



**JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE
(Autonomous)
B N ROAD, MYSURU- 570 025**

DEPARTMENT OF ZOOLOGY

**Syllabus for
B.Sc. Hons ZOOLOGY (UG)**

I & II SEMESTERS

**Framed According to the National Educational Policy
(NEP 2020)**

(2021-22 Batch Onwards)

Model Curriculum Structure for Degree Program

B. Sc., Hons in Zoology

Name of the Degree Program: B. Sc., Hons

Discipline Core: Zoology Total Credits for the

Program: 50/100/142/184/268 Starting year of implementation: 2021-22

PROGRAM OBJECTIVES (POs)

POs1-The Programme offers both classical as well as modern concepts of Zoology in higher education.

POs2-It enables the students to study animal diversity in both local and global environments.

POs3-To make the study of animals more interesting and relevant to human studies more emphasis is given to branches like behavioural biology, evolutionary biology and economic zoology.

POs4-More of upcoming areas in cell biology, genetics, molecular biology, biochemistry, genetic engineering and bioinformatics have been also included.

POs5-Equal importance is given to practical learning and presentation skills of students.

POs6-The lab courses provide the students necessary skills required for their employability. **POs7-**Skill enhancement courses in classical and applied branches of Zoology enhance enterprising skills of students.

POs8-The global practices in terms of academic standards and evaluation strategies.

POs9- Provides opportunity for the mobility of the student both within and across the world.

POs 10-The uniform grading system will benefit the students to move across institutions within India to begin with and across countries.

POs11-It will also enable potential employers in assessing the performance of the candidates across the world.

Semester I- Zoology Core Course I Content:
Zoology: Paper-I: Cytology, Genetics & Infectious Diseases.

Course Title/Code: Cytology, Genetics and Infectious Diseases	Course Credits: 4
Course Code: FSA470	L-T-P per week: 4-0-0
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60

Course Outcomes (COs):

At the end of the course the student should be able to understand:

- CO1. The structure and function of the cell organelles.
- CO2. The chromatin structure and its location.
- CO3. The basic principle of life, how a cell divides leading to the growth of an Organism and also reproduces to form a new organism.
- CO4. How a cell communicates with its neighboring cells.
- CO5. The principles of inheritance, Mendel's laws and the deviations.
- CO6. How environment plays an important role by interacting with genetic factors.
- CO7. Detect chromosomal aberrations in humans and study of pedigree analysis.

Content	Hours
Unit -1	14hrs
<p>Chapter 1: Structure and Function of Cell Organelles - I in Animal cell</p> <ul style="list-style-type: none"> • Ultra structure of animal cell • Plasma membrane: Fluid mosaic model, Chemical structure – lipids, Proteins and their role in maintaining structural integrity. Functions of Plasma membrane - Cell permeability, diffusion, passive transport, active transport. • Endomembrane system: Protein targeting and sorting, transport, endocytosis and exocytosis. <p>Chapter 2: Structure and Function of Cell Organelles - II in Animal cell.</p> <ul style="list-style-type: none"> • Endoplasmic reticulum- Types, Structure and functions. • Peroxisome & Ribosome: Types – (Prokaryotic & Eukaryotic), Structure and functions. • Golgi apparatus - Structure and functions. • Lysosomes - Structure and functions. • Mitochondria: Structure and functions. Oxidative phosphorylation; electron transport system • Cytoskeleton: Structure and functions of - Microtubules, microfilament intermediate filaments. 	
Unit -2	14hrs
<p>Chapter 3: Nucleus and Chromatin Structure.</p> <ul style="list-style-type: none"> • Ultra structure of Nucleus and Functions - Nuclear envelop, Nuclear pore complex, Nucleoplasm. • Ultrastructure of nucleolus and functions. • Chemical structure and base composition of DNA and RNA. • Nucleosome model, DNA super coiling, Chromatin organization, Structure of chromosomes (Fine structure). Types of DNA and RNA. <p>Chapter 4: Cell cycle, Cell Division and Cell Signalling.</p> <ul style="list-style-type: none"> • Introduction to Cell cycle and its regulation Cell division: Mitosis stages and its Significance and Meiosis Stages and its Significance. • Signal transduction: Intracellular signalling and Cell surface receptors, via G-protein linked receptors. • Cell-cell interaction: Cell adhesion molecules, Cellular junctions. 	
Unit -3	14hrs
<p>Chapter 5: Mendelism and Sex Determination.</p> <ul style="list-style-type: none"> • Basic principles of heredity: Mendel's laws - Monohybrid cross and Dihybrid cross. Complete and Incomplete Dominance (Ex. <i>Mirabilis jalapa</i>). Penetrance and Expressivity. • Genetic Sex Determining Systems (XX- XY, XX – XO, ZZ – ZW), Environmental Sex Determination (<i>Bonelia viridis</i>), Sex Determination and Mechanism in <i>Drosophila melanogaster</i> (<i>Genic balance theory</i>). • Dosage Compensation - Barr body, Lyon's hypothesis. 	

<p>Chapter 6: Extensions of Mendelism, Genes and Environment.</p> <ul style="list-style-type: none"> • Extensions of Mendelism: Multiple Alleles (Inheritance of ABO blood group in Humans and Rh factor), Gene Interaction (Supplementary, Complementary and Epistasis). • The Interaction between Sex and Heredity: Sex-Influenced characteristics (Male pattern baldness in humans, horns in sheep) and Sex-Limited Characteristics (Plumage pattern, milk production and Moustache and Beard in Males) • Cytoplasmic Inheritance (Kappa particles in <i>Paramecium</i>), Genetic Maternal Effects (Shell coiling in <i>Limnaea</i>). • Interaction between Genes and Environment -Himalayan albino rabbit Environmental Effects on Gene Expression (Norm of reaction), Inheritance of Continuous Characteristics (Polygenic Inheritance - Skin colour in Man). 	
Unit -4	14hrs
<p>Chapter 7: Human Chromosomes and Patterns of Inheritance.</p> <ul style="list-style-type: none"> • Patterns of Inheritance: Autosomal dominance (Huntington's chorea, PTC), Autosomal recessive (Sickle cell anemia, Albinism), X-linked recessive (Colour blindness, Hemophilia), X-linked dominant (Vitamin D resistance Ricketts, Coffin Lowry syndrome). • Chromosomal Anomalies: Structural (Deletion, Duplication, Inversion, Translocation with examples) and Numerical aberrations (Turner's syndrome, Klinefelter's syndrome). Autosomal anomalies - Down syndrome and Cri-du-chat syndrome. • Human Karyotyping and Pedigree analysis (Autosomal dominant, Autosomal recessive, X – linked dominant, X – linked recessive). <p>Chapter 8: Infectious Diseases.</p> <ul style="list-style-type: none"> • Introduction to Pathogenic Organisms: Viruses, Bacteria, Fungi, Protozoa and Worms. Structure, Life cycle, Pathogenicity, including diseases, causes, symptoms and control of common parasites: <i>Trypanosoma</i>, <i>Giardia</i> and <i>Wuchereria</i>. 	

Suggested Readings :

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA(2004).
2. Alberts et al: Molecular Biology of the Cell: Garland(2002).
3. Cooper: Cell: A Molecular Approach: ASM Press(2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman(2004).
5. Lewin B. Genes VIII. Pearson (2004).
6. Watson et al. Molecular Biology of the Gene. Pearson(2004).
7. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby- Kuby Immunology. W H Freeman(2007).
8. Delves Peter J., Martin Seamus J., Burton Dennis R., Roitt Ivan M. Roitt's Essential Immunology, 13th Edition. Wiley Blackwell(2017).
9. Principles of Genetics by B. D. Singh
10. Cell-Biology by C. B. Pawar, Kalyani Publications
11. Economic Zoology by Shukla and Upadhyaya

Semester I- Zoology Core Course I Content:
Zoology: Paper-I: Cytology, Genetics & Infectious Diseases.

Semester I

Course Title: Cytology, Genetics and Infectious Diseases	Course Credits: 2
Course Code: FSA470	L-T-P per week: 0-0-4
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 25	Summative Assessment Marks: 25

Course Outcomes (COs):

At the end of the course the student should be able to:

1. To use simple and compound microscopes.
2. To prepare stained slides to observe the cell organelles.
3. To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms.
4. The chromosomal aberrations by preparing karyotypes.
5. How chromosomal aberrations are inherited in humans by pedigree analysis in families.
The antigen-antibody reaction.

Lab Course Content

List of labs to be conducted	56hrs
1. Understanding of simple and compound microscopes.	
2. To study different cell types such as buccal epithelial cells, neurons, striated muscle cells using Methylene blue/any suitable stain (virtual/ slaughtered tissue).	
3. To study the different stages of Mitosis in root tip of <i>Allium cepa</i> .	
4. To study the different stages of Meiosis in grasshopper testis (virtual).	
5. To check the permeability of cells using salt solution of different concentrations.	
6. Study of parasites in humans (e.g. Protozoans, Helminthes in compliance with examples being studied in theory) permanent microslides.	
7. To learn the procedures of preparation of temporary (spicules) or permanent stained slides (Fish scales), with available mounting material.	
8. Study of wild <i>Drosophila melanogaster</i> (male & female) and Mutant Phenotypes of <i>Drosophila</i> sp, –White eye, bar eye, sepia eye, vestigial wing & yellow body. (From Cultures or Photographs).	
9. Study of Polytene chromosomes (<i>Chironomus</i> larva or <i>Drosophila</i> larva).	
10. Preparation of <i>Drosophila</i> and human Karyotype and study (identification) of the chromosomal structural (Chriduchat syndrome (Deletion), Fragile X syndrome (duplication) , walker-warburg syndrome (Inversion) and leukemia (translocation) and numerical aberrations (Turner's, Klinefelter's and Down's syndrome) from the pictures provided. (Virtual / Optional).	
11. To prepare family pedigrees.	
12. https://www.vlab.co.in	
13. https://zoologysan.blogspot.com	
14. www.vlab.iitb.ac.in/vlab	
15. www.onlinelabs.in	
16. www.powershow.com	
17. https://vlab.amrita.edu https://sites.dartmouth.edu/	

Suggested Readings:

1. Lodish et al: Molecular Cell Biology: Freeman & Co, USA(2004).
2. Alberts et al: Molecular Biology of the Cell: Garland(2002).
3. Cooper: Cell: A Molecular Approach: ASM Press(2000).
4. Karp: Cell and Molecular Biology: Wiley (2002). Pierce B. Genetics. Freeman(2004).
5. Thomas J. Kindt, Richard A. Goldsby, Barbara A. Osborne, Janis Kuby- Kuby
Immunology. W HFreeman(2007).
6. Kesar, Saroj and Vasishta N.2007 Experimental Physiology: Comprehensive Manual.
Heritage Publishers,NewDelhi.

Scheme of Practical ExaminationI
Semester BSc. Zoology
Cytology, Genetics and Infectious diseases
Course Code: FSA470

Duration: 3 hours

Max. Marks: 25

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|--|-----|
| 1. Identify the spots A, B and C, giving suitable reasons with diagram
(Experiment no 1, 2, 3, 4, 6, 8, 9&10) | 12M |
| 2. Prepare a whole mount of the given material | 03M |
| 3. Preparation of Karyotype | 05M |
| 4. Preparation of Pedigree analysis | 05M |

(The candidate has to submit the duly certified record at the time of practical examination. The record is for the reference of the examiners, but not for assessment (since it is already assessed for IA)

Assessment:**Weightage for assessments (in percentage)**

Type of Course	Formative Assessment / IA Marks	Summative Assessment Marks
Theory	40	60
Practical	25	25

Pedagogy: Written Assignment/Presentation/Seminar

Formative Assessment - Theory	
Assessment Occasion	Weightage in Marks
House Examination/Test	C1+C2=10+10=20
Written Assignment/Presentation/Seminar	10+10=20
Total	40

Pedagogy: Written Assignment/Presentation/Record/Seminar

Formative Assessment- Practical	
Assessment Occasion	Weightage in Marks
Internal assessment C1	10
Internal assessment C2	10
Class record	05
Total	25

Open Elective Course Content

Semester: I

Course Title: Economic Zoology Course Code: FSA920	Course Credits: 3
Total Contact Hours: 42	Duration of ESA: 3 Hours
Formative AssessmentMarks: 40	Summative AssessmentMarks: 60

Course Outcomes (COs):

At the end of the course the student will be able to:

1. Gain knowledge about silkworms rearing and their products.
2. Gain knowledge in Bee keeping equipment and apiary management.
3. Acquaint knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality.
4. Acquaint knowledge about the culture techniques of fish and poultry.
5. Acquaint the knowledge about basic procedure and methodology of vermiculture.
6. Learn various concepts of lac cultivation.
7. Students can start their own business i.e. self-employments.
8. Get employment in different applied sectors

Course Content

Content	Hrs
Unit I	14
<p>Chapter 1. Sericulture:</p> <ul style="list-style-type: none"> • History and present status of sericulture in India • Mulberry and non-mulberry species in Karnataka and India • Mulberry cultivation • Morphology and life cycle of <i>Bombyxmori</i> • Silkworm rearing techniques: Processing of cocoon, reeling • Silkworm diseases and pest control <p>Chapter 2. Apiculture:</p> <ul style="list-style-type: none"> • Introduction and present status of apiculture • Species of honey bees in India, life cycle of <i>Apisindica</i> • Colony organization, division of labour and communication • Bee keeping as an agro based industry; methods and equipments: indigenous methods, extraction appliances, extraction of honey from the comb and processing • Bee pasturage, honey and bees wax and their uses • Pests and diseases of bees and their management 	
Unit II	14
<p>Chapter 3. Live Stock Management:</p> <ul style="list-style-type: none"> • Dairy: Introduction to common dairy animals and techniques of dairy management • Types, loose housing system and conventional barn system; advantages and limitations of dairy farming • Establishment of dairy farm and choosing suitable dairy animals-cattle • Cattle feeds, milk and milk products • Cattle diseases • Poultry: Types of breeds and their rearing methods • Feed formulations for chicks • Nutritive value of egg and meat • Disease of poultry and control measures <p>Chapter 4. Aquaculture:</p> <ul style="list-style-type: none"> • Aquaculture in India: An overview and present status and scope of aquaculture • Types of aquaculture: Pond culture: Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, composite fish culture and pearl culture 	
Unit - III	14

<p>Chapter 5. Fish culture:</p> <ul style="list-style-type: none"> • Common fishes used for culture. • Fishing crafts and gears. • Ornamental fish culture: Fresh water ornamental fishes- biology, breeding techniques • Construction and maintenance of aquarium: Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality. control of snail and algal growth. • Modern techniques of fish seed production <p>Chapter 6. Prawn culture:</p> <ul style="list-style-type: none"> • Culture of fresh and marine water prawns. • Preparation of farm. • Preservation and processing of prawn, export of prawn. <p>Chapter 7. Vermiculture:</p> <ul style="list-style-type: none"> • Scope of vermiculture. • Types of earthworms. • Habit categories - epigeic, endogeic and anecic; indigenous and exotic species. • Methodology of vermicomposting: containers for culturing, raw materials 	
<p>required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of vermicompost.</p> <ul style="list-style-type: none"> • Advantages of vermicomposting. • Diseases and pests of earthworms. <p>Chapter 8. Lac Culture:</p> <ul style="list-style-type: none"> • History of lac and its organization, lac production in India. • Life cycle, host plants and strains of lac insect. • Lac cultivation: Local practice, improved practice, propagation of lac insect, inoculation period, harvesting of lac. • Lac composition, processing, products, uses and their pests. 	

Text Books

Suggested Readings:

1. Eikichi, H. (1999). Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co.Pvt. Ltd., New Delhi.
2. Ganga, G. (2003). Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling.
3. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Mahadevappa, D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R., (2000). Mulberry Silk
5. Reeling Technology Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Roger, M (1990). The ABC and Xyz of Bee Culture: An Encyclopedia of Beekeeping, Kindle Edition.
7. Shukla and Upadhyaya (2002). Economic Zoology, Rastogi Publishers
8. Yadav Manju (2003). Economic Zoology, Discovery Publishing House.
9. Jabde Pradip V (2005). Textbook of applied Zoology, Discovery Publishing House, New Delhi.
10. Cherian & Ramachandran Bee keeping in-South Indian Govt. Press, Madras.
11. Sathe, T.V. Vermiculture and Organic farming.
12. Bard. J (1986). Handbook of Tropical Aquaculture.
13. Santhanam, R. A. Manual of Aquaculture.
14. Zuka. R.1 and Hamiyn (1971). Aquarium fishes and plants
15. Jabde, P.V. (2005) Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lacculture.
16. Animal Disease- Bairagi K. N. Anmol Publications Pvt.Ltd 2014

17. Economics Of Aquaculture - Singh(R.K.P) - Danika Publishing Company 2003
18. Applied and Economic Zoology (SWAYAM) web
https://swayam.gov.in/nd2_cec20_ge23/preview

Assessment

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Field visit

Formative Assessment - Theory	
Assessment Occasion	Weightage in Marks
House Examination/Test	$C1+C2=10+10=20$
Written Assignment/Presentation/Seminar	$10+10=20$
Total	40

Skill Enhancement Course in Zoology

Course Content

Semester:I

Course Title: Vermiculture Course Code: VEC5ZOOP1	Course Credits: 2
Total Contact Hours: 56 Hours	Duration of ESA: 3 Hrs
Formative Assessment Marks: 20	Summative Assessment Marks: 30

Course Outcomes (COs):

At the end of the course the student:

1. Understands the importance of earthworms in maintaining soil quality.
2. Learns that the vermicomposting is an effective organic solid waste management method.
3. Gets acquainted with the importance of earthworms in agro-based economic activity.
4. Vermicomposting leads to organic farming and healthy food production.
5. Vermicomposting may be taken up as a small scale industry by the farmers and unemployed youth.
6. Get jobs in teaching institutions or vermiculture units as technicians.
7. Learn the concept of vermicomposting as bio fertilizers thus student can become an entrepreneur after completion of the course.
8. Best opportunity for self-employment and lifelong learning with farmers.

Course Content

List of labs to be conducted		56Hrs
1	Collection of native earth worm species to study habit and habitat.	
2	Keys to identify different species of earth worm.	
3	Externals and Life cycle of <i>Eiseniafetida</i> and <i>Eudriluseugeniae</i> .	
4	Dissection of digestive and reproductive system.	
5	Study of vermicomposting equipments and devices.	
6	Preparation of vermibeds and their maintenance.	
7	Study of different vermicomposting methods.	
8	Harvesting, separation of worms, packaging, transport and storage of vermicompost.	
9	Vermi-wash collection and processing.	
10	Small scale earth worm farming for home gardens and studying the effect of vermicompost on garden plants.	
11	Budget and cost scenario of vermiculture (Project).	
12	Diseases and natural enemies of earth worms and their control measures.	
13	Role of vermitechnology in environmental protection.	
14	Economics and Marketing of vermicompost and vermi wash.	
15	Visit to vermiculture farm to acquaint with latest techniques.	

Text Books and references

1. Bhatt J.V. & S.R. Khambata (1959) -Role of Earthworms in Agriculture| Indian Council of Agricultural Research, New Delhi
2. Edwards, C.A. and J.R. Lofty (1977) -Biology of Earthworms| Chapman and Hall Ltd., London.
3. Lee, K.E. (1985) -Earthworms: Their ecology and Relationship with Soils and Land Use| Academic Press, Sydney.
4. Dash, M.C., B.K.Senapati, P.C. Mishra (1980) — Vermes and Vermicomposting| Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, JyotiVihar, Orissa.
5. Kevin, A and K.E.Lee (1989) — Earthworm for Gardeners and Fisherman| (CSIRO,Australia, Division of Soils)
6. Satchel, J.E. (1983) -Earthworm Ecology| Chapman Hall, London.
7. Wallwork, J.A. (1983) -Earthworm Biology| Edward Arnold (Publishers) Ltd. London.

Pedagogy

1. Demonstration
2. Assignment
3. Group discussion
4. Field visit
5. Use of Audio-Visual aids.

Formative Assessment	
Assessment Occasion	Weightage in Marks
Class Test	10
Attendance and Assignments	05
Visit to vermicompost unit and report	05
Total	20

Scheme of Practical Examination I**Semester BSc. Zoology**

Skill Enhancement course: Vermiculture

Duration: 3 hours**Max. marks: 30**

1. Identify and describe the given system of the given specimen/chart 'A' given, with neat labelled diagram. (05 marks)
2. Identify and comment on the spotters B to E (Life cycle/Externals/Devices used in vermicomposting/ Vermicompost types) (5x5=25 marks)

TOTAL = 30 Marks

Semester II- Zoology Core Course I Content:

Paper-II: Biochemistry and Physiology

Course Title: Biochemistry and Physiology	Course Credits: 4
Course Code: FSB470	L-T-P per week: 4-0-0
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60

Course outcomes:

The student at the completion of the course will learn:

1. To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates.
2. How simple molecules together form complex macromolecules.
3. To understand the thermodynamics of enzyme catalyzed reactions.
4. Mechanisms of energy production at cellular and molecular levels.
5. To understand various functional components of an organism.
6. To explore the complex network of these functional components.
7. To comprehend the regulatory mechanisms for maintenance of function in the body.

Content	Hours
Unit I	14
<p>Chapter 1. Structure and Function of Biomolecules:</p> <ul style="list-style-type: none"> • Structure and Biological importance of carbohydrates (Classification with examples Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates). • Lipids Classification and Biological importance-(saturated and unsaturated Fatty acids, Tri-acylglycerols, Phospho lipids, Glycolipids and Steroids) Clinical importance of Lipids, HDL & LDL ,TG and Cholesterol • Proteins Structure, Classification and General Properties of α-amino acids; Essential and non-essential amino acids, Levels of organization in proteins(Primary, secondary, tertiary and quaternary structure with Haemoglobin as an example) Simple and conjugate proteins. 	
<p>Chapter 2. Enzyme Action and Regulation</p> <ul style="list-style-type: none"> • Nomenclature and classification of enzymes; Cofactors; Specificity of enzyme action. • Isozymes; Mechanism of enzyme action • Enzyme kinetics; Factors affecting rate of enzyme-catalyzed reactions ; Equation of Michaelis-Menten, Concept of K_m and V_{max}, Enzyme inhibition • Allosteric enzymes and their kinetics; Regulation of enzyme action. 	
Unit 2	14
<p>Chapter 3. Metabolism of Carbohydrates and Lipids</p> <ul style="list-style-type: none"> • Metabolism of Carbohydrates: glycolysis, citric acid cycle, gluconeogenesis, phosphate pentose pathway, Glycogenolysis and Glycogenesis • Lipids- Biosynthesis of palmitic acid; Ketogenesis, β-oxidation and ω-oxidation of saturated fatty acids with even and odd number of carbon atoms 	
<p>Chapter 4. Metabolism of Proteins and Nucleotides</p> <ul style="list-style-type: none"> • Catabolism of amino acids: Transamination, Deamination, Urea cycle, Nucleotides and vitamins • Anabolism -Peptide linkages 	
Unit 3	14

Chapter 5. Digestion and Respiration in humans

- **Digestion**- Structural organization and functions of gastrointestinal tract and associated glands.
- Mechanical and chemical digestion of food; Absorptions of carbohydrates, lipids, proteins, water, minerals and vitamins; Physiology of trachea and Lung.
- **Respiration** -Mechanism of respiration, Pulmonary ventilation; Respiratory volumes and capacities; Transport of oxygen and carbon dioxide in blood, Respiratory pigments, Dissociation curves and the factors influencing it; Control of respiration.

Chapter 6. Circulation and Excretion in humans

- Components of blood and their functions; hemopoiesis
- **Blood clotting**: Blood clotting system, Blood groups: Rh-factor, ABO and MN
- Structure of mammalian heart
- Cardiac cycle; Cardiac output and its regulation, Electrocardiogram, Blood pressure and its regulation
- Structure of kidney and its functional unit; Mechanism of urine formation

Unit IV

14

Chapter 7. Nervous System and Endocrinology in humans

- Structure of neuron, resting membrane potential(RMP)
- Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers. Types of synapse
- **Endocrine glands** - pineal, pituitary, thyroid, parathyroid, pancreas and adrenal; hormones secreted by them.
- Classification of hormones; Mechanism of Hormone action.

Chapter 8. Muscular System in humans

- Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle twitch; Motor unit, summation and tetanus

Suggested Readings:

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet & Voet: Biochemistry Vols 1 & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Harcourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume 1 & 2, 11th edition, CBS Publishers (2016).

Zoology Semester II Core Course Lab Content

Course Title/Code: Biochemistry and Physiology	Course Credits: 2
Course Code: FSB470	L-T-P per week: 0-0-4
Total Contact Hours: 56	Duration of ESA: 3 Hours
Formative AssessmentMarks: 25	Summative AssessmentMarks: 25

Course Outcomes (COs):

1. At the end of the course the student should be able to understand:Basic structure of biomolecules through model making.
2. Develop the skills to identify different types of blood cells.
3. Enhance basic laboratory skill like keen observation, analysis and discussion.
4. Learn the functional attributes of biomolecules in animal body.
5. Know uniqueness of enzymes in animal body and their importance through enzyme kinetics

Course Content

List of labs to be conducted	56Hours
1. Preparation of models of nitrogenous bases- nucleosides and nucleotides.	
2. Preparation of models of amino acids and dipeptides.	
3. Preparation of models of DNA and RNA.	
4. Qualitative analysis of Carbohydrates, Proteins and Lipids.	
5. Qualitative analysis of Nitrogenous wastes – Ammonia, Urea and Uric acid.	
6. Separation of amino acids or proteins by paper chromatography.	
7. Determination of the activity of enzyme (Urease)-Effect of [S] and determination of Km and Vmax.	
8. Determination of the activity of enzyme (Urease) - Effect of temperature and time.	
9. Action of salivary amylase under optimum conditions.	
10. Quantitative estimation of Oxygen consumption by fresh water Crab.	
11. Quantitative estimation of salt gain and salt loss by fresh water.	
12. Estimation of Hemoglobin in human blood using Sahli's haemoglobinometer	
12. Counting of RBC in blood using Hemocytometer	
13. Counting of WBC in blood using Hemocytometer	
14. Differential staining of human blood corpuscles using Leishman stain	
15. Recording of blood glucose level by using glucometer	
Virtual Labs (Suggestive sites)	
https://www.vlab.co.in https://zoologysan.blogspot.com www.vlab.iitb.ac.in/vlab www.onlinelabs.in www.powershow.com https://vlab.amrita.edu https://sites.dartmouth.edu	

Text Books

1. Nelson & Cox: Leininger's Principles of Biochemistry: McMillan (2000)
2. Zubay et al: Principles of Biochemistry: WCB (1995)
3. Voet&Voet: Biochemistry Vols 1 & 2: Wiley (2004)
4. Murray et al: Harper's Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott: Biochemistry and Molecular Biology: Oxford University Press
5. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, XI Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).
6. Tortora, G.J. & Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).
7. Christopher D. Moyes, Patricia M. Schulte. Principles of Animal Physiology. 3rd Edition, Pearson Education (2016).
8. Hill, Richard W., et al. Animal physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).
9. Chatterjee CC Human Physiology Volume 1 & 2, 11th edition, CBS Publishers (2016).

Web References:

- Mammalian Physiology– www.biopac.com

TOPICS RECOMMENDED FOR SEMINAR/PROJECT REPORT

1. Biochemical pathways, their evolutionary background and regulation.
2. Blood groups and their importance.
3. Vital enzymes for human body.
4. Essential and nonessential amino acids.
5. Important body lipids.
6. Significance of animal proteins.
7. Role of carbohydrates in animal body.
8. Nature of proteins and nurture of animal body.
9. Role of lipids in structural and functional organization of body.

Scheme of Practical Examination II
Semester BSc. Zoology
Biochemistry and Physiology
Course Code: FSB470

Time: 3 hours

Maximum marks:25M

1. Biochemistry experiments by lots
(Carbohydrates, Proteins & Lipids) **6 Marks**
2. Physiology experiments by lots
(Nitrogenous wastes/ salivary amylase/ activity of urease enzyme). **6 Marks**
3. Differential staining of human blood corpuscles OR Estimation of blood glucose level **5 Marks**
4. Identify the spots A(Haemoglobinometer/ Haemocytometer/ Paper chromatography) **3Marks**
5. Model submission. **5Marks**

The candidate has to submit the duly certified record at the time of practical examination. The record is for the reference of the examiners, but not for assessment (since it is already assessed for IA)

Assessment:**Weightage for assessments (in percentage)**

Type of Course	Formative Assessment / IA Marks	Summative Assessment Marks
Theory	40	60
Practical	25	25

Pedagogy: Written Assignment/Presentation/Seminar

Formative Assessment - Theory	
Assessment Occasion	Weightage in Marks
House Examination/Test	$C1+C2=10+10=20$
Written Assignment/Presentation/Seminar	$10+10=20$
Total	40

Pedagogy: Written Assignment/Presentation/Record/Seminar

Formative Assessment- Practical	
Assessment Occasion	Weightage in Marks
Internal assessment C1	10
Internal assessment C2	10
Class record	05
Total	25

Open Elective Course Content

Semester: **II Zoology**

Course Title: Parasitology	Course Credits: 3
Course Code: FSB920	
Total Contact Hours: 42	Duration of ESA: 3 Hours
Formative Assessment Marks: 40	Summative Assessment Marks: 60

Course Outcomes (COs):

At the end of the course the students will be able to:

1. Know the stages of the life cycles of the parasites and infective stages.
2. Develop ecological model to know population dynamics of parasite, establishment of parasite population in host body, adaptive radiations and methods adopted by parasite to combat with the host immune system.
3. Develop skills and realize significance of diagnosis of parasitic infection and treatment.
4. Understand about diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level.
5. Develop their future career in medical sciences and related administrative services.

Course Content

Content	42Hrs
Unit – 1	
<p>Chapter 1. General Concepts</p> <ul style="list-style-type: none"> • Introduction, Parasites, parasitoids, host, zoonosis • Origin and evolution of parasites • Basic concept of Parasitism, symbiosis, phoresis, commensalisms and mutualism • Host-parasite interactions and adaptations • Life cycle of human parasites • Occurance, mode of infection and prophylaxis <p>Chapter 2. Parasitic Platyhelminthes</p> <ul style="list-style-type: none"> • Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of • <i>Fasciolopsisbuski</i> • <i>Schistosomahaematobium</i> • <i>Taeniasolium</i> • <i>Hymenolepis nana</i> <p>Chapter 3. Parasitic Protists</p> <ul style="list-style-type: none"> • Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of • <i>Entamoebahistoltyica</i> • <i>Giardia intestinalis</i> 	14
<ul style="list-style-type: none"> • <i>Trypanosomagambiense</i> • <i>Plasmodium vivax</i> 	
Unit – 2	
<p>Chapter 4. Parasitic Nematodes</p> <ul style="list-style-type: none"> • Study of morphology, life cycle, pathogenicity, prophylaxis and control measures of <ul style="list-style-type: none"> • <i>Ascarislumbricoides</i> • <i>Ancylostomaduodenale</i> • <i>Wuchereriabancrofti</i> • <i>Trichinellaspiralis</i> • Nematode plant interaction ; Gall formation <p>Chapter 5. Parasitic Arthropods</p> <ul style="list-style-type: none"> • Biology, importance and control of <ul style="list-style-type: none"> • Ticks (Soft tick <i>Ornithodoros</i>, Hard tick <i>Ixodes</i>) • Mites(<i>Sarcoptes</i>) • Lice (<i>Pediculus</i>) • Flea (<i>Xenopsylla</i>) • Bug (<i>Cimex</i>) • Parasitoid (Beetles) <p>Chapter 6. Parasitic Vertebrates</p> <ul style="list-style-type: none"> • Cookicutter Shark • Hood Mocking bird and Vampire bat and their parasitic behavior and effect on host 	14
Unit – 3	
	14

Chapter 7. Molecular diagnosis & clinical parasitology

- General concept of molecular diagnosis for parasitic infection
- Advantages and disadvantages of molecular diagnosis
- Fundamental techniques used in molecular diagnosis of endoparasites
- Immunoassay or serological techniques for laboratory diagnosis of endoparasites on the basis of marker molecules like *G.intestinalis*, *B. coli*, *E. histolytica*, *L. donovani*, Malarial parasite using
 - ELISA, RIA
 - Counter Current Immunoelectrophoresis (CCI)
 - Complement Fixation Test (CFT) PCR, DNA, RNA probe

Suggested Readings:

19. Arora, D. R and Arora, B. (2001) Medical Parasitology. II Edition. CBS Publications and Distributors.
20. E.R. Noble and G.A. Noble (1982) Parasitology: The biology of animal parasites. V Edition, Lea & Febiger.
21. Ahmed, N., Dawson, M., Smith, C. and Wood, Ed. (2007) Biology of Disease. Taylor and Francis Group.
22. Parija, S. C. Textbook of medical parasitology, protozoology & helminthology (Text and colour Atlas), II Edition, All India Publishers & Distributors, Medical Books Publishers, Chennai, Delhi.
23. Meyer, Olsen & Schmidt's Essentials of Parasitology, Murray, D. Dailey, W.C. Brown Publishers.
24. K. D. Chatterjee (2009). Parasitology: Protozoology and Helminthology. XIII Edition, CBS Publishers & Distributors (P) Ltd.
25. Gunn, A. and Pitt, S.J. (2012). Parasitology: an Integrated Approach. Wiley Blackwell.
26. Noble, E. R. and G.A. Noble (1982) Parasitology: The biology of animal parasites. V th Edition, Lea & Febiger.
27. Paniker, C.K.J., Ghosh, S. [Ed] (2013). Paniker's Text Book of Medical Parasitology. Jaypee, New Delhi.
28. Parija, S.C. Textbook of medical parasitology, protozoology & helminthology (Text and color Atlas), II Edition, All India Publishers & Distributors, Medical Books Publishers, Chennai, Delhi.
29. Roberts, L.S and Janovy, J. (2009). Smith & Robert's Foundation of Parasitology. 8th. Edn. McGraw Hill.

30. Bogitsh, B. J. and Cheng, T. C. (2000). Human Parasitology. 2nd Ed. Academic Press, New York.
31. Chandler, A. C. and Read. C. P. (1961). Introduction to Parasitology, 10th ed. John Wiley and Sons Inc.
32. Cheng, T. C. (1986). General Parasitology. 2nd ed. Academic Press, Inc. Orlando. U.S.A.
33. Schmidt, G. D. and Roberts, L. S. (2001). Foundation of Parasitology. 3rd ed. McGraw Hill Publishers.
34. Schmidt, G. D. (1989). Essentials of Parasitology. Wm. C. Brown Publishers (Indian print 1990, Universal Book Stall).
35. John Hyde (1996) Molecular Parasitology Open University Press.
36. J Joseph Marr and Miklos Muller (1995) Biochemistry and Molecular Biology of Parasites 2nd Edn Academic Press.

Pedagogy: Chalk and Talk, PPT, Group discussion, Seminar, Interaction, virtual lab, Lab visit

Formative Assessment	
Assessment Occasion	Weightage in Marks
House Examination/Test	20
Written Assignment/Presentation/Project / Term Papers/Seminar	20
Total	40

Skill Enhancement Course Content

Semester: II Zoology

Course Title: Sericulture Course Code: VEC5ZOOP2	Course Credits: 2
Total Contact Hours: 56 Hours	Duration of ESA: 3 Hrs.
Formative Assessment Marks: 20	Summative Assessment Marks: 30

Course Outcomes (COs):

At the end of the course the student acquires the following knowledge:

1. Sericulture is an agro-based industry which gives economic empowerment to the students.
2. Sericulture may be taken up as a small scale industry by the small farmers and unemployed youth.
3. Get jobs in teaching profession, silk board and other Govt. institutions as technicians.

Student can be self-employed after successful completion of the course

Course Content

List of Lab to be conducted		42 Hrs
1	Morphology and taxonomy of mulberry.	
2	Raising of saplings – cutting preparation, planting and maintenance of nursery.	
3	Agronomical practices in mulberry cultivation-weeding, manuring, irrigation and harvesting.	
4	Diseases and pests of mulberry.	
5	Silk producing insects – non mulberry and mulberry silk worms.	
6	Life cycle and morphology of <i>Bombyxmori</i> .	
7	Dissection of digestive system and silk glands of <i>Bombyxmori</i> .	
8	Silk worm rearing equipments.	
9	Rearing process – incubation, chawki rearing, late age worm rearing, mounting and harvesting of cocoons.	
10	Silk worm diseases and pests – Grasserie, Flacherie, Muscardine, Pebrine, Uzi fly and Beetles.	
11	Grainages – production of silk worm eggs.	
12	Physical and commercial characteristics of cocoons.	
13	Reeling and weaving process – stiffling , cooking , brushing, reeling and re-reeling, different types of looms.	
14	Visit to mulberry farm and sericulture centre.	
15	Economics of silk production (Project)	

Text Books and References

1. Govindan , R.,Narayanswami,T.K and Devaiah, M.C.1998,Principles of silk worm pathology.Ser Publishers ,Banglore.
2. Tazima, Y.1964 -The genetics of the silk worml Logos Press Ltd.London .
3. Tazima Y 1978 The silk worm an important laboratory tool Kodnasha Ltd. Tokyo.
4. Ganga G ,SulochanaChetty J An introduction to sericulture Oxford and IBH Publishing Co.Pvt. Ltd. New Delhi.
5. Ullal and Narasimhanna Hand book of practiclesericulture .
6. FAO Mannuals on sericulture vol . 1-4.
7. Tazima Y 1958 Silkworm egg CSB Publication ,Bombay .
8. Yashimoro Tanaka 1964 Sericology CSB Publication , Bombay.

Pedagogy

1. Demonstration
2. Assignment
3. Group discussion
4. Field Visit.
5. Use of Audio-Visual aids.

Formative Assessment	
Assessment Occasion	Weightage in Marks
Class Test	10
Attendance and Assignments	05
Visit to Mulberry Farm and Sericulture centre.	05
Total	20

**Model Question Paper Scheme: I Semester B.Sc. Degree
examination ZOOLOGY
Paper: Cytology, Genetics and Infectious
Diseases**

Time: 3 Hrs

Maximum Marks: 60

Instructions to Candidates:

1. Draw neat labelled diagrams wherever necessary.
2. Answer should be completely in English.

I. Answer all the following in one word or one sentence (5x1=5)

- 1.
- 2.
- 3.
- 4.
- 5.

II. Answer any **five** of the following (8 to be given): (5x3=15)

- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.

III. Answer any **four** of the following (6 to be given) (4x5=20)

- 14.
- 15.
- 16.
- 17.
- 18.
- 19.

IV. Answer any **two** of the following (4 to be given) (2x10=20)

- 20.
- 21.
- 22.
- 23.

**Model Question Paper Scheme: II Semester B.Sc. Degree
examination ZOOLOGY**

Paper: Biochemistry and Physiology

Time: 3 Hrs

Maximum Marks: 60

Instructions to Candidates:

3. Draw neat labelled diagrams wherever necessary.
4. Answer should be completely in English.

V. Answer all the following in one word or one sentence (5x1=5)

- 1.
- 2.
- 3.
- 4.
- 5.

VI. Answer any **five** of the following (8 to be given): (5x3=15)

- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.

VII. Answer any **four** of the following (6 to be given) (4x5=20)

- 14.
- 15.
- 16.
- 17.
- 18.
- 19.

VIII. Answer any **two** of the following (4 to be given) (2x10=20)

- 20.
- 21.
- 22.
- 23.

