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Kuvempu University
Bachelor of Science (B.Sc. Degree) Semester Scheme
Zoology Syllabus (SEP- 2025-26)

Major Course (ZOO-3T) Paper 3: Physiology & Biochemistry

Program Name	**B.Sc.**	**Semester**	**III**
Course Title	**Physiology & Biochemistry (Theory)**		
Course Code	**------**	No. of Credits	**03**
Contact Hours	**3 Hours/Week**	Duration of SEA/ Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Learning objectives:

1. To achieve a thorough understanding of various aspects of physiological systems and their functioning in animals.
2. To provide insightful knowledge on the structure & classification of carbohydrates, proteins, lipids & enzymes.

Course Outcomes:

By the completion of the course, the graduate should be able

1. To understand the functions of important human physiological systems including digestion, cardio-respiratory and excretory systems, endocrine system.
2. To understand the muscular structure, contraction mechanism and nervous co ordination.
3. To describe the structure, classification and chemistry of biomolecules and enzymes responsible for sustenance of life in living organisms.

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Unit-I 16 Hours

1. **Digestion:** Mechanical and chemical digestion. Digestion and absorption of carbohydrates, proteins and lipids. **Digestive disorders:** peptic ulcer, gallstones and Irritable Bowel Syndrome (IBS).

2. **Respiration:** (structure of lungs- self study) ExternaPl and internal respiration, respiratory pigments-hemoglobin, haemocyanin & haemoerythrin. Physiology of respiration- Breathing, exchange of gasses- transport of oxygen- oxygen dissociation curves, Bohr's effect. Transport of carbon dioxide- chloride shift, respiratory quotient, respiratory volumes. **Respiratory disorders:** asthma, and tuberculosis.

3. **Circulation:** Structure of heart, heartbeat, origin and conduction of heartbeat. Blood composition and functions. Mechanism of blood clotting, blood pressure and ECG. **Cardiovascular diseases:** myocardial infarction (heart attack), heart failure, stroke

4. **Renal Physiology:** Uricotelism with examples, ammonotelism with examples, ureotelism with examples, ornithine cycle in human, Structure of kidney (self study), Nephron- Structure, urine formation, counter current multiplier system, composition of urine. **Renal disorders:**, renal calculi (kidney stones), Chronic Kidney Disease (CKD).

Unit-II 16 Hours

5. **Muscle physiology:** Brief account of types of muscles, ultra structure of striated muscles, contractile proteins-actin, myosin, troponin & tropomysin, mechanism of muscle contraction & relaxation, sliding filament theory-simple muscle twitch, summation, tetanus, tonus, All or None law, fatigue and oxygen debt.
6. **Nerve physiology:** structure of brain (self study), Classification of neurons, structure of multipolar, myelinated neuron. Structure of synapse - Nature and

conduction of nerve impulse, synaptic transmission, neuromuscular junction and neurotransmitters.

7. **Endocrinology:** List the various endocrine glands and their corresponding hormones¸ Consequences of hypo and hyper secretion.
8. **8. Osmoregulation and thermoregulation:** Introduction and types.

Unit-III 16 Hours

9. **Biomolecules: Carbohydrates**: Definition, classification, types: monosaccharides (trioses, tetroses, pentoses, hexoses, aldoses, and ketoses) disaccharides and polysaccharides (homo and hetero polysaccharides) biological importance of carbohydrates.

   Proteins: primary, secondary, tertiary and quaternary protein structure, classification of simple and conjugated proteins, fibrous and globular proteins, biological importance of proteins.

   Lipids: classification, simple lipids (neutral fats and waxes). Conjugated lipids (phospholipids, glycolipids cephalins, lecithins). Derived lipids (fatty acids, steroids, prostaglandins) biological importance of lipids.

10. **Vitamins:** Fat soluble vitamins (A, D, E & K) –water soluble vitamins (B-complex & vitamin C) functions and deficiency symptoms.
11. **Enzymes**: Classification of enzymes (IUB System) mechanism of enzyme action, factors affecting enzyme activity,. A brief account on iso-enzyme, co-enzymes, co-factors, enzyme activation and inhibition.

NB : - Topics related to syllabus can be given to students as assignments/seminar.

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1. Animal physiology, 1989, Arora, M.P, Himalaya publishing house.
2. Animal physiology, 1990, IV edition Schmidt Nielson, Cambridge Uni. USA.
3. Chatterjee CC, 20 1 6, Human Physiology, Volume l & 2, 11th edition, CBS Publishers.

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5. Pearson Education General and comparative animal physiology, 1983, W.S. Hoar, prentice hall Inc. New Delhi.

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7. Principles of bio-chemistry, 1993, Lehninger, A.L, Nelson, D.L.S,Cox, M.M Worth.

8. Nelson & Cox: Leininger‘s Principles of Biochemistry: McMillan (2000)

9. Zubay *et al*: Principles of Biochemistry: WCB (1995)

10. Voet&Voet: Biochemistry Vols l & 2: Wiley (2004)

11. Murray *et al*: Harper‘s Illustrated Biochemistry: McGraw Hill (2003) Elliott and Elliott:

12. Biochemistry and Molecular Biology: Oxford University Press

13. Guyton, A.C. & Hall, J.E. Textbook of Medical Physiology, Xl Edition, Hercourt Asia PTE Ltd. /W.B.Saunders Company. (2006).

14. Tortora, G.J. &Grabowski, S. Principles of Anatomy & Physiology. XI Edition John Wiley & sons (2006).

15. Hill, Richard W., et al. Anima l physiology. Vol. 2. Sunderland, MA: Sinauer Associates, (2004).

Third Semester Zoology Practical: Physiology & Biochemistry

02 Credits 4hours/week

I Physiology:

A. Major Experiments

1. Total RBC count in human blood-personal sample.
2. Total WBC count in human Blood- personal sample.
3. Salivary amaylase activity test of human saliva.
4. Osmotic haemolysis in blood cells.
5. Dehydrogenase activity in milk.

B. Minor experiments

1. Estimation of haemoglobin using sahli's haemoglobinometer.
2. Preparation of haemin crystals.
3. Determination of clotting and bleeding time.
4. Demonstration of Blood pressure.
5. Principal and applications of Sphygmomanometer, Stethoscope and glucometer.
6. Measurement of oxygen saturation by pulse oximeter before and after exercise.
7. Study of microscopic structure of endocrine glands: Thyroid, pancreas, testes, liver, ovary, kidney, intestine and adrenal.

II Biochemistry Experiments:

1. Quantitative detection of glucose, carbohydrates, proteins and fats in the given samples.

Tests to be conducted.

a) For glucose - Benedict's test
b) For starch - Iodine test
c) For protein – Biurate test

d) For lipids – Acrolein test

2. Quantitative detection of nitrogenous waste products in given samples.

a) Test for ammonia –Nesslers's reagent test
b) Test for Urea – specific Urease test
c) Test for Uric acid – Folin's uric acid reagent test
d) Test for Creatinin – Jaffe's test

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Major Course (ZOO-4T) Paper 4: Environmental Biology, Ethology & Biostatistics

Program Name	**B.Sc.**	**Semester**	**IV**
Course Title	**Environmental Biology, Ethology & Biostatistics (Theory)**		
Course Code	**------**	No. of Credits	**03**
Contact Hours	**3 Hours/Week**	Duration of SEA/ Exam	**3 Hours**
Formative Assessment Marks	**20**	Summative Assessment Marks	**80**

Learning objectives:

1. To understand the structure & function of ecosystems and to explore global environmental issues and sustainable solutions.
2. To learn about the basic principles of animal behaviour.
3. To introduce the fundamentals of statistical methods in biological research.

Course Outcomes:

By the completion of the course, the graduate should be able

1. To explain the components of ecosystem and their interactions. And to analyze human impacts on environment and evaluate sustainable practices.
2. To acquire basic knowledge on animal behavioral patterns and their role in the formation of social groups.
3. To define key statistical terms and to organize, summarize biological data using appropriate statistical measures.

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Unit-I 16 Hours

1. **Eco-system:** Basic concept of ecosystem, Components of ecosystem-Abiotic factors (sunlight, temperature, soil, water & atmosphere), Biotic Components (producers, consumers, decomposers). Ecological Pyramids, Functions of ecosystem-food chain, food web, energy flow. Laws of thermodynamics, Types of ecosystems with examples- Terrestrial Ecosystem (forest, grassland & desert), Aquatic Ecosystem (marine & fresh water). Man engineered ecosystem.

2. **Limiting factors**: Concept, definition of Liebig's law of minimum, Shelford's law of tolerance.

3. **Animal Interactions:** Commensalism, mutualism, predation, competition, ammensalism & parasitism.

4. **Population Ecology**: Properties of population- population density, natality, mortality, population growth rate, and age distribution, population growth forms, J & S shaped curves, emigration, immigration & migration, population fluctuation.

5. **Wildlife Conservation & Management:** Significance, causes of extinction, concept of threatened species, red data book, IUCN, WWF, CITES. Green environment & Green peace; protected areas, biosphere reserves, national parks & wildlife sanctuaries in India. Project tiger, Project elephant, and Wildlife protection act- 1972.

Unit-II 16 Hours

1. **Learning, Imprinting & Behaviour:** Definition and types of animal behaviour with examples. Innate behaviour, Taxes-Reflexes, Instinct and motivation, learning behaviour, habituation, imprinting, conditioning and insight learning, Pheromones; types & their effect on behaviour, hormones & their action on behaviour (aggressive & parental behaviour).

2. **Social organization in animals:** Honey bees, Termites and Macaques.

3**. Animal migration:** Fish migration: Salmon & Eel.
Bird migration: Origin of bird migration causes & types of bird migration, bird navigation and advantages of bird migration.

4. **Courtship Behaviour:** General principle, courtship of 3 Spined stickle back fish, frog, calotes, peacock.

5. **Parental care in animals:** Hippocampus, Arius, Ichthyophis, Rhacophorus.

6. **Biological clock:** Circadian, circannual, circalunar rhythms with example.

Unit-III 16 Hours

1. Biostatics : Introduction, sampling methods & tables, Data – Collection, types, class – interval.

2. **Biostatistics-:** Measures of central tendency- mean, median & mode. Data summarizing; frequency distribution, Graphical presentation- Bar diagram, pie diagram & histogram. Elementary idea of probability & its applications.

2. **Biostatistics-:** Measures of Dispersion- Range, Standard Deviation, Variance. Correlation & regression, Tests of Significance; F-Test, ANOVA, t-test, chi square test.

NB: - Topics related to syllabus can be given to students as assignments/seminar.

REFERENCES:

1. Agarwal. V. K. (2009). Animal Behaviour.S. Chand and Company Pvt. Ltd., NewDelhi.
2. Agarwal, K.C. 2008. Environmental Biology, II edition, Nidhi Publishers.
3. Ahluwalia, V. K. and Malhotra. S. (2006). Environmental science. Ane Books Pvt. Ltd.
4. Arora, M.P. 2001. Ecology, Himalaya Publishing House, New Delhi.
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6. David McFarland. (1999). Animal Behaviour. Pearson Education Ltd. Essex, England.
7. Edward Arnold Marvel and Hamilton. Mechanism of Behavior. McGraw-Hill New Delhi.
8. Gurumani, N. 2004. An Introduction to Biostatistics, MJP publishers, Chennai.
9. Hosetti & Venkateshwarulu. 2018. Trends in Wildlife Biodiversity Conservation, Daya Publishing House, New Delhi.
10. Khan and Khanum, (1990) Fundamentals of biostatistics.Press,Chicago
11. Meera Asthana and Astana D.K.1990 Environmental pollution and Toxicology Alka printers.
12. Norman T.J. (2007) Bailey Statistical methods in biology, Cambridge Universitypress.
13. Odum, E.P.1971.Fundamentals of Ecology.W.B. Saunders College Publishing, Philadelphia.
14. P.D Sharma (2012), Ecology and Environment' - 11thEd. Rastogi Publications.
15. Rastogi, V.B (2009) Fundamentals of Biostatistics, Ane Books Pvt. Ltd. NewDelhi.
16. Reena Mather. 2011. Animal Behaviour, Rastogi Publications
17. Saharia, V.B. 1982. Wildlife in India, Natraj publications, Dehradun.
18. Sharma P.D. (2005) Environmental biology and Toxicology, Rastogi publication
19. Stiling Peter (2002). Ecology: Theories and applications. Prentice Hall of India pvt.Ltd. NewDelhi.
20. Verma and Agarwal. 2000. Principles of Ecology, S. Chand & Co, New Delhi.

Fourth Semester Zoology Practical: Environmental Biology, Ethology & Biostatistics

02 Credits **4hours/week**

I Environmental Biology:

1. Estimation of total hardness
2. Estimation of dissolved oxygen by Winkler's method
3. Estimation of CO_2 of the water samples
4. Estimation of total Alkalinity.
5. Determination of population density in a natural/hypothetical community by quadrate method and calculation of Shannon-Weiner diversity index for the same community.
6. Animal Association: Commensalism, mutualism, predation, competition, ammensalism & parasitism (for each two examples)
7. Report on a visit to national park/bio diversity park/wild life sanctuary.
8. Location of tiger reserves, National parks, Biosphere reserves, Wildlife sanctuary of India on map.
9. Endangered fauna of India-Slendur loris, pangolin, great Indian bustard, python, veranus, gharial and horn bill.

II Ethology: Parantal care in Hippocampus, Icthyophis,
Social organization in termites and honeybees.

III Biostatistics:

1. Construction of graphs using the given data- Bar diagram (simple bar Diagram, multiple bar diagram, component bar diagram), Histogram and Pai Diagram.
2. measuring central tendency using the given data- Mean, Mode, Median and Standard deviation.
3. To measure the Height and weight of all students in the class and apply Statistical measures (median, range, variance and frequency distribution)

PROPOSED SYLLABUS INZOOLOGYFORB.Sc.(UG) IVSEMESTER-SEP(From 2025 onwards)

IVSEMESTER: Elective Paper:OCCUPATIONAL ZOOLOGYTotal Hrs: 32

1	**Apiculture:** Species of honey bees in India, Mouth parts, Sting Apparatus ,Colony organization, Modern methodsofbeekeeping,Economicimportanceofhoney,beewax &venom;anoteon formationofhoney&itschemicalcomposition.	6
2	**Lacculture:**Laccultivation&processingandusesoflac	1
3	**Vermiculture:** Morphology of earthworm, IndigenousandexoticSpeciesofearthworms–epigeic,endogeicandanecicspecies.Methodsofvermicomposting: a) Low cost floor beds b) Tank system, composition and benefits of vermicompost. Vermiwash& its utility in Agriculture	4
4	**Sericulture:** Mulberry cultivation, Mulberry and Non-mulberry species in India, Life cycle of *Bombyxmori,* Mulberrysilkwormrearing techniques(Chawkiandadultworm rearing). Post -harvest techniques, An account on silkworm diseases, Economic importance of Sericulture.	5
5	**Poultry:**Scope,Poultrybreeds, Rearingofbroilersandlayers, feed formulation for chicks , Housing system of rearing- Cage, deep litter & Slat system, Poultrydiseases (Bacterial, viral, protozoan, Nutritional deficiency diseases), nutritive value of egg and meat.	5
6	**Dairyfarming:**BreedsofCattle,Collection,processing,preservationandmarketingof milk. Cattle breeding techniques: Artificial insemination, Super ovulation and embryo transplantation. Milk and milk Products.	6
7	**Aquaculture:** Culturing of Indian major carps andInduced breedingtechnique, Fish by-products, Rearingofornamentalfishes,CulturingofIndianfreshwaterprawn andFreshwater pearlculture	5
	Suggested reading: 1. **"Applied and Economic Zoology" by Dr. V.B. Upadhyay and Dr. G.S. Shukla** 2. **"A Handbook of Economic Zoology" by A. Jawaid and S.P. Sinha** 3. **"Economic Zoology" by K.R. Ravindranathan** 4. **"Modern Trends in Biology & Economic Zoology" by H.C. Nigam** 5. "A textbook of Economic Zoology"-SARAS publications	

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Elective (EL3- 1T) Paper 1: Parasitology

Program Name	**B.Sc.**	**Semester**	**III**
Course Title	**Parasitology (Theory)**		
Course Code	------	No. of Credits	
Contact Hours		Duration of SEA/ Exam	
Formative Assessment Marks		Summative Assessment Marks	

Learning objectives:

1. To understand the basic concepts of parasitism, including types of parasites, host and host parasite relationships.
2. To describe the morphology, life cycles and modes of transmission of important protozoan, helminthes and arthropod parasites.
3. To recognize the symptoms and pathogenic effects of common parasitic infections in humans and to understand the basic principles of parasite control and prevention.

Course Outcomes:

By the completion of the course, the graduate should be able

1. To identify & describe major human and animal parasites, including, protozoans, helminthes & ectoparasites.
2. To explain parasitic effect on health of humans and animals and pathology associated with major infections.
3. To outline basic methods of diagnosis, prevention and control of parasitic diseases.

30 Hours

1. Introduction to Parasitology and Types of Parasites

Definitions: Parasitism, Host, Parasite, Vector-biological and mechanical. Types of parasite- ectoparasite, endoparasite and their subtypes. Parasitic adaptations in Ectoparasites and End parasites. Types of host: Intermediate and definitive, reservoir

II Host-parasite relationship and host specificity

Different types of host- parasite relationship, structural specificity, physiological specificity and ecological specificity

III Life cycle, pathogenicity, control measures and treatment

Entamoeba histolytica, *Fasciola hepatica, Taenia solium, Wuchereria bancrofti*

IV Morphology, life cycle, pathogenicity, control measures andtreatment

Head louse (*Pediculus humanus capittis*), Mite (Sarcoptesscabei), Bed bug (Cimex lectularis)

V Parasitological significance

Zoonosis- Bird flu, Anthrax, Rabies and Toxoplasmosis

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