OPERATOR OVERLOADING
5. PROG PROGRAM TO ILLUSTRATE INLINE FUNCTION
6. PROGRAM TO ILLUSTRATE MULTIPLE INHERITANCE
7. PROGRAM TO CREATE A CLASS CALLED EMPLOYEE. ACCEPT PROGRAM TO ILLUSTRATE INLINE FUNCTION USING ARRRAY OF OBJECTS.
8. PROGRAM TO CREATE A CLASS CALLLED STUDENT & TO ACCCEPT & DISPLAY NECESSARY DETAILS OF A STUDENT USING NESTED CLASS.
9. PROGRAM TO CREATE A CLASS CALLED BANK & ACCEPT CUSTOMER DATA.
10. PROGRAM TO ILLUSTRAT FUNCTION OVER LOADING.

DCB21001

II SEMESTER

DSC 1B: Data Structures and File Processing
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the classification, characteristics and understanding of Data structures
CO2. Specify the details of Searching Techniques
CO3. Deliberate in details with examples Basic Concepts of Memory Management Techniques
CO4. Understand in depth File System Operations
CO5. Specify the characteristics of File Organization Methods
CO6. Deliberate in details with examples of Storage Devices

Unit – 1 **15 Hours**

Basic Data Structures: Introduction, Abstract data structures- stacks, queues, linked lists and binary trees. **Sets:** Dictionary implementation, use of priority queues, hashing, binary trees, balanced trees, sets with merge-find operations.

Unit - 2 **15 Hours**

Searching: Internal and external searching, use of hashing and balancing techniques.

Memory Management: Garbage collection algorithms for equal sized blocks, storage allocation for objects with mixed size, buddy systems.

Unit - 3 **15 Hours**

Physical Devices: Characteristics of storage devices such as disks and tapes, I/O buffering.

Basic File System Operations: Create, open, close, extend, delete, read-block, write-block, protection mechanisms.

Unit - 4 **15 Hours**

File Organizations: Sequential, indexed sequential, direct, inverted, multi-list, directory systems, Indexing using B-tree, B+ tree and their variants, hashing – hash function, collision handling methods, extendible hashing.

Reference Books:

1. M.T. Goodrich, R. Tamassia and D. Mount, Data Structures and Algorithms in C++, John Wiley and Sons, Inc., 2004.
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2nd Ed., Prentice-Hall of India, 2006.
3. Robert L. Kruse and A.J. Ryba, Data Structures and Program Design in C++, Prentice Hall, Inc., NJ, 1998.
4. B. Stroupstrup, The C++ Programming Language, Addison Wesley, 2004
5. D.E. Knuth, Fundamental Algorithms (Vol. I), Addison Wesley, 1997

Data Structures and File Processing Lab

Part - A

1. Program to find lower triangular and upper triangular matrices for the given matrix.
2. Write an interactive program to insert an element at the given position and delete an element at the specified position in the given array.
3. Program to search an element identifies the number of occurrences with locations in linear array.
4. Program to sort the given M x N matrix row-wise and column-wise using bubble sorting technique.
5. Write an interactive program to search an element in the given linear array using linear and binary searching technique.
6. Write a program to merge two sorted arrays.

Part – B

7. Write an interactive program to implement the following operations on stack using arrays
   a. PUSH b. POP
8. Program to implement Tower of Hanoi problem.
9. Write an interactive program to perform insertion and deletion operations in Linear Queue using arrays.
10. Write an interactive program to perform insertion and deletion operations in Circular Queue using arrays.
11. Write an interactive program to insert a node in a linked list at the front, delete a node from the rear and display.
12. Write an interactive program to implement pre order, post order and in order traversal of a binary tree using linked list.

Note: Lecturer May Change the Programs without deviating Theory Paper

DCB23001

II SEMESTER

DSC 2B: Operating Systems with Linux

Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in details with examples system software
CO2. Learn the details of Operating System organization
CO3. Understand the classification and characteristics of Process Management and Scheduling mechanisms
CO4. Understand in depth Memory Management and allocation strategies
CO5. Learn in details with examples basic concepts of shell scripting
CO6. Understand in depth basic Linux environment

Unit - 1 **15 Hours**

Introduction: System Software, Resource Abstraction, OS strategies. Types of operating systems - Multiprogramming, Batch, Time Sharing, Single user and Multiuser, Process Control & Real Time Systems.

Operating System Organization: Factors in operating system design, basic OS functions, implementation consideration; process modes, methods of requesting system services – system calls and system programs.

Unit - 2 **15 Hours**

Process Management: System view of the process and resources, initiating the OS, process address space, process abstraction, resource abstraction, process hierarchy, Thread model

Unit - 3 **15 Hours**

Scheduling: Scheduling Mechanisms, Strategy selection, non-pre-emptive and pre-emptive strategies.

Memory Management: Mapping addresses space to memory space.

Unit - 4 **15 Hours**

Memory allocation strategies, fixed partition, variable partition, paging, virtual memory

Shell introduction and Shell Scripting: What is shell and various type of shell, Various editors present in Linux, Different modes of operation in vi editor, What is shell script, Writing and executing the shell script, Shell variable (user

defined and system variables), System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr , unique utilities), Pattern matching utility (grep)

Reference Books:

1. A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8th Edition, John Wiley Publications 2008.
2. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
3. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
4. W. Stallings, Operating Systems, Internals & Design Principles, 5th Edition, Prentice Hall of India. 2008.
5. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Operating Systems with Linux Lab

Software Lab based on Operating Systems

Note: Following exercises can be performed using Linux or UNIX

1. Usage of following commands: ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands: cal, cat (append), cat (concatenate), mv, cp, man, date.
3. Usage of following commands: chmod, grep, tput (clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify "cal" command to display calendars of the specified months.
6. Write a shell script to modify "cal" command to display calendars of the specified range of months.
7. Write a shell script to accept a login name. If not a valid login name display message – "Entered login name is invalid".
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of "who" command along with the total number of users.
10. Write a shell script to display the multiplication table any number,
11. Write a shell script to compare two files and if found equal asks the user to delete the duplicate file.
12. Write a shell script to find the sum of digits of a given number.
13. Write a shell script to merge the contents of three files, sort the contents and then display them page by page.
14. Write a shell script to find the LCD (least common divisor) of two numbers.
15. Write a shell script to perform the tasks of basic calculator.
16. Write a shell script to find the power of a given number.
17. Write a shell script to find the factorial of a given number.
18. Write a shell script to check whether the number is Armstrong or not.
19. Write a shell script to check whether the file have all the permissions or not.
20. Program to show the pyramid of special character "*".

DCB25001

II SEMESTER

DSC 3B: Programming in JAVA
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in depth java programming fundamental
CO2. Specify in details with examples Basic java oops Concepts
CO3. Understand in depth java Interface and packages
CO4. Deliberate the details of Exception handling in java
CO5. Identify the classification and characteristics of File handling in java
CO6. Learn the details of File handling in java
CO7. Learn the characteristics of Applet Programming

Unit - 1 **15 Hours**

Introduction to Java: Features of Java, JDK Environment, Object Oriented Programming Concept Overview of Programming, Paradigm, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism, Difference between C++ and JAVA

Java Programming Fundamental: Structure of java program, Data types, Variables, Operators, Keywords, Naming Convention, Decision Making (if, switch),Looping(for, while) ,Type Casting

Unit - 2 **15 Hours**

Classes and Objects: Creating Classes and objects, Memory allocation for objects, Constructor, Implementation of Inheritance, Implementation of Polymorphism, Method Overloading, Method Overriding, Nested and Inner classes

Arrays and Strings: Arrays, Creating an array, Types of Arrays, String class Methods, String Buffer methods.

Unit - 3 **15 Hours**

Abstract Class, Interface and Packages: Modifiers and Access Control, Abstract classes and methods, Interfaces, Packages Concept, Creating user defined packages

Exception Handling: Exception types, Using try catch and multiple catch, Nested try, throw throws and finally, Creating User defined Exceptions.

Unit - 4 **15 Hours**

File Handling: Byte Stream, Character Stream, File IO Basics, File Operations, Creating file, Reading file, Writing File.

Applet Programming: Introduction, Types Applet, Applet Life cycle, Creating Applet, Applet tag.

Reference Books:

1. Ivan Bayross, Web Enabled Commercial Application Development Using Html, Dhtml,javascript, Perl Cgi , BPB Publications, 2009.
2. Cay Horstmann, BIG Java, Wiley Publication , 3rd Edition., 2009
3. Herbert Schildt , Java 7, The Complete Reference, , 8th Edition, 2009.
4. E Balagurusamy , Programming with JAVA, TMH, 2007

Programming in JAVA Lab

Software Lab based on Java

1. WAP to find the largest of n natural numbers.
2. WAP to find whether a given number is prime or not.
3. Write a menu driven program for following:
    a. Display a Fibonacci series
    b. Compute Factorial of a number
    c. WAP to check whether a given number is odd or even.
    d. WAP to check whether a given string is palindrome or not.
4. WAP to print the sum and product of digits of an Integer and reverse the Integer.
5. Write a program to create an array of 10 integers. Accept values from the user in that array. Input another number from the user and find out how many numbers are equal to the number passed, how many are greater and how many are less than the number passed.
6. Write a program that will prompt the user for a list of 5 prices. Compute the average of the prices and find out all the prices that are higher than the calculated average.

7. Write a program in java to input N numbers in an array and print out the Armstrong numbers from the set.
8. Write java program for the following matrix operations:
    a. Addition of two matrices
    b. Summation of two matrices
    c. Transpose of a matrix
    d. Input the elements of matrices from user.
9. Write a java program that computes the area of a circle, rectangle and a Cylinder using function overloading.
10. Write a Java for the implementation of multiple inheritance using interfaces to calculate the area of a rectangle and triangle.
11. Write a java program to create a frame window in an Applet. Display your name, address and qualification in the frame window.
12. Write a java program to draw a line between two coordinates in a window.
13. Write a java program to display the following graphics in an applet window.
    a. Rectangles
    b. Circles
    c. Ellipses
    d. Arcs
    e. Polygons
14. Write a program that reads two integer numbers for the variables a and b. If any other character except number (0-9) is entered then the error is caught by NumberFormatException object. After that ex.getMessage () prints the information about the error occurring causes.
15. Write a program for the following string operations:
    a. Compare two strings
    b. Concatenate two strings
    c. Compute length of a string
16. Create a class called Fraction that can be used to represent the ratio of two integers. Include appropriate constructors and methods. If the denominator becomes zero, throw and handle an exception.

DCC21001

III SEMESTER

DSC 1C: Discrete Mathematics & Logic Computation

Credit (L: T: P = 5: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Identify the classification and characteristics of Set theory
CO 2. Specify in details with examples graph theory
CO 3. Deliberate the classification and characteristics of relation
CO 4. Write down the details of relation
CO 5. Learn the classification and characteristics of function
CO 6. Write down in details with examples function
CO 7. Identify the characteristics of mathematical logic
CO 8. Understand in depth mathematical logic
CO 9. Identify the classification and characteristics of Boolean algebra
CO 10. Identify the details of Boolean algebra

Unit - 1 **15 Hours**

Basics of Set Theory: Notation, Inclusion and Equality of Sets, The Power set, Operations on sets, Venn diagram, Set identities, Ordered pairs and Cartesian Products.

Graph Theory: Basic Definitions, Paths and Connectedness, Matrix Representation of Graphs, Trees.

Unit - 2 **15 Hours**

Relations and ordering – Properties of binary relations in a Set, Relation Matrix and the Graph of a Relation, Equivalence Relations, Compatibility Relations, Composition of Binary Relation

Unit – 3 **15 Hours**

Functions: Definition and Introduction, Composition of Functions, Inverse Functions.

Unit - 4 **15 Hours**

Mathematical Logic: Statements and Notation, Connectives, Negation, Conjunction, Disjunction, Statement Formulas and Truth Tables, Conditional

and Bi-conditional, Tautologies, Equivalence of Formulas, Tautological Implications.

Unit - 5 **15 Hours**

Boolean Algebra & Formal: Boolean algebra - Application of Boolean Algebra to switching theory. Languages - Recognition and generation - Phase structure grammars and languages – Finite state Machine - Recognition in regular languages.

Reference Books:

1. Discrete Mathematical Structures with Applications to Computer Science by J.P. Tremblay, R Manohar 3rd Edition – Tata McGraw Hill.
2. Discrete mathematical structures by B. Kolman, R.C. Busby and S. Ross, 3rd edition.
3. Introduction to discrete mathematics by Liu, C.L., McGraw Hill, 2nd edition, 1985.
4. Discrete mathematics by S.A. Witala, McGraw Hill, 1987.

DCC23001

III SEMESTER
DSC 2C: Database Management Systems
Credit (L: T: P = 4: 0: 2)

Course Outcome

After successful completion of the course, the student is able to
CO 1. Understand the characteristics of DBMS with examples
CO 2. Deliberate the details of types of database languages with examples
CO 3. Learn the details of ER- Diagrams and Relationship
CO 4. Understand in depth Basic concepts of Relational Model
CO 5. Learn in details with examples MYSQL Commands
CO 6. Learn in details with examples in PL-SQL

Unit - 1 15 Hours

Introduction to Database Management Systems: Definition of Data, Information, DBMS, Data base system application, Purpose of database systems, Characteristics of DB – Self describing nature, Insulation between programs, data and data Abstraction (data Independence), support of multiple views of the data, sharing of data and multiples transaction processing, Storage management, Database language – DDL, DML,DCL. File processing system v/s DBMS, Data models, Levels of Abstraction in a DBMS, Three Schema architecture, Characteristics of database approach,, data models, DBMS architecture and data independence.

Unit - 2 15 Hours

Entity Relationship and Enhanced ER Modelling: Entity types, Entity Sets, Attributes, and Keys, Relationships, Relationship Types, Roles, and Structural Constraints, Weak Entity Types, ER Diagrams, Naming Conventions,SQL99: Schema Definition, constraints, and object modelling

Unit - 3 15 Hours

Relational Data Model: Basic concepts, Relational Constraints and Relational Database Schemas, Update Operations and Dealing with Constraint Violations, Basic Relational Algebra Operations.

Database design: ER and EER to relational mapping, functional dependencies, normal forms-first normal form, second normal forms. Third normal form BCNF

Unit - 4 15 Hours

MYSQL (SQL/PL-SQL): SQL VS. SQL * PLUS: SQL COMMANDS ANDDATA TYPES, OPERATORS AND EXPRESSIONS, INTRODUCTION TO SQL * PLUS.

Managing Tables and Data:

- CREATING AND ALTERING TABLES (INCLUDING CONSTRAINTS)
- DATA MANIPULATION COMMAND LIKE INSERT, UPDATE, DELETE
- SELECT STATEMENT WITH WHERE, GROUP BY AND HAVING, ORDER BY, DISTINCT, SPECIAL OPERATOR LIKE IN, ANY, ALL BETWEEN, EXISTS, LIKE
- JOIN, BUILT IN FUNCTIONS OTHER DATABASE OBJECTS
- VIEW • SYNONYMS, INDEX TRANSACTION CONTROL STATEMENTS
- COMMIT, ROLLBACK, SAVEPOINT INTRODUCTION TO PL/SQL
- SQL V/S PL/SQL • PL/SQL BLOCK STRUCTURE
- LANGUAGE CONSTRUCT OF PL/SQL (VARIABLES, BASIC AND COMPOSITE DATA TYPE, CONDITIONS LOOPING ETC.)
- % TYPE AND % ROWTYPE
- USING CURSOR (IMPLICIT, EXPLICIT)

Reference Books:

1. R. Elmasri, S.B. Navathe, Fundamentals of Database Systems 6th Edition, Pearson Education, 2010.
2. R. Ramakrishanan, J. Gehrke, Database Management Systems 3rd Edition, McGraw-Hill, 2002.
3. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010.
4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6th Edition, Pearson Education, 2013.

Database Management Systems Lab

Software Lab based on Database Management Systems

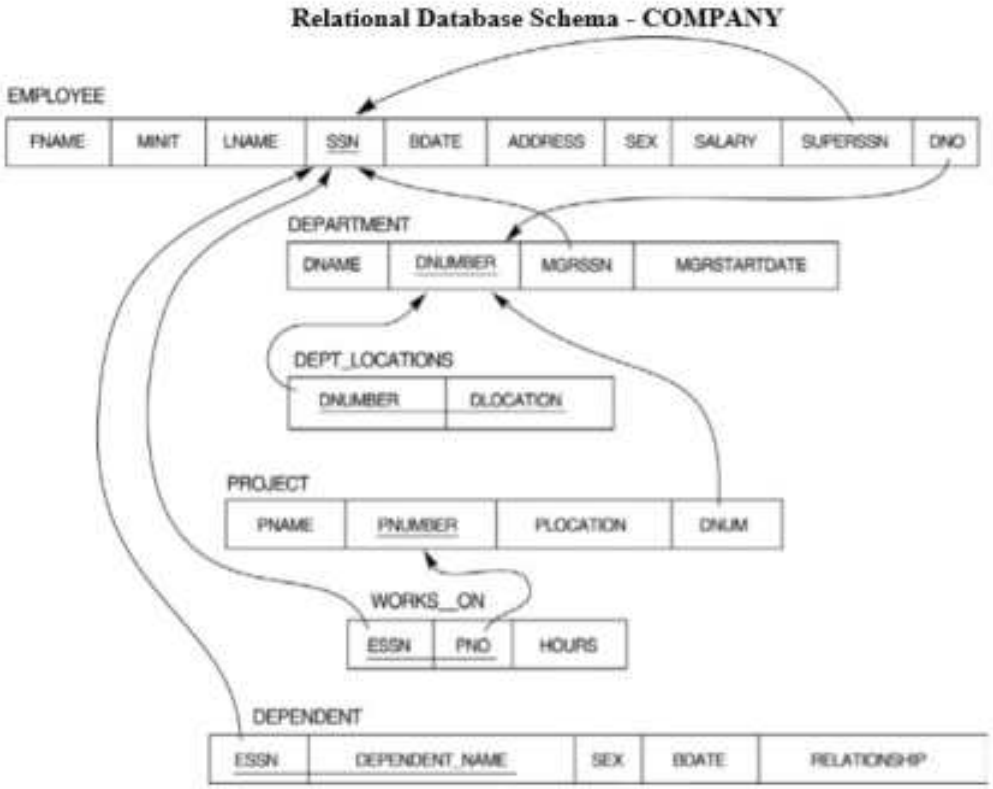
The following concepts must be introduced to the students: **Note:** MS Access / MySQL may be used.

DDL Commands

- Create table, alter table, drop table

DML Commands

- Select, update, delete and insert statements
- Condition specification using Boolean and comparison operators (and, or, not,=,<>,>,<,>=,<=)
- Arithmetic operators and aggregate functions(Count, sum, avg, Min, Max)
- Multiple table queries (join on different and same tables) • Nested select statements
- Set manipulation using (any, in, contains, all, not in, not contains, exists, not exists, union, intersect, minus, etc.)
- Categorization using group by……..having
- Arranging using order by



1. Create tables with relevant foreign key constraints

2. Populate the tables with data
3. Perform the following queries on the database:
   a. Display all the details of all employees working in the company.
   b. Display ssn, lname, fname, address of employees who work in department no 7.
   c. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong'
4. Retrieve the name and salary of every employee
5. Retrieve all distinct salary values
6. Retrieve all employee names whose address is in 'Bellaire'
7. Retrieve all employees who were born during the 1950s
8. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)
9. Retrieve the names of all employees who do not have supervisors
10. Retrieve SSN and department name for all employees
11. Retrieve the name and address of all employees who work for the 'Research' department 12. For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birth date.
13. For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
14. Retrieve all combinations of Employee Name and Department Name
15. Make a list of all project numbers for projects that involve an employee whose last name is 'Narayan' either as a worker or as a manager of the department that controls the project. 16. Increase the salary of all employees working on the 'ProductX' project by 15%. Retrieve employee name and increased salary of these employees.
17. Retrieve a list of employees and the project name each works in, ordered by the employee's department, and within each department ordered alphabetically by employee first name.
18. Select the names of employees whose salary does not match with salary of any employee in department 10.
19. Retrieve the name of each employee who has a dependent with the same first name and same sex as the employee.
20. Retrieve the employee numbers of all employees who work on project located in Bellaire, Houston, or Stafford.
21. Find the sum of the salaries of all employees, the maximum salary, the minimum salary, and the average salary. Display with proper headings.

22. Find the sum of the salaries and number of employees of all employees of the 'Marketing' department, as well as the maximum salary, the minimum salary, and the average salary in this department
23. Select the names of employees whose salary is greater than the average salary of all employees in department 10.
24. For each department, retrieve the department number, the number of employees in the department, and their average salary.
25. For each project, retrieve the project number, the project name, and the number of employees who work on that project.
26. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively. 27. For each department having more than 10 employees, retrieve the department no, no of employees drawing more than 40,000 as salary.
28. Insert a record in Project table which violates referential integrity constraint with respect to Department number. Now remove the violation by making necessary insertion in the Department table.
29. Delete all dependents of employee whose ssn is '123456789'.
30. Delete an employee from Employee table with ssn = '12345' (make sure that this employee has some dependents, is working on some project, is a manager of some department and is supervising some employees). Check and display the cascading effect on Dependent and Works on table. In Department table MGRSSN should be set to default value and in Employee table SUPERSSN should be set to NULL 31. Perform a query using alter command to drop/add field and a constraint in Employee table.

DCC25001

III SEMESTER

DSC 3C: Web Technologies
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to
CO 1. Learn the details of HTML tags
CO 2. Understand the details of Basic CSS and implements
CO 3. Understand the details of Basic Concepts of Java Scripts
CO 4. Write down in details with application and Usage of Java scripts
CO 5. Understand in details with examples Document object Model
CO 6. Deliberate in depth Basic of XML

Unit - 1 15 Hours

Introduction to Web Design: Introduction to HyperTextMarkupLanguage (HTML), header, footer, formatting tags, graphical elements, inserting images, lists, hyperlinks, tables. **Frames-**introduction, frameset. Forms- attributes of forms. Creating web pages

Unit - 2 15 Hours

Cascading Style Sheets: Introduction, Understanding the Basic CSS syntax,Types of style sheets, multiple sheets, Background properties,Text properties, Font properties,Border properties, Margin properties Padding list & table properties. DIV, SPAN

Unit - 3 15 Hours

JavaScript: Introduction, Java script in HTML, Java script statement, comments, Expressions, Data types, operators, Conditional statements, Loop statements, functions, Popup boxes ,Array & Boolean Objects Math & Date Objects String & Number Objects, events and event handling & form document object.

Unit - 4 15 Hours

DOM and XML: Basics of DOM, DOM methods, functions Forms collection, table collections Inner HTML.
XML Introduction; Syntax: Document structure; Document Type definitions; Namespaces; XML schemas; Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets.

Reference Books:

1. M.Deitel, P.J.Deitel, A.B.Goldberg: Internet & World Wide Web How to program, 3rd Edition, Pearson Education / PHI, 2004.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.
3. 3. XueBai et al: The Web Warrior Guide to Web Programming, Thomson, 2003.

Web Technologies Lab

1. Program for formatting tags.
2. Creating a Webpage having Hyperlink.
3. Creating Types of Lists (Ordered, UnOrdered, Definition).
4. Creating a Nested List.
5. Creating a Time Table.
6. Creating a HTML document having vertical frames.
7. Creating Student Application Form.
8. Program to insert audio & video files
9. Creating Internal & External Style Sheets.
10. Program to Margin & Padding.
11. Program to create a Greeting card
12. Program to Image Transparency
13. Program to generate Fibonacci series in Javascript.
14. Program to display Rainbow Colours in Javascript.
15. Program to create Pop-Up Boxes.
16. Program to generate multiplication table.
17. Program to find even and odd numbers.
18. Program to add 2 numbers.
19. Program to find factorial of a numbers.
20. Program to generate 2 different patterns.
21. Program to change background color after 5 sec of page load.
22. Display reverse of a given number.
23. Program to generate random numbers.
24. Program to find the sum of individual numbers.
25. Program to display Book information in XML.

DCD21001

IV SEMESTER
DSC 1D: Numerical Analysis and Statistics
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the details of Computer Numerical data and arithmetic
CO2. Understand the classification and characteristics of Iterative Methods in numerical analysis
CO3. Deliberate in details with examples Matrices and linear system of Equations
CO4. Specify in details with examples Interpolation
CO5. Understand in depth Numerical integration and differentiation
CO6. Learn the details of Importance and limitations of statistics

Unit - 1 **15 Hours**

Computer Arithmetic: Fixed and Floating point representation, Normalization of numbers. Errors in numbers.

Iterative methods: Bisection method, Regula-Falsi method, Secant method, Newton-Raphson method

Unit - 2 **15 Hours**

Matrices and Linear System of Equations: LU decomposition method, Gauss elimination, Gauss seidal and Gauss Jordan for solving system of equations

Interpolation: Polynomial interpolation, Newton-Gregory forward and backward interpolation, Newton's divided differences interpolation formulae.

Unit - 3 **15 Hours**

Numerical Integration: Trapezoidal rule, Simpson's 1/3rd and 3/8th rule,

Numerical Differentiation: Euler's, modified Euler's and Runge-Kutta (RK) 2^{nd} order and 4^{th} order.

Unit - 4 **15 Hours**

Statistics: Definition, Importance, Functions and Limitations of statistics.

Graphic presentation: Frequency distribution, Histogram, Frequency polygon, frequency curve and O gives Measures of central tendency: (Mean, Median, Mode) Dispersion, Correlation, Regression.

Reference Books:

1. K.E. Atkinson, W. Han, Elementary Numerical Analysis, 3rd Ed., Wiley, 2003.
2. C. Xavier, S.S. Iyengar, Introduction to Parallel Algorithms, Wiley-Interscience, 1998.
3. A. Kharab, R.B. Guenther, An Introduction to Numerical Methods: A MATLAB Approach,1st Ed. Chapman and Hall/CRC, 2001.
4. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, 2007.
5. S.R. Otto and J.P. Denier, An Introduction to Programming and Numerical Methods in MATLAB, Springer, 2005.
6. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and EngineeringComputation, 7th Ed., New Age International Publishers, 2007.
7. Computer oriented numerical methods by V Rajaraman
8. Statistics Theory and Practice by R S N Pillai, Bagavathi
9. Practical statistics by S P Gupta

Numerical Analysis and Statistics Lab

Software lab based on numerical techniques and statistics

1. BRUTE FORCE METHOD
2. BISECTION METHOD
3. REGULA –FALSI METHOD
4. NEWTON RAPHSON
5. SECANT
6. LU DECOMPOSITION
7. GAUSS ELIMINATION
8. GAUSS JORDAN
9. GAUSS SEIDAL
10. EULER'S
11. MODIFIED EULER'S
12. RUNGE KUTTA II ORDER
13. RUNGE KUTTA IV ORDER
14. TRAPEZOIDAL
15. SIMPSONS 1/3 RD
16. SIMPSONS 3/8 TH
17. FINDING THE MEAN, MEDIAN AND MODE OF A SET OF DATA
18. FINDING THE RANGE OF A SET OF DATA
19. FINDING THE STANDARD DEVIATION OF A SET OF DATA
20. NEWTONS FORWARD AND BACKWARD INTERPOLATION
21. NEWTONS DIVIDED DIFFERENCE

DCD23001

IV SEMESTER
DSC 2D: J2EE
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Learn the details of Basic elements of J2EE
CO 2. Deliberate the details of Concepts of Multi-Tier Architectures
CO 3. Understand the characteristics of Enterprise Application Strategy
CO 4. Write down in depth Basic Concepts of JDBC
CO 5. Identify in details with examples implementation of SQL Commands Using JDBC objects
CO 6. Learn in details with examples Basic Concepts of Servlet
CO 7. Learn in details with examples Basic Concepts of JSP

Unit - 1 15 Hours

Interdiction: The ABC of Programming Languages, taking programming languages up a notch, the beginning of java, java byte-code, the advantages of Java, J2EE and J2SE.

J2EE Multi-Tier Architecture: Distributive systems, the Tier, J2EE Multi-Tier Architecture, Client Tier Implementation, Web Tier Implementation, Enterprise JavaBeans Tier Implementation, Enterprise Information Systems Tier Implementation, Challenges.

J2EE Nest Practices: Enterprise Application Strategy, The enterprise application, clients, Sessions Management, Web Tier and Java Server pages, Enterprise Java Beans Tier, The Myth of using inheritance, Maintainable classes, Performance Enhancements, The power of Interfaces, The power of threads, The power of Notification.

Unit - 2 15 Hours

J2EE Database Concepts: Data, Database, Database Schema, the Art of Indexing.

JDBC Objects: The concept of JDBC, JDBC Driver Types, JDBC packages, A Brief overview of the JDBC Process, Database Connection, Associating the JDBC / ODBC Bridge with the database, Statement Objects, Result Set, Transaction Processing, Metadata.

Unit - 3 **15 Hours**

JDBC and Embedded SQL: Model Programs: Model A Program, Model B Program, Tables: Creating a Table, Dropping a Table, Indexing: Creating an Index, Dropping an Index, Inserting Data into tables: Inserting a Row, Inserting the systems date into a column, Inserting the system Time into a column, Inserting a Timestamp into a column, Selecting Data from a Table: Selecting all data from a Table, Requesting one column, Requesting Multiple column, Requesting rows, Requesting rows and columns, AND, OR, and NOT clauses, Joining multiple compound expressions, equal & not equal operators, Less than & greater than operators, Less than equal to & greater than equal to, BETWEEN, LIKE, IS NULL Operator, DISTINCT Modifier, IN modifier,

Unit - 4 **15 Hours**

Metadata: Number of columns in result set, Data type of a column, Name of a column, Column Size, updating Tables: Updating a row and column, updating multiple rows, Deleting Data from a table: Deleting a Row from a table, Joining tables, Calculating Data, Grouping and ordering data, sub queries, view.

Java Servlets: Java servlets and common gateway interface programming: Benefits of using a Java servlet, A simple Java servlet, Anatomy of a java servlet: Development Descriptor, Reading Data from a client, Reading HTTP request Headers, Sending Data to a Client & writing the HTTP response Header, Working with cookies, Tracking Sessions, Quick reference guide.

JAVA Server Pages: JSP installation, JSP Tags: Variables & objects, Methods, Control Statements, Loops, Tomcat, Request string: Parsing other information, User sessions, cookies, Session objects, Quick reference guide.

Reference Books:

1. The complete reference J2EE seventh edition - Java 2 Enterprise edition overview
2. J2EE: The complete Reference - McGraw-Hill Education

J2EE Lab

J2EE LAB CYCLE

1. Program to Create Jdbc Connection
2. Application to access the database using the Java Database Connectivity (JDBC).
3. Perform a Database Query and View Results.
4. Write a program to demonstrate Basic Servlet.
5. Write a program to Display request header information.
6. Write a program to design web application
7. Write a program to display cookie value, cookie age and cookie path.
8. Write a program in JSP file to set and then display the cookie.
9. Write a program for Java script validation.
10. Write a JAVA Servlet Program to implement a dynamic HTML using Servlet (user name and password should be accepted using HTML and displayed using a Servlet).
11. Write a JAVA Servlet Program to Download a file and display it on the screen (A link has to be provided in HTML, when the link is clicked corresponding file has to be displayed on Screen)
12. Write a JAVA Servlet Program to implement RequestDispatcher object (use include() and forward() methods)
13. Write a JAVA Servlet Program to implement and demonstrate get() and Postmethods(Using HTTP Servlet Class).
14. Write a JAVA Servlet Program to implement sendRedirect() method(using HTTP Servlet Class).
15. Write a JAVA Servlet Program to implement sessions (Using HTTP Session Interface).
16. Write a JAVA JSP Program to print 10 even and 10 odd number.
17. Write a JAVA JSP Program to implement verification of a particular user login and display a welcome page.
18. Write a JAVA JSP Program to get student information through a HTML and create a JAVA Bean Class, populate Bean and display the same information through another JSP.
19. Write a JAVA JSP Program which uses <jsp:plugin> tag to run a applet
20. Write a JAVA JSP Program whch implements nested tags and also uses Tag Support Class.

DCD25001

IV SEMESTER

DSC 3D: Software Engineering and Software Testing
Credit (L: T: P = 4: 0: 2)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Understand in details with examples Concepts of Software process
CO 2. Specify the details of Software requirements and analysis
CO 3. Learn in depth Design concepts and principles of software engineering
CO 4. Understand in depth software Configuration Management and Project Management
CO 5. Learn in details with examples Software Tastings
CO 6. Specify in depth trends in software engineering

Unit - 1 15 Hours

Software Process: Introduction, S/W Engineering Paradigm, life cycle models (water fall, incremental, spiral, evolutionary, prototyping, object oriented) , System engineering, computer based system, verification, validation, life cycle process, development process, system engineering hierarchy.

Software requirements: Functional and non-functional, user, system, requirement engineering process, feasibility studies, requirements, elicitation, validation and management, software prototyping, prototyping in the software process, rapid prototyping techniques, user interface prototyping, S/W document.

Unit - 2 15 Hours

Software Analysis: Analysis and modelling, data, functional and behavioural models, structured analysis and data dictionary.

Design Concepts and Principles: Design process and concepts, modular design, design heuristic, design model and document, Architectural design, software architecture, data design, architectural design, transform and transaction mapping, user interface design, user interface design principles. Real time systems, Real time software design, system design, real time executives, data acquisition system, monitoring and control system.

Unit - 3 15 Hours

Software Configuration Management: The SCM process, Version control, Change control, Configuration audit, SCM standards.

Software Project Management: Measures and measurements, S/W complexity and science measure, size measure, data and logic structure measure, information flow measure. Estimations for Software Projects, Empirical Estimation Models, Project Scheduling.

Unit - 4 **15 Hours**

Testing: Taxonomy of software testing, levels, test activities, types of s/w test, black box testing, testing boundary conditions, structural testing, test coverage criteria based on data flow, mechanisms, regression testing, testing in the large. S/W testing strategies, strategic approach and issues, unit testing, integration testing, validation testing, system testing and debugging.

Trends in Software Engineering: Reverse Engineering and Re-engineering – wrappers – Case Study of CASE tools.

Reference Books:

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill
2. Ian Sommerville, Software engineering, Pearson education Asia, 6th edition, 2000.
3. PankajJalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
4. James F Peters and WitoldPedryez, "Software Engineering – An Engineering Approach", John Wiley and Sons, New Delhi, 2000.
5. Ali Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxfor University Press, New Delhi, 1996.
6. Pfleeger, "Software Engineering", Pearson Education India, New Delhi, 1999.
7. Carlo Ghezzi, Mehdi Jazayari and Dino Mandrioli, "Fundamentals of Software Engineering", Prentice Hall of India, New Delhi, 1991.

Software Engineering and Software Testing Lab

Lab based on Software Engineering

1. Practical Title
   - Problem Statement,
   - Process Model
2. Requirement Analysis
   - Creating a Data Flow
   - Data Dictionary,
   - Use Cases
3. Project Management
   - Computing FP
   - Effort
   - Schedule, Risk Table, Timeline chart
4. Design Engineering
   - Architectural Design
   - Data Design, Component Level Design
5. Testing
   - Basis Path Testing

Sample Projects like

- DTC Route Information: Online information about the bus routes and their frequency and fares
- Car Pooling: To maintain a web based intranet application that enables the corporate
- Employees within an organization to avail the facility of carpooling effectively.
- Patient Appointment and Prescription Management System
- Organized Retail Shopping Management Software
- Parking Allocation System
- Wholesale Management System

DCD31001

IV SEMESTER

SEC 1A: Elective: Mathematics
Credit (L: T: P = 3: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Deliberate in details with examples partial fraction
CO 2. Learn the characteristics of Theory of equation
CO 3. Understand in details with examples trigonometry
CO 4. Learn in details with examples complex number
CO 5. Understand the classification and characteristics of Analytic geometry
CO 6. Deliberate in details with examples straight lines
CO 7. Specify in details with examples pair of lines
CO 8. Specify the classification and characteristics of conics
CO 9. Understand the classification and characteristics of differentiation
CO 10. Identify in details with examples integration

Unit - 1 15 Hours

PARTIAL FRACTIONS: Proper & improper fractions-all four types.
LOGARITHMS: All problems, except common logarithms.
MATHEMATICAL INDUCTION: Simple problems on all types.
THEORY OF EQUATIONS:
i) Solutions of cubic, bi quadratic equations when complex and irrational roots are given
ii) Solutions of cubic, bi quadratic equations when roots are in AP, GP and HP.
iii) Solutions of cubic, bi quadratic equations using synthetic division.
iv) Operations on complex numbers.
BINOMIAL THEOREM: NO PROOF.
i) Expansion - problems thereon.
ii) Finding middle terms.
iii) Finding constant terms or terms independent of x.
TRIGONOMETRY:
i) Definition of radian (no proof for constant angle)
ii) Problems on conversion of radians to degree and vice versa
iii) Problems on $s = r\theta,\ s = \frac{1}{2} r^2\theta$ (no proofs)

TRIGONOMETRIC FUNCTIONS AND IDENTITIES: Simple problems
GRAPHS OF TRIGONOMETRIC FUNCTIONS: for sine, cos and tan functions.
Allied angles: Problems thereon

Unit - 2 **15 Hours**

COMPLEX NUMBERS:

i) Finding modulus and amplitude of complex numbers
ii) Solving problems using Domoivre's Theorem.

ANALYTICAL GEOMETRY

i) Problems on distance formula - Proving parallelogram, square, rhombus, equilateral triangle, Co linearity.
ii) Problems on section formula - internal division, external division, midpoint formula, centroid of a triangle.
iii) Problems on area of a triangle.

Unit - 3 **15 Hours**

STRAIGHT LINES:

i) By finding slopes - show that lines are parallel and perpendicular.
ii) Finding slopes - when two points are given
iii) Equation of straight lines - passing through given point, parallel and perpendicular to given line.
iv) Problems on intercept form, slope form, normal form, two point form.
v) Problems on angle between two lines.
vi) Concurrency of three lines and point of concurrency.

PAIR OF LINES

ii) Angle between two lines $ax^2 + 2hxy + by^2 = 0$. $ax^2 + 2hxy + by^2 + 2gx + 2fy + C = 0$.
iii) Point of Intersection.
iv) Condition for an equation to represent pair of lines.

CIRCLES:

i) Finding center and radius.
ii) Finding equation of a circle passing through three points, when different conditions are given, passing through x and y- axis.

CONICS: PARABOLA -

Finding vertex, focus, tangent, normal, length of latus rectum, eccentricity. (No proofs)

Unit - 4 — 15 Hours

LIMITS AND CONTINUITY:

i) Simple direct problems on limits of the form $\left(\frac{x^n - a^n}{x - a}\right)$, $\frac{\sin\theta}{\theta}$, $\frac{\tan\theta}{\theta}$ (no determinate forms).

ii) Simple problems on continuity.

DIFFERENTIATION:

i) Problems on sum , product, quotient, chain rule (No parametric, logarithmic functions)

DIFFERENTIAL EQUATIONS:

Solving problems by variable separable form.

INTEGRATION:

i) By substitution
ii) By parts
iii) By partial fractions
iv) Problems of types

$$\int \frac{dx}{a^2 + x^2}, \int \frac{dx}{a^2 - x^2}, \int \frac{dx}{x^2 - a^2}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{\sqrt{a^2 + x^2}}, \int \frac{dx}{\sqrt{x^2 - a^2}}, \int \frac{dx}{x\sqrt{x^2 - a^2}}, \int \frac{dx}{x\sqrt{x^2 + a^2}}$$

$$\int \sqrt{a^2 - x^2}\,dx, \int \sqrt{a^2 + x^2}\,dx, \int \sqrt{x^2 - a^2}\,dx.$$

$$\int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$

APPLICATION OF INTEGRATION:

Simple problems on area

i) Find the area of circle, ellipse, parabola & the ordinate x=a by integration
ii) Find the area bounded by the parabola $y^2 = 4ax$, x – axis and x = 1, x = y.

Find the area bounded by y = sin x, x - axis &x = 0, y = z.

Reference Books:

1. Theory and Problems in Mathematics – I by BOSCO Publications 2004.
2. Theory and Problems in Mathematics – II by BOSCO Publications 2005.
3. Engineering Mathematics, Volumes I–IV by S Chandrasekhar.

DCD33501

IV SEMESTER

SEC 1B: Elective: Business Mathematics

Credit (L: T: P = 3: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Specify the characteristics of matrices and determinants
CO 2. Understand the details of straight lines
CO 3. Write down in details with examples matrices and determinants
CO 4. Deliberate the characteristics of algebra
CO 5. Learn the classification and characteristics of permutation and combination
CO 6. Deliberate in details with examples mathematical induction
CO 7. Deliberate the characteristics of sequence and series
CO 8. Understand the classification and characteristics of progression
CO 9. Learn in details with examples compound interest
CO 10. Deliberate the classification and characteristics of coordinate geometry

Unit - 1 **15 Hours**

Matrices and Determinants: Order - Types of matrices - Addition and subtraction of matrices and Multiplication of a matrix by a scalar - Product of matrices. Evaluation of determinants of order two and three - Properties of determinants (Statements only) - Singular and non singular matrices - Product of two determinants.

Unit - 2 **15 Hours**

Algebra: Partial fractions - Linear non repeated and repeated factors - Quadratic non repeated types. Permutations - Applications - Permutation of repeated objects - Circular permutaion.

Combinations - Applications - Mathematical induction - Summation of series using $\sum n$, $\sum n2$ and $\sum n3$.Binomial theorem for a positive integral index - Binomial coefficients.

Unit - 3 **15 Hours**

Sequences and series: Harmonic progression - Means of two positive real numbers - Relation between A.M., G.M., and H.M. - Sequences in general - Specifying a sequence by a rule and by a recursive relation - Compound interest - Nominal rate and effective rate - Annuities - immediate and due.

Unit - 4 **15 Hours**

Ordinate Geometry: Rectangular castes ion Co–ordinates in a Plane, Equations of straight lines and the concept of gradient with its practical applications in real life business problems.

Reference Books:

1. Mathematics for Economics and Business by R.S. Bhardwaj .
2. Business Mathematics by PadmalochanHazarika.
3. Business Mathematics by D.C. Sancheti and V.K. Kapoor.
4. Mathematical Economics by Dowling, T. Edword.
5. Mathematical Analysis for Economics by Allen, RGD.

DCD37001

IV SEMESTER

SEC 1C: Elective: Accountancy & Financial Management

Credit (L: T: P = 3: 1: 0)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Deliberate the details of Basic Accounting Concepts
CO 2. Specify in depth Examples of Accounting
CO 3. Deliberate the details of Meaning and Scope of Financial Management
CO 4. Learn in depth Functions of Financial Manager
CO 5. Learn the characteristics of Ratio Analysis
CO 6. Understand the detail Concepts of Costing
CO 7. Learn in details with examples Budgetary Control

Unit - 1 **15 Hours**

ACCOUNTING:

1. Introduction: Principles, concepts and conventions, double entry system of Accounting, ledger keeping.
2. Subsidiary books with special reference to simple cash book and three columns cash book.
3. Trial balance and final accounts of sole trader: Preparation trial balance, adjusting entries, including revenue for bad debts, revenue for discount on debtors and creditors, preparation of final accounts.

Unit - 2 **15 Hours**

FINANCIAL MANAGEMENT:

4. Final accounts of joint stock companies.
5. Introduction: Meaning and scope of financial management, functions of the financial manager.
6. Ratio analysis: Meaning of ratio, advantages, limitations, types of ratios and their usefulness, liquidity and ratios, profitability rations, efficiency ratios, solvency ratios, problems including preparation of balance sheet.

Unit - 3 **15 Hours**

COSTING & BUDGETARY CONTROL:

7. Funds flow statement: Meaning and concepts of funds, preparation of fund flow statement.
8. Unit costing: Preparation of cost sheet and tender price statement.

9. Marginal costing: Concepts, Marginal cost equations, P/V ratio, B.E.P., Margin of safety, Sales to earn a desired profit, Problems on the above.

Unit - 4 **15 Hours**

10. Budgetary Control: Meaning and definition, preparation of flexible budget and cash budget.
11. Standard costing: Meaning of standard cost and standard costing, analysis of variances – material and labour variances only.

Reference Books:

1. Accountancy Vol. 1 by B.S. Raman.
2. Accountancy Vol. 2 by B.S. Raman.
3. Management Accounting by R.K. Sharma and Gupta.
4. Financial Management by I.M. Pandey.

DCD39001

IV SEMESTER
SEC 1D: Elective: Entrepreneurship Development
Credit (L: T: P = 3: 1: 0)

Course Outcome

After successful completion of the course, the student is able to
CO1. Specify the characteristics of Entrepreneurship
CO2. Deliberate the details of identification of opportunities
CO3. Understand in depth Feasibility and financial management of the Project
CO4. Write down the details of Project Report
CO5. Learn the characteristics of SWOT Techniques
CO6. Learn the details of Enterprise Rules and regulations

Unit - 1 **15 Hours**

Need scope and characteristics of entrepreneurships special schemes for a technical entrepreneur STED.

Identification of opportunities: Exposure to Demand based, Resource based, Service based important substitutes and expert promotion industries. Market surveys techniques.

Need scope and approaches for the project formulation.

Criteria for the principles of products selection and development.

Unit - 2 **15 Hours**

Structure of the project report, Choice of technology, plant and equipment.

Institutions financing procedure and financial incentives.financial ratios and their significance. Books of accounts, financial statements and funds flow analysis.

Resource management, man machine and material.The critical path method (CPM) and project evolution, review techniques (PERT).

Planning tools for establishing SSI

a. CREATIVITY AND INNOVATION b. ROBLEMSOLVING APPROACH
c. STRENGTH AND WEAKNESS OPPORTUNITY AND THREAT (SWOT) techniques.

Unit - 3 **15 Hours**

Techno economics feasibility of the project.Plan layout and process planning for the product.Quality control / quality assurances and testing of the products. Costing and pricing.

Management of self and understanding human behavior.Sickness in small-scale industries and their remedial measures.

Unit - 4 **15 Hours**

Coping and uncertainties, stress management, and positive reinforcement

a. Licensing registration, b. Municipal by laws and insurance coverage Important provision of factory acts sales of goods act partnership act.
a. DILUTION CONTROL,
b. SOCIAL RESPONSIBILITY AND BUSINESS ETHIQUES Income tax, sales tax and excise rule.

Reference Books:

1. Entrepreneurship Development – Kanaka
2. Entrepreneurship Development – VasanthDesa

DCE21001

V SEMESTER
DSE 1A: Elective: Data Communication and Computer Networks
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in depth Elements of Data Communications and network Systems
CO2. Learn in depth Transmission Media
CO3. Understanding the various classifications and characteristics of Signals
CO4. Understand in details with examples Network Models
CO5. Learn in depth Error Detection and Corrections Algorithms
CO6. Deliberate in details with examples Switching Concepts
CO7. Deliberate the classification and characteristics of networking and internetworking Devices

Unit - 1 **15 Hours**

Data Communications: Components, Data Representation, Dataflow

Networks: Network criteria, Physical Structures, Topology (Mesh, Star, Tree, Bus, Ring, Hybrid)

Categories of Network: LAN, MAN, WAN

History of Network: Protocols and Standards: Protocols (Standards organization),

Addressing: Physical, Logical, Port, Specific.

Unit - 2 **15 Hours**

Transmission Media: Guided Media – Twisted pair cable, co-axial cable, optical fiber, Unguided Media – Radio waves, microwaves, Infrared.

Signals: Analog and Digital Data, Analog and Digital Signals, periodic and non periodic signals. Analog Signals – Sine wave, Peak Amplitude, Period and frequency, Phase, wave length, composite signals. Digital Signals – Band width, Bit length, Bit rate, base band transmission, Digital v/s Analog. Transmission Impairment, Data rate limits (Noisy and noiseless channel)

Unit - 3 **15 Hours**

Network Models: Layered tasks, OSI model (peer – to – peer), Layered Architecture. Functions of Layers (OSI), TCP / IP Protocol suite

Multiplexing: FDM (MUX and DEMUX process, Application of FDM), WDM, TDM (Interleaving, synchronizing, bit padding)

Switching Concept: Working principle of circuit switching and packet switching. Circuit switched networks, three phases efficiency, delay. Data grams network, routing table, delay efficiency, virtual.

Error Detection and Correction: Types of Errors, Redundancy, Error detection virus Error Correction.

Error Detection: Parity check, Cyclic Redundancy Check (CRC), Check Sum. Error Correction - Retransmission, Forward Error Correction, Burst error Correction.

Unit - 4 **15 Hours**

Networking And Internetworking Devices: Connecting Devices - Hubs, Repeaters, Amplifiers, Bridges – LAN bridges, transparent bridges, Source-route bridges, Routers, Gateways, 2 layer and 3 layers switches.

Routing Concepts: Types, Shortest path, flooding.

Wireless Lan's: Blue tooth - Architecture, Blue tooth layers.

Network Layer : IPV4, IPV6 addresses

Transport Layer: UDP – user datagram, operations, Application. TCP - Services, TCP segment, SCTP - Services, packet format.

Application Layer: - SMTP, SNMP, HTTP, FTP

Reference Books:

1. Data Communication and Networking – Forouzan
2. Computer Network – Tanenbaurn – 3rd Editions
3. Computer Network – Larry L. Peterson & Bruce S. Davie

Data Communication and Computer Networks Lab

1. Program for Identifying well known Ports
2. Program for Data Retrieval from Remote Database.
3. Program for Simulating SMTP Client.
4. Program for Simulating Telnet Client
5. Program for Simple file transfer between two systems, (without using Protocols)
6. Program for implementing HTTP.
7. Program for Downloading Image files.
8. Simulate Checksum Algorithm.
9. Simulate Stop & Wait Protocol.
10. Simulate Go-Back-N Protocol.
11. Simulate Selective Repeat Protocol.
12. Take an example subnet of hosts. Obtain broadcast tree for it.
13. Network address with automatic subnet address generation:

DCE23001

V SEMESTER
DSE 1B: Elective: Computer Graphics
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the classification and characteristics of Elements of Graphics Systems
CO2. Learn in depth Graphics Algorithms
CO3. Deliberate the classification and characteristics of 2D Graphics
CO4. Understand the characteristics of 3D Graphics
CO5. Deliberate the details of Transformation and Viewing Techniques
CO6. Learn the details of Illumination and Colour Models

Unit - 1 **15 Hours**

INTRODUCTION: Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

Unit - 2 **15 Hours**

TWO DIMENSIONAL GRAPHICS: Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; widow-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

Unit - 3 **15 Hours**

THREE DIMENSIONAL GRAPHICS: Three dimensional concepts; Three dimensional object representations – Polygon surfaces Polygon tables- Plane equations – Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces.

TRANSFORMATION AND VIEWING: Three dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

Unit - 4 **15 Hours**

ILLUMINATION AND COLOUR MODELS: Light sources – basic illumination models – halftone patterns and dithering techniques; Properties of light – Standard primaries and chromaticity diagram; Intuitive colour concepts – RGB colour model – YIQ colour model – CMY colour model – HSV colour model – HLS colour model; Colour selection.

Reference Books:

1. Computer Graphics C Version by Donald Hearn & M. Pauline Baker Pearson Education, New Delhi, 2004
2. Procedural Elements for Computer Graphics by David F. Rogers, Tata McGraw Hill Book Company, New Delhi, 2003
3. Computer Graphics: Principles & Practice in C by J. D. Foley, S. K Feiner, A Van Dam F. H John, Pearson Education, 2004
4. Computer Graphics using Open GL by Franscis S Hill Jr Pearson Education, 2004.

Computer Graphics Lab

1. Implementation of Bresenhams Algorithm – Line, Circle, Ellipse.
2. Implementation of Line, Circle and ellipse Attributes
3. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
4. Composite 2D Transformations
5. Cohen Sutherland 2D line clipping and Windowing
6. Sutherland – Hodgeman Polygon clipping Algorithm
7. Three dimensional transformations - Translation, Rotation, Scaling
8. Composite 3D transformations
9. Drawing three dimensional objects and Scenes
10. Generating Fractal images

DCE25001

V SEMESTER
DSE 1C: Elective: Multimedia Systems and Applications
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the details of Components of Multimedia with applications
CO2. Identify in details with examples Text, Images, Sound and Videos
CO3. Learn in depth Animation Techniques
CO4. Understand the details of Multimedia in internet
CO5. Deliberate the characteristics of Making Multimedia
CO6. Deliberate in depth Multimedia Making Tools

Unit - 1 **15 Hours**

Multimedia: Introduction to multimedia, components, uses of multimedia, multimedia applications, virtual reality.

Text: Fonts & Faces, Using Text in Multimedia, Font Editing & Design Tools, Hypermedia & Hypertext.

Images: Still Images – bitmaps, vector drawing, 3D drawing & rendering, natural light &colors, computerized colors, color palettes, image file formats.

Unit - 2 **15 Hours**

Sound: Digital Audio, MIDI Audio, MIDI vs Digital Audio, Audio File Formats.

Video: How video works, analog video, digital video, video file formats, video shooting and editing.

Unit - 3 **15 Hours**

Animation: Principle of animations, animation techniques, animation file formats.

Internet and Multimedia: www and HTML, multimedia on the web – web servers, web browsers, web page makers and site builders.

Unit - 4 **15 Hours**

Making Multimedia: Stages of a multimedia project, Requirements to make good multimedia, Multimedia Hardware - Macintosh and Windows production

Platforms, Hardware peripherals - Connections, Memory and storage devices, Multimedia software and Authoring tools.

Reference Books:

1. Tay Vaughan, "Multimedia: Making it work", TMH, Eighth edition.
2. Ralf Steinmetz and KlaraNaharstedt, "Multimedia: Computing, Communications Applications", Pearson.
3. Keyes, "Multimedia Handbook", TMH.
4. K. Andleigh and K. Thakkar, "Multimedia System Design", PHI.

Multimedia Systems and Applications Lab

Practical exercises based on concepts listed in theory using Presentation tools in office automation tool / GIMP / Blender / Audacity / Animation Tools / Image Editors / Video Editors.

Implement the followings using Blender -

1. Create an animation using the tools panel and the properties panel to draw the following – Line, pe , oval, circle, rectangle , square, pencil , brush , lasso tool
2. Create an animation using text tool to set the font , size , color etc.
3. Create an animation using Free transform tool that should use followings-
   - Move Objects
   - Skew Objects
   - Stretch Objects
   - Rotate Objects
   - Stretch Objects while maintaining proportion
   - Rotate Objects after relocating the center dot
4. Create an animation using layers having following features- Insert layer, Delete layer, guide layer, Mask layer.
5. Modify the document (changing background color etc.)using the following tools
   - Eraser tool
   - Hand tool
   - Ink bottle tool
   - Zoom tool
   - Paint Bucket tool
   - Eyedropper tool
6. Create an animation for bus car race in which both starts from the same point and car wins the race.
7. Create an animation in which text Hello gets converted into GoodBye (using motion/shape tweening).
8. Create an animation having five images having fade-in fade-out effect.
9. Create an scene to show the sunrise (using multiple layers and motion tweening)
10. Create an animation to show the ripple effect.
11. Create an animation (using Shape tweening and shape hints) for transforming one shape into another.
12. Create an animation for bouncing ball (you may use motion guide layer).

OR

Project :

Design a minimum 10 page interactive website using Joomla or WordPress.

DCE31001

V SEMESTER
DSE 2A: Elective: ASP.Net
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Learn the details of ASP.NET Framework
CO 2. Learn the details of ASP.NET working Environment
CO 3. Deliberate in details with examples Standard Control Of Asp.NET
CO 4. Understand the details of Developing Simple Websites Using Asp.net Controls
CO 5. Deliberate in depth Developing Simple Web Application Using Asp.net Controls
CO 6. Learn the details of Database Access Controls
CO 7. Identify in details with examples Database Access Controls

Unit - 1 **15 Hours**

Overview of the ASP.NET: Introduction of different Web Technology, What is Asp.Net, How Asp.Net Works, Use of visual studio, Different Languages used in ASP.Net. Summary.

Framework: Common Language Runtime (CLR), .NET Framework Class Library, Summary

Unit - 2 **15 Hours**

Setting up and Installing ASP.NET: Installing Internet Information Server, Installation of Asp.Net, virtual directory, Application Setting in IIS, Summary.

Unit - 3 **15 Hours**

Asp.Net Standard Controls, Displaying information, Label Controls, Literal Controls, Bulleted List, Accepting User Input, Textbox controls, Radio Button and Radio Button List Controls, Checkbox and Checkbox List Controls, Button controls, Link Button Control, Image Button Control, Using Hyperlink Control, Dropdown List, List Box, Displaying Images, Image Control, Image Map Control, Using Panel Control, Using Hyperlink Control, Asp.Net, Page & State Management, Overview of events in page, Summary.

Unit - 4 **15 Hours**

Designing Websites with master pages, creating master pages, Creating default contents, nesting master pages, registering master pages in web configuration, Summary.

ASP.Net Theme: ASP.NET Website Theme, Named Skin and Default Skin In ASP.NET Theme, Style Sheet Theme and Theme Attributes Of A Page Directive

Using the Rich Controls: Accepting File Uploads, Saving files to file system, Calendar Control, Displaying advertisements, Displaying Different Page view, Displaying a Tabbed Page View, Wizard Control, Summary.

Reference Books:

1. Mathew Mac Donald, ASP . Net The Complete Reference, McGraw –Hill, 2002.

ASP . Net Lab

LAB MANUAL:

1. Write a Program to generate the factorial operation.
2. Write a Program to perform Money Conversion.
3. Write a Program to generate the Quadratic Equation.
4. Write a Program to generate the Login control.
5. Write a Program to perform Asp.Net state.
6. Write a Program to perform validation operation.
7. Write a Program to perform Tree view operation.
8. Write a Program to display the phone no of an author using database.
9. Write a Program to insert the data in to database using Execute-Non Query.
10. Write a Program to bind data using template in data list.
11. Write a Program to bind data using Hyperlink column in data grid.

DCE35001

V SEMESTER
DSE 2B: Elective: Visual Programming
Credit (L: T: P = 4: 0: 1)

{**Note:** Use any open source alternative such as Tkinter with Python /Sharp Develop/GAMBAS/OPENXAVA with JAVA}

Course Outcome:

After successful completion of the course, the student is able to

CO 1. Learn in details with examples Basic concept Of GUI Environment
CO 2. Deliberate the details of GUI Controls
CO 3. Learn in details with examples Data types and Operations in Visual Programming
CO 4. Learn in details with examples Control statements in Visual Programming
CO 5. Write down in details with examples Modular Programming
CO 6. Learn the details of Forms Handling in Visual Programming
CO 7. Understand in depth Database Connectivity in Visual Programming

Unit - 1 **15 Hours**

GUI Environment: Introduction to graphical user interface (GUI), programming language (procedural, object oriented, event driven), the GUI environment, compiling, debugging, and running the programs.

Controls: Introduction to controls textboxes, frames, check boxes, option buttons, images, setting borders and styles, the shape control, the line control, working with multiple controls and their properties, designing the user interface, keyboard access, tab controls, default & cancel property, coding for controls.

Operations: Data types, constants, named & intrinsic, declaring variables, scope of variables, val function, arithmetic operations, formatting data.

Unit - 2 **15 Hours**

Decision Making: If statement, comparing strings, compound conditions (and, or, not), nested if statements, case structure, using if statements with option buttons & check boxes, displaying message in message box, testing whether input is valid or not.

Modular programming: Menus, sub-procedures and sub-functions defining / creating and modifying a menu, using common dialog box, creating a new sub-procedure, passing variables to procedures, passing argument by value or by reference, writing a function/ procedure.

Unit - 3 **15 Hours**

Forms Handling: Multiple forms creating, adding, removing forms in project, hide, show method, load, unload statement, me keyword, referring to objects on a different forms

Iteration Handling: Do/loops, for/next loops, using msgbox function, using string function

Arrays and Grouped Data Control: Arrays - 1-dimension arrays, initializing an array using for each, user-defined data types, accessing information with user-defined data types, using list boxes with array, two dimensional arrays.

Unit - 4 **15 Hours**

lists, loops and printing list boxes & combo boxes, filling the list using property window / add item method, clear method, list box properties, removing an item from a list, list box/ combo box operations.

Database Connectivity: Database connectivity of forms with back end tool like mysql, populating the data in text boxes, list boxes etc. searching of data in database using forms. Updating/ editing of data based on a criterion.

Reference Books:

1. Reference: Programming in Visual Basic 6.0 by Julia Case Bradley, Anita C. Millispangh (Tata Mcgraw Hill Edition 2000 (Fourteenth Reprint 2004))

Visual Programming Lab

1. Print a table of numbers from 5 to 15 and their squares and Cubes.
2. Print the largest of three numbers.
3. Find the factional of a number n.
4. Enter a list of positive numbers terminated by zero. Find the sum and average of these numbers.
5. A person deposits Rs. 1000 in a fixed account yielding 5% interest. Complete the amount in the account at the end of each year for n years.
6. Read n numbers. Count the number of negative numbers, positive numbers and zeros in the list.
7. Read n numbers. Count the number of negative numbers, positive numbers and zeroes in the list. use arrays.
8. Read a single dimension array. Find the sum and average of these numbers.
9. Read a two dimension array. Find the sum of two 2D Array.
10. Create a database Employee and Make a form to allow data entry to Employee Form with the following command buttons:

DCE37001

V SEMESTER
DSE 3C: Elective: Artificial Intelligence and Expert Systems
Credit (L: T: P = 4: 0: 1)

Course Outcome

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples Artificial intelligence system
CO2. Learn the characteristics of Concepts of Representation of knowledge
CO3. Understand in details with examples Concepts of Representation of knowledge
CO4. Understand the details of knowledge inference methods
CO5. Understand in details with examples Concepts of Machine Learning Techniques
CO6. Learn the details of Expert System

Unit - 1 **15 Hours**

INTRODUCTION TO AI AND PRODUCTION SYSTEMS: Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

REPRESENTATION OF KNOWLEDGE: Game playing - Knowledge representation, Knowledge representation using Predicate logic,

Unit - 2 **15 Hours**

Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

KNOWLEDGE INFERENCE: Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster -Shafer theory.

Unit - 3 **15 Hours**

PLANNING AND MACHINE LEARNING: Basic plan generation systems - Strips -Advanced plan generation systems - Kstrips -Strategic explanations - Why, Why not and how explanations. Learning- Machine learning, adaptive Learning.

Unit - 4 **15 Hours**

EXPERT SYSTEMS: Expert systems - Architecture of expert systems, Roles of expert systems -Knowledge Acquisition –Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

Reference Books:

1. Kevin Night, Elaine Rich, Nair B., "Artificial Intelligence (SIE)",McGraw Hill- 2008. (Unit-1,2,4,5)
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007. (Unit-III)
3. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
4. Stuart Russel, Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.

Artificial Intelligence and Expert Systems Lab

1. Implement Breadth First Search (for 8 puzzle problem or Water Jug problem or any AI search problem)
2. Implement Depth First Search (for 8 puzzle problem or Water Jug problem or any AI search problem)
3. Implement Best First Search (for 8 puzzle problem or Water Jug problem or any AI search problem)
4. Implement Single Player Game (Using Heuristic Function)
5. Implement Two Player Game (Using Heuristic Function)
6. Implement A* Algorithm
7. Implement Propositional calculus related problem
8. Implement First order propositional calculus related problem
9. Implement Certainty Factor problem
10. Implement Syntax Checking of English sentences-English Grammar
11. Develop an Expert system for Medical diagnosis.
12. Develop any Rule based system for an application of your choice.

DCE41001

V SEMESTER

DSE 3A: Cloud Computing
Credit (L: T: P = 4: 0: 1)

Course Outcome

After successful completion of the course, the student is able to

CO1. Learn in depth Fundamentals of Cloud Computing
CO2. Understand the details of Cloud Services and File System
CO3. Learn in depth Concept of Collaborating with Cloud
CO4. Understand the details of Virtualization in cloud
CO5. Learn the classification and characteristics of Security challenges in Cloud Computing
CO6. Specify the classification and characteristics of Security challenges in Cloud Computing
CO7. Understand the details of Security challenges in Cloud Computing
CO8. Understand the Common standardsof Cloud Computing
CO9. Deliberate in details with examples Various Application of Cloud Computing

Unit - 1 15 Hours

Cloud Introduction: Cloud Computing Fundamentals: Cloud Computing definition, Types of cloud, Cloud services: Benefits and challenges of cloud computing, Evolution of Cloud Computing , usage scenarios and Applications , Business models around Cloud– Major Players in Cloud Computing - Issues in Cloud - Eucalyptus - Nimbus - Open Nebula, CloudSim.

Cloud Services and File System: Types of Cloud services: Software as a Service - Platform as a Service – Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services.

Unit - 2 15 Hours

Service providers- Google App Engine, Amazon EC2, Microsoft Azure, Sales force.

Collaborating With Cloud: Collaborating on Calendars, Schedules and Task Management – Collaborating on Event Management, Contact Management, Project Management –Collaborating on Word Processing , Databases – Storing and Sharing Files- Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Collaborating via Social Networks – Collaborating via Blogs and Wikis.

Unit - 3 **15 Hours**

Virtualization For Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - Hypervisors – Xen, KVM , VMWare, Virtual Box, Hyper-V.

Unit - 4 **15 Hours**

Security, Standards, And Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium –The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Reference Books:

1. Bloor R., Kanfman M., Halper F. Judith Hurwitz "Cloud Computing " Wiley India Edition,2010
2. John Rittinghouse& James Ransome, "Cloud Computing Implementation Management and Strategy", CRC Press, 2010
3. Antohy T Velte ,Cloud Computing : "A Practical Approach", McGraw Hill,2009
4. Michael Miller, Cloud Computing: "Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, August 2008.
5. James E Smith, Ravi Nair, "Virtual Machines", Morgan Kaufmann Publishers, 2006.

Online Reading/Supporting Material

1. Haley Beard, "Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing", Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008
2. Webpages.iust.ac.ir/hsalimi/.../89.../Cloud%20Common%20standards.pptop ennebula.org,
3. www.cloudbus.org/cloudsim/, http://www.eucalyptus.com/
4. hadoop.apache.org
5. http://hadoop.apache.org/docs/stable/hdfs_design.html
6. http://static.googleusercontent.com/external_content/untrusted_dlcp/ research.google.com/en//archive /mapreduce-osdi04.pdf

Cloud Computing Lab

Software Lab based on Cloud Computing:

1. Create virtual machines that access different programs on same platform.
2. Create virtual machines that access different programs on different platforms.
3. Exploring Google cloud for the following

    a) Storage
    b) Sharing of data
    c) Manage your calendar, to-do lists,
    d) A document editing tool

4. Exploring Open source cloud (Any two)

DCE43001

V SEMESTER
DSE 3B: Elective: Enterprise Resource Planning
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the details of ERP
CO2. Learn in depth Models of ERP
CO3. Write down in depth Business Process Mapping for ERP
CO4. Understand in details with applications of ERP and Related Technologies
CO5. Deliberate the details of ERP Modules
CO6. Specify in details with examples SAP

Unit - 1 **15 Hours**

Introduction to ERP, Evolution of ERP, What is ERP? Reasons for the growth of ERP, Scenario and Justification of ERP in India, Evaluation of ERP, Various Modules of ERP, Advantage of ERP and Disadvantage of ERP.

Unit - 2 **15 Hours**

An overview of Enterprise, Integrated Management Information, Business Modeling, ERP for Small Business, ERP for make to order companies, Business Process Mapping for ERP Module Design, Hardware Environment and its Selection for ERP Implementation.

Unit - 3 **15 Hours**

ERP and Related Technologies, Business Process Reengineering (BPR), Management Information System (MIS), Executive Information System (EIS), Decision support System (DSS), Supply Chain Management (SCM) (With Example)

Unit - 4 **15 Hours**

ERP Modules, Introduction to Finance, Plant Maintenance, Quality Management, Materials Management, ERP Market, Introduction, SAP AG, Baan Company, Oracle Corporation, People Soft, JD Edwards World Solutions Company, System Software Associates.

Reference Books:

1. C.S. V Murthy Enterprise Resource Planning
2. R.G. Saha – Enterprise Resource Planning - HPH
3. Alexis Leon, Leon Publishers: Enterprise Resource Planning

4. Ravi Anupindi, Sunil Chopra, Pearson Education". "Managing Business Process Flows
5. Altekar, PHI. Enterprise Resource Planning
6. Srivatsava, I.K. International Publishers, Enterprise Resource Planning
7. P. DiwanVinod Kumar Garg and N.K. Venkitakrishnan, PHI. Enterprise Resource Planning
8. Introduction to SAP, an Overview of SD: MM, PP, FI/CO Modules of SAP. 10. ZaveriJyotindra Enterprise Resource Planning

Enterprise Resource Planning Lab

Students should be Prepare ERP Solution Report for his / her Case Study under the supervision of Teacher/ Lecturer

DCE45001

V SEMESTER
DSE 3C: Elective: Data Mining and Data Warehousing
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the characteristics of Data Warehousing
CO2. Understand the details of Data Warehousing Architecture
CO3. Deliberate in depth Data Mining
CO4. Learn in details with examples Association Rule Mining
CO5. Specify the details of Classification and Prediction Techniques
CO6. Learn in depth Clustering Methods
CO7. Write down in depth Application of Data Mining

Unit - 1 **15 Hours**

Data Warehousing: Introduction- Definition and description need for data ware housing, need `for strategic information, failures of past decision support systems, OLTP vs DWH-DWH requirements-trends in DWH-Application of DWH.

Data Warehousing Architecture: Reference architecture- Components of reference architecture - Data warehouse building blocks, implementation, physical design process and DWH deployment process.

Unit - 2 **15 Hours**

A Multidimensional Data, Model Data Warehouse Architecture.

Data Mining: Data mining tasks-Data mining vs KDD- Issues in data mining, Data Mining metrics, Data mining architecture - Data cleaning- Data transformation- Data reduction - Data mining primitives.

Unit - 3 **15 Hours**

Association Rule Mining: Introduction - Mining single dimensional Boolean association rules from transactional databases - Mining multi-dimensional association rules.

Classification and Prediction: Classification Techniques - Issues regarding classification and prediction - decision tree - Bayesian classification –Classifier accuracy.

Unit - 4 **15 Hours**

Clustering: Clustering Methods - Outlier analysis.

Applications and Other Data Mining Methods: Distributed and parallel Data Mining Algorithms, Text mining- Web mining.

Reference Books:

1. Jiawei Han and MichelineKamber, " Data Mining Concepts and Techniques", Morgan Kaufmann Publishers, USA, 2006.
2. Berson,"DataWarehousing, Data Mining and OLAP", Tata McGraw Hill Ltd, New Delhi, 2004.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, , Pearson Education.
4. Arun K Pujari,"Data mining techniques", Oxford University Press, London, 2003.
5. Dunham M H,"Data mining: Introductory and Advanced Topics". Pearson Education, New Delhi, 2003.
6. MehmedKantardzic," Data Mining Concepts, Methods and Algorithms", John Wiley and Sons, USA, 2003.
7. Soman K. P., DiwakarShyam, Ajay V., Insight into Data mining: Theory and Practice, PHI 2006

Data Mining and Data Warehousing Lab

Software Lab based on Data Mining:

Practical List: Practical are to be done using Weka, and a report prepared as per the format*.

The operations are to be performed on built-in dummy data sets of weka and / or the downloadable datasets mentioned in references below. Also wherever applicable, the parameter values are to be varied (upto 3 distinct values). The 'Visualize' tab is to be explored with each operation.

1. Preprocessing: Apply the following filters –
   a. weka>filter>supervised>attributed>
      AddClassification ,AttributeSelection, Discretize , NominalToBinary
   b. weka>filter>supervised>instance:
      StratifiedRemoveFolds, Resample
   c. weka>filter>unsupervised>attribute>
      Add, AddExpression, AddNoise ,Center , Discretize , MathExpression ,MergeTwoValues , NominalToBinary , NominalToString, Normalize
      NumericToBinary ,NumericToNominal , NumericTransform , PrincipalComponent,
      RandomSubset , Remove , RemoveType , ReplaceMissingValues , Standardize
   d. weka>filter>unsupervised>instance>
      Normalize , Randomize , Standardize, RemoveFrequentValues, RemoveWithValues , Resample , SubsetByExpression
2. Explore the 'select attribute' as follows
      weka>attributeSelection> , FilteredSubsetEval , WrapperSubsetEval
3. Association mining
   weka>associations> , Apriori, FPGrowth
4. Classification**
   weka>classifiers>bayes> , NaïveBayes , weka>classifiers>lazy> : IB1 , IBkweka>classifiers>trees , SimpleCart , RandomTree , ID3
5. Clustering**
   weka>clusters> , SimpleKMeans , FarthestFirst algorithm, DBSCAN, hierarchicalClusterer

DCE51001

V SEMESTER

SEC 2A: Elective: Object Oriented Modelling& Design with UML
Credit (L: T: P = 3: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate in details with examples Object Oriented Development
CO2. Write down the details of OO Modeling Concepts
CO3. Learn the details of OO process Overview
CO4. Identify in depth Design of System Using OO Model
CO5. Specify the details of Steps for Implementation of OO Modeling
CO6. Learn the details of Design a System Using UML Tool

Unit - 1 15 Hours

INTRODUCTION: What is object orientation? What is OO development? OO themes, Evidence for usefulness of OO development, OO Modeling history. Introduction to UML, Importance of modeling, Principles of modeling, Object oriented modeling, Overview of UML, Conceptual model of the UML, Architecture, Software development life cycle.

MODELING CONCEPTS: Modeling as a design technique- Modeling, Abstraction, the three models. Class modeling -object and class concepts, link and association concepts, Generalization and inheritance, a sample model, navigation of class models, Advanced class modeling, advanced object and class concepts, association ends, n-ray associations, aggregation, abstract classes, multiple inheritance, metadata, reification, constraints, derived data, packages.

Unit - 2 15 Hours

State modeling events, states, transitions and conditions, state diagrams, state diagram behavior. Interaction modeling- use case models, sequence models, activity models. Advanced Interaction Modeling- use case relationships, procedural sequence models, special constructs for activity models

PROCESS OVERVIEW- development stages, development life cycle, Doman analysis- overview of analysis, domain class model, domain state model, domain interaction model, iterating the analysis.

Unit - 3 15 Hours

SYSTEM DESIGN-overview of system design, estimating performance, making a reuse plan, breaking a system into subsystems, identifying

concurrency, allocation of subsystems, management of data storage, handling global resources, choosing a software control strategy, handling boundary conditions.

CLASS DESIGN- Overview of class design, Bridging the gap, realizing use cases, designing algorithms, Recursing downward, refactoring, Design Optimization Reification of Behavior, adjustment of inheritance, organizing a class design.

IMPLEMENTATION MODELING-Overview of Implementation, fine-tuning classes Fine-tuning generalizations, Realizing associations testing.

Reference Books:

1. Object –oriented modeling and design- Michael R Blaha and James R Rumbaugh
2. Object Technology- David A.Taylor
3. Designing Flexible Object Oriented systems with UML – Charles Ritcher
4. Object Oriented Analysis & Design, Sat/.inger. Jackson, BurdThomson
5. Object Oriented Modeling and Design - James Rumbaugh
6. Teach Yourself UML in 24 Hours - Joseph Schmuilers

Object Oriented Modelling& Design with UML Lab

Term Work / Assignment

Each candidate will submit an approximately10-page written report on a case study or mini project. Students have todo OO analysis & design for the project problem, and develop use case model, analysis model and design model for it, using UML.

Practical assignment

Nine assignments, one on each of the diagrams learnt in UML.

DCE53001

V SEMESTER

SEC 2B: Elective: Analysis and Design of Algorithms

(Credit L: T: P = 3: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn the details of Types of notion of Algorithm
CO2. Learn in details with examples Algorithm Design Techniques
CO3. Deliberate in depth Sorting Techniques
CO4. Deliberate in depth of Searching Techniques
CO5. Identify in details with examples Analysis of Graph Algorithms
CO6. Learn the details of Dynamic Programming Methods

Unit - 1 15 Hours

Introduction: Notion of Algorithm, Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms Correctness of Algorithm

Algorithm Design Techniques: Iterative techniques Divide and conquer greedy algorithms.

Sorting Techniques: Selection sort, bubble sort, insertion sort, more sorting techniques-quick sort, merge sort. Radix sort,

Unit - 2 15 Hours

Searching Techniques: Linear and Binary search, Complexity Analysis.

Graphs: Analysis of Graph algorithms -Depth-First Search Breadth-First Search and its applications, minimum Spanning Trees and Shortest Paths - PRIM 'S, KRUSKAL, Dijkstra's algorithm. Branching-Hamiltonian Circuit problem.

Unit - 3 15 Hours

DYNAMIC PROGRAMMING: The General Method, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths, Single-Source Shortest Paths: The Travelling Salesperson problem.

Reference Books:

1. Analysis & design of Algorithm-Padma Reddy
2. A.V. Levitin, Introduction to the Design and Analysis of Algorithms, Pearson Education, 2006.
3. J. Kleinberg and E. Tardos, Algorithms Design, Pearson Education, 2006.

Analysis and Design of Algorithms Lab

1. Implement Insertion Sort.
2. Implement Merge Sort.
3. Implement recursive algorithm
4. Implement Randomized Quick sort.
5. Implement Radix Sort.
6. Implement Searching Techniques (linear & Binary)
7. Implement selection sort
8. Implement Bubble sort
9. Implement Prim's Algorithm
10. Implement Dijkstra's Algorithm
11. Implement Krushkal's Algorithm
12. Implement Travelling Salesperson problem
13. Implement Floyd's Algorithm
14. Implement Depth First Search
15. Implement Binary Search tree.

DCE55001

V SEMESTER
SEC 2C: Elective: E-Commerce Technologies
Credit (L: T: P = 3: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to
CO1. Understand the details of E-Commerce
CO2. Learn the details of Basic Concepts Of Internet and WWW
CO3. Identify in depth Internet Security Methods
CO4. Learn in details with examples Concepts of Electronic Data Exchange and applications
CO5. Learn in details with examples Planning For E-Commerce
CO6. Understand in depth Features of Internet Marketing

Unit - 1 15 Hours

An introduction to Electronic commerce: What is E-Commerce (Introduction And Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, 9 Electronic Commerce and Electronic Business(C2C)(C2G,G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C)

The Internet and WWW: Evolution of Internet, Domain Names and Internet Organization (.edu, .com, .mil, .gov, .net etc.) , Types of Network, Internet Service Provider, World Wide Web, Internet & Extranet, Role of Internet in B2B Application, building own website, Cost, Time, Reach, Registering a Domain Name, Web promotion, Target email, Baner, Exchange, Shopping Bots.

Unit - 2 15 Hours

Internet Security: Secure Transaction, Computer Monitoring, Privacy on Internet, Corporate Email privacy, Computer Crime(Laws , Types of Crimes), Threats, Attack on Computer System, Software Packages for privacy, Hacking, Computer Virus(How it spreads, Virus problem, virus protection, Encryption and Decryption, Secret key Cryptography, DES, Public Key Encryption, RSA, Authorization and Authentication, Firewall, Digital Signature(How it Works)

Electronic Data Exchange: Introduction, Concepts of EDI and Limitation, Applications of EDI, Disadvantages of EDI, EDI model, Electronic Payment System: Introduction, Types of Electronic Payment System, Payment Types,

Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash.

Unit - 3 **15 Hours**

Planning for Electronic Commerce: Planning Electronic Commerce initiates, linking objectives to business strategies, measuring cost objectives, Comparing benefits to Costs, Strategies for developing electronic commerce web sites.

Internet Marketing: The PROS and CONS of online shopping, The cons of online shopping, Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalization e-commerce.

Reference Books:

1. G.S.V.Murthy, E-Commerce Concepts, Models, Strategies- :- Himalaya Publishing House, 2011.
2. Kamlesh K Bajaj and DebjaniNag , E- Commerce , 2005.
3. Gray P. Schneider , Electronic commerce, International Student Edition, 2011,
4. HENRY CHAN, RAYMOND LEE, THARAM DILLON, ELIZABETH CHANG E COMMERCE, FUNDAMENTALS AND APPLICATIONS, Wiely Student Edition, 2011

E-Commerce Technologies Lab

Software Lab based on E-Commerce Technologies

E-commerce concepts are to be implemented in developing a website using a combination of following technologies:

1. Hyper Text Markup Language (HTML)
2. Cascading Style Sheets (CSS)
3. JavaScript
4. ASP
5. PHP
6. XML
7. Joomla

DCF31001

VI SEMESTER

DSE 4A: Elective: Operation Research
Credit (L: T: P = 4: 0: 1)

Course Outcome

After successful completion of the course, the student is able to

CO1. Write down the details of Origin and Development of Operation Research
CO2. Understand the characteristics of Linear Programming Problems and Methods
CO3. Deliberate in depth Transportation Problems
CO4. Deliberate in depth Assignment Problem
CO5. Identify in details with examples Network Analysis
CO6. Learn in depth Application of Operation Research

Unit - 1 **15 Hours**

Linear Programming Problems: Origin and development of operations research, formulation of Linear Programming problem, Graphical solution. Theory of simplex method, Use of artificial variables and their solution.

Unit - 2 **15 Hours**

Transportation Problem: Mathematical formulation of transportation problem, Initial basic Feasible solution, North West corner rule, Matrix minima method, Vogel's approximation method, MODI method to find optimal solution.

Unit - 3 **15 Hours**

Assignment Problem: Mathematical formulation of an Assignment problem, Assignment algorithm, Hungarian Method to solve Assignment Problem.

Unit - 4 **15 Hours**

Network Analysis: Basic components of Network, Rules for drawing Network diagram Time calculation in Networks. Critical Path Method and PROJECT Evaluation and Review Techniques. Algorithm and flow chart for CPM and PERT.

Reference Books:

1. Taha, "Operations Research", 7th edition, Pearson Education, 2007.
2. Billey E. Gillett, "Introduction to Operations Research", Himalaya Publishing House, Delhi,1979.
3. HamadyA.Taha "Operations Research" , Collin Mac Millan, 1982

Operation Research Lab

Lab based on Operation Research

1. LPP
2. Simplex
3. Dual Simplex
4. Big – M
5. Vogel's
6. Maxima and Minima
7. North West corner
8. Sequencing Problems
9. Modi Method
10. Hugarian Method
11. Assignment Problem

DCF33001

VI SEMESTER

DSE 4B: Elective: System Software & Compiler design
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Understand the classification and characteristics of language Processors
CO2. Learn the details of Concepts Of Macros
CO3. Learn the details of Linkers and Loaders
CO4. Understand in details with examples of Compiler Concepts
CO5. Understand the details of Parsing Methods
CO6. Write down the details of Code optimization

Unit - 1 **15 Hours**

ASSEMBLERS & MACROS: Overview of Language processors – Assemblers: Design of two pass assemblers - single pass assemblers

MACRO: Macro definition- macro call – macro expansion- nested macro advanced

Macro facilities- Design of Microprocessor.

LINKERS & LOADERS: Relocation and linking concepts – Design of linker – self relocating programs – linking in MS-DOS – overlays

DYNAMIC LINKING: Loaders – Absolute loaders- relocating loaders

Unit - 2 **15 Hours**

COMPILERS: GRAMMARS & AUTOMATA - Languages – Grammars – Types of grammars – Context free grammar – regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA – Thompson's construction- minimization of NDFA - Derivation - parse tree - ambiguity – Lexical analysis- handles - token specification - design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering – A language for specifying lexical analyzers - implementation of lexical analyzer

SYNTAX ANALYSIS – PARSING: Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing – FIRST- FOLLOW- LEADING- TRAILING

Unit - 3 **15 Hours**

Predictive parsing – recursive descent parsing. LR parsing – LR (0) items - SLR parsing – Canonical LR – LALR parsing - generation of LALR - Ambiguous grammars - error recovery

SYNTAX DIRECTED TRANSLATION & CODE OPTIMIZATION: Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesized attributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions –Backpatching - Declaration - CASE statements

Unit - 4 **15 Hours**

CODE OPTIMIZATION: Local optimization- Loop Optimization techniques – DAG –Dominators- Flow graphs – Storage allocations- Peephole optimization – Issues in Code Generation.

Reference Books:

1. Alfred V Aho , Jeffery D Ullman , Ravi Sethi, " Compilers , Principles techniques and tools ", Pearson Education 2011
2. Dhamdhere D.M., “Systems Programming”, Tata McGraw Hill Education Pvt. Ltd., 2011.
3. Srimanta Pal, “Systems Programming”, Oxford University Press, 2011.
4. Raghavan V., “Principles of Compiler Design”, Tata McGraw Hill Education Pvt. Ltd., 2010.
5. David Galles, “Modern Compiler Design”, Pearson Education, Reprint 2012.
6. DasaradhRamaiah. K., “Introduction to Automata and Compiler Design”, PHI, 2011.

System Software & Compiler design Lab

1. Implementation of a text editor
2. Implementation of an Assembler
3. Implementation of Macro processor
4. Converting a regular expression to NFA
5. Conversion of an NFA to DFA
6. Computation of FIRST and FOLLOW sets

   131 CS-Engg&Tech-SRM-2013
7. Computation of Leading and Trailing Sets
8. Construction of Predictive Parsing Table
9. Implementation of Shift Reduce Parsing
10. Computation of LR(0) items
11. Construction of DAG
12. Intermediate code generation

DCF35001

VI SEMESTER

DSE 4C: Elective: Digital Image Processing
Credit (L: T: P = 4: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in details with examples Element of Digital Image Processing Systems
CO2. Specify in depth Image Enhancement Techniques
CO3. Write down in depth Image Restoration Methods
CO4. Learn the details of Image Segmentation Algorithms
CO5. Identify in details with examples Data Image Compression
CO6. Learn in depth - Various Application of Image Processing

Unit - 1 **15 Hours**

DIGITAL IMAGE FUNDAMENTALS Elements of digital image processing systems, Videocon and Digital Camera working principles, Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

IMAGE ENHANCEMENT: Histogram equalization and specification techniques, Noise distributions, Spatial averaging,

Unit - 2 **15 Hours**

Directional Smoothing, Median, Geometric mean, Harmonic mean, Contra harmonic mean filters, Homomorphism filtering, Color image enhancement.

IMAGE RESTORATION: Image Restoration - degradation model, Unconstrained restoration - Lagrange multiplier and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering,

Unit - 3 **15 Hours**

Geometric transformations-spatial transformations.

IMAGE SEGMENTATION: Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

Unit - 4 **15 Hours**

IMAGE COMPRESSION: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

Reference Books:

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

Digital Image Processing Lab

Lab 1: Write a program for image enhancement

Lab2: Write a program for image compression

Lab3: Write a program for color image processing

Lab4: Write a program for image segmentation

Lab 5: Write a program for image morphology

Lab 6: Image Restoration

Lab 7: Edge detection

Lab 8: Blurring 8 bit color versus monochrome

DCF40001

VI SEMESTER

DSE 5: Elective: Dissertation / Project
Credit (L: T: P = 0: 0: 6) 12 Hours/Week

Course Outcome:

After successful completion of the course, the student is able to

CO1. Identify in details with examples Problem identification
CO2. Write down in depth System Analysis
CO3. Understand and Develop SRS for selected System Problem
CO4. Understand and Develop System Design for selected System Problem
CO5. Learn in details and Develop a Code and Test the System
CO6. Understand the details of Presentation and Demo of Project Work

- This option is to be offered only in 6th Semester.
- The students will be allowed to work on any project based on the concepts studied in
  Core/elective or skill based elective courses.
- The group size should be maximum of TWO (02) students.
- Each group will be assigned a teacher as a supervisor who will handle both their theory as Well as lab classes.
- A maximum of Four (04) projects would be assigned to one teacher.

DCF51001

VI SEMESTER

SEC 3A: PHP Programming
Credit (L: T: P = 1: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to
CO1. Learn in depth Elements of PHP
CO2. Learn in depth Interaction Methods Between HTML and PHP
CO3. Understand in depth PHP function
CO4. Understand in depth String Manipulation
CO5. Learn the characteristics of Regular Expression
CO6. Learn the details of Developing PHP Web Application

Unit - 1 15 Hours

Introduction Basic PHP Development Control Structure: Introduction to www, History, Understanding client/server roles Apache, PHP, MySQL, XAMPP Installation PHP Basic syntax, PHP data Types, PHP Variables PHP Constants, PHP Expressions, PHP Operators Control Structures & Loop

Working With the File System Working With Regular Expressions, Opening a File, Reading from a File, Writing to a File, File Locking, Uploading Files via an HTML Form, Getting File Information, Directory Functions, Getting a Directory Listing, The basic regular expressions, Matching patterns, Finding matches, Replace patterns

WORKING WITH FORMS: PHP Form handling, PHP GET/POST, PHP Form Validation, Accessing user input, Combine HTML and PHP code using hidden fields, Redirecting the user, File upload

CLASSES AND OBJECTS: Object oriented concepts, Define a class, attributes, Object, Object properties, methods, constructors and destructors, Class constants, Static method, Class inheritance, Abstract classes, Final keyword, Implementing Interface, Object serialization

Reference Books:

1. Complete Beginner's Guide to PHP: Programming & Web Development by Cedric Palmer (22 February 2014)
2. PHP and MySQL Web Development by Laura Thomson and Luke Welling
3. PHP Reference: Beginner to Intermediate PHP5 by Mario Lurig
4. PHP 4: A Beginner's Guide by William Mccarty

PHP Programming Lab

Students should do Mini Project Using PHP under the supervision of Teacher/ Lecturer

DCF53001

V SEMESTER
SEC 3B: Elective: Computer Simulations
Credit (L: T: P = 1: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Deliberate the details of Concepts of Simulation and Methods
CO2. Understand the details of Random Numbers/variates
CO3. Learn the details of Design of Simulation Experiments
CO4. Understand the characteristics of Discrete System simulation languages
CO5. Learn in details with Case studies using Simulation Languages
CO6. Identify the details of applications of simulation

Unit - 1 15 Hours

INTRODUCTION: Concept of simulation – simulation as a decision making tool-Monte Carlo simulation.

RANDOM NUMBERS/VARIATES: Pseudo random numbers – methods of generating random variates – random variates for uniform, normal, binominal, passion, exponential distributions.

DESIGN OF SIMULATION EXPERIMENTS: Problem formulation – data collection and reduction – logic developments – initial conditions – run length, tabular method of simulation – development of models using higher level languages for systems like queuing, production, inventory and maintenance – output analysis and interpretation, validation.

DISCRETE SYSTEM SIMULATION LANGUAGES: Need for simulation language – Comparison of simulation languages: SIMCRIPT, GASP, SIMULA, GPSS, PROMODEL, etc…

CASE STUDIES USING SIMULATION LANGUAGES: Development of simulation models using the simulation language studies for systems for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network.

Reference Books:

1. Jerry Banks and John S.Carson, Barry L Nelson, David M.Nicol, P.Shahabudeen "Discrete event system simulation"' Pearson, 2007.
2. Thomas J.Schriber, "Simulation using GPSS", John Wiley, 2002.
3. Law A.M. and Kelton W.D "Simulation Modeling and Analysis, McGraw Hill, 2003

Computer Simulations Lab

Design lab Cycle based on Computer Simulations (Theory) Paper by Concerned Teacher / Lecturer

DCF55001

V SEMESTER

SEC 3C: Elective: Information Security and Cyber Laws

Credit (L: T: P = 1: 0: 1)

Course Outcome:

After successful completion of the course, the student is able to

CO1. Learn in depth Computer Network Threats
CO2. Understand the details of Digital Crimes
CO3. Understand the details of Risk Analysis
CO4. Understand in details with examples Concepts of Cryptography
CO5. Learn in details with examples Application of Cryptography
CO6. Learn in details with examples safety tools and Cyber Laws

Unit - 1 15 Hours

Introduction: Computer network as a threat, hardware vulnerability, software vulnerability, importance of data security.

Digital Crime: Overview of digital crime, criminology of computer crime.

Information Gathering Techniques: Tools of the attacker, information and cyber warfare, scanning and spoofing, password cracking, malicious software, session hijacking

Risk Analysis and Threat: Risk analysis, process, key principles of conventional computer security, security policies, authentication, data protection, access control, and internal vs. external threat, security assurance, passwords, authentication, and access control, computer forensics and incident response

Introduction to Cryptography and Applications: Important terms, Threat, Flaw, Vulnerability, Exploit, Attack, Ciphers, Codes, Substitution Cipher (Caesar), Transposition Cipher (Rail-Fence), Public key cryptography (Definitions only), Private key cryptography (Definition and Example), Cyber forensics, Steganography

Safety Tools and Issues: Firewalls, logging and intrusion detection systems, Windows and windows XP / NT security, Unix/Linux security, ethics of hacking and cracking

Cyber laws to be covered as per IT 2008

Reference Books:

1. M. Merkow, J. Breithaupt, Information Security Principles and Practices, Pearson Education.
2. G.R.F. Snyder, T. Pardoe, Network Security, Cengage Learning, 2010
3. A. Basta, W.Halton, Computer Security: Concepts, Issues and Implementation, Cengage Learning India, 2008
4. Anderson, Ross. Security engineering.John Wiley & Sons, 2008. (Freely available online)

Information Security and Cyber Laws Lab

1. Demonstrate the use of Network tools: ping, ipconfig, ifconfig, tracert, arp, netstat, whois
2. Use of Password cracking tools: John the Ripper, Ophcrack. Verify the strength of passwords using these tools.
3. Perform encryption and decryption of Caesar cipher. Write a script for performing these operations.
4. Perform encryption and decryption of a Rail fence cipher. Write a script for performing these operations.
5. Use nmap / zenmap to analyse a remote machine.
6. Use Burp proxy to capture and modify the message.
7. Demonstrate sending of a protected word document.
8. Demonstrate sending of a digitally signed document.
9. Demonstrate sending of a protected worksheet.
10. Demonstrate use of steganography tools.
11. Demonstrate use of gpg utility for signing and encrypting purposes.

Question Paper Pattern
Theory (3 or 4 Credits)

Time: 3 Hours Max. Marks: 70

Part – A

I. Answer any Eleven Question out of given Twelve Questions.11 X 2 = 22

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

Note: Three Questions each from the Units 1, 2, 3, and 4

Part - B

II. Answer any Two Sub Questions from each main Question.

13. A) **2 X 6 = 12**
B)
C)

14. A) **2 X 6 = 12**
B)
C)

15. A) **2 X 6 = 12**
B)
C)

16. A) **2 X 6 = 12**
B)
C)

Note: Each Main questions contains 3 sub questions carries 06 Marks (may have internal Split-ups) and from Units 1, 2, 3 and 4 respectively

Question Paper Pattern

Theory (1 or 2 Credits)

Time: 2 Hours Max. Marks: 50

Part – A

I. Answer all Questions. 05 X 02 = 10

1.
2.
3.
4.
5.

Part - B

II. Answer any Four Questions out of given Five Questions.4 X 10 = 40

1.
2.
3.
4.
5.

Note: Each Main questions contains 3 sub questions carries 06 Marks (may have internal Split-ups) and from Units 1, 2, 3 and 4 respectively

PRINCIPAL
JSS College of Arts, Commerce & Science
(Autonomous)
Ooty Road, MYSURU-25

Question Paper Pattern

Practical / Project (1 or 2 Credits)

Time: 3 Hours Max. Marks: 70

Practicals

1. Two Experiments/ Programs 20 Marks Each 2 x 20 = 40 Marks
   a. Write-ups 10 Marks
   b. Conducting & Results 10 Marks (Any One for 2 Hours of Practical's)
2. Viva – Voice 10 Marks
3. Record 10 Marks

Project

1.	Project Presentation	10% Marks
2.	Project Demo	20% Marks
3.	Viva – Voice	20% Marks
4.	Record / Report	20% Marks
5.	IA (C1 & C2)	30% Marks

PRINCIPAL
JSS College of Arts, Commerce & Science
(Autonomous)
Ooty Road, MYSURU-25