



DAVANAGERE UNIVERSITY
DAVANGERE


3 Year B.Sc. Program

SYLLABUS

SUBJECT: ZOOLOGY

(Effective from 2026-27)

DISCIPLINE SPECIFIC CORE: SEM-V-VI


Chairman
PG BOS
DOS in Zoology
Davangere University
Davangere - 577 007


Prof. M. Govindappa
Dean-Science & Technology
Davangere University
Shivangotri, Davangere-577007


Registrar
Davangere University
Shivangotri, Davangere

Semester	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hour s/ Semester	Duration of Exam	Formative Assessment Marks	Summative Assessment Marks	Total Marks
V sem	Molecular Cell Biology and Developmental Biology (Theory) 24-SEP-ZT-5.1	03	04	56 hrs	3hrs	20	80	100
	Endocrinology and Histology (Theory) 24-SEP-ZT-5.2	03	04	56 hrs	3hrs	20	80	100
	Endocrinology and Histology (Practical) 24-SEP-ZP-5	02	04	56 hrs	3hrs	10	40	50
	Elementary Research Methodology	02	02	28 hrs	2hrs	10	40	50
VI sem	Immunology and Parasitology (Theory) 24-SEP-ZT-6.1	03	04	56 hrs	3hrs	20	80	100
	Title: Wildlife Biology, Environmental Biology, and Animal Behaviour (Theory) 24-SEP-ZT-6.2	03	04	56 hrs	3hrs	20	80	100
	Immunology and Parasitology, Wildlife Biology, Environmental Biology and Animal Behaviour (Practical) 24-SEP-ZP-6	02	04	56 hrs	3hrs	10	40	50
	Project work/Internship	02	02	28 hrs	2hrs	10	40	50


Prof. M. Govindappa
 Dean-Science & Technology
 Davangere University
 Shivangotri, Davangere-577007


Registrar
 Davangere University
 Shivangotri, Davangere

Davanagere University, Davanagere

Zoology (UG)

B.Sc. Semester – V

Discipline Specific Core

Course Title: Molecular Cell Biology and Developmental Biology (Theory)

Course Code: 24-SEP-ZT-5.1

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours/ Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC	Theory	03	04	56 hrs	3hrs	20	80	100

Course Outcomes (COs): At the end of the course, students will be able to:

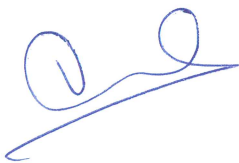
- Understand principles and working of different types of microscopes
- Familiarize students with the structural and functional aspects of cell, the basic unit of life, and its different organelles.
- Understand the cyclic events and types of cell division, processes of cell death and cellular aging.
- Comprehend the knowledge on cancer cell and causes of cancer.
- Acquaint the developmental process in animals.
- Understand stages of development in frog and chick.

Units	Course Title: Molecular Cell Biology and Developmental Biology (Theory) Code: 24-SEP-ZT-5.1	56 hrs
Unit-I	<p>Molecular Cell Biology:</p> <p>Microscopy: Light, electron and phase contrast microscopes. Applications of optical microscopes,</p> <p>Types of cells (Eubacteria, archaebacteria, eukaryotes),</p> <p>Prokaryotic cell organization (Prokaryotic cell structure, Bacterial cell wall.</p> <p>Eukaryotic cell organization (Brief idea of structure and function of - Plasma membrane, Nucleus, Endoplasmic reticulum, Golgi apparatus, Mitochondria, Chloroplast, Lysosome, Peroxisome. Cytoskeleton.</p> <p>Chromosomes: Types of chromosomes, chromosomal fine structure, heterochromatin and euchromatin, polytene chromosomes.</p>	14hrs

Unit-II	<p>Nucleic acids : Identification of genetic material, Hershey - Chase experiment, Structure of DNA, Watson and Crick DNA model- types of DNA, replication of DNA; RNA: Types, structure and functions</p> <p>Protein Synthesis and Regulation: Protein Synthesis, mechanism (initiation, elongation and termination) of protein synthesis. Gene regulation (Operon hypothesis: regulator gene, promoter gene, operator gene, structural gene, repressor gene, co-repressor gene and inducer gene), regulation at transcription, regulation by gene arrangement and reversible phosphorylation, types of control mechanisms, regulation of gene activity in eukaryotes.</p> <p>Genetic Code: Properties of genetic code, codons and anti-codon, The Wobble Hypothesis, Triplet code.</p> <p>Cell cycle and cell division: Various phases of mitosis and meiosis.</p> <p>Apoptosis and necrosis: definition and significance with examples</p> <p>Cancer biology: Types of cancer, oncogenes, carcinogenic agents. physical, chemical and biological, causes of cancer.</p>	14 hrs
Unit-III	<p>Developmental Biology :</p> <p>Gametogenesis: spermatogenesis & structure of mammalian sperm. Oogenesis, structure of mammalian ovum.</p> <p>Types of eggs: Based on amount of yolk and distribution of yolk with examples. Cleidoic egg and its significance.</p> <p>Fertilization: Definition, Types, Mechanism of fertilization and significance.</p> <p>Parthenogenesis: Definition, Natural parthenogenesis (arhenotoky and thelytoky) , Artificial parthenogenesis and its Significance.</p> <p>Patterns of cleavage – radial, biradial, spiral and bilateral cleavage with examples. Influence of yolk on cleavage.</p> <p>Blastulation: Comparative account with reference to Frog and Chick. Fate maps- Presumptive organ forming areas and fate maps in Frog and Chick.</p>	14 hrs
Unit-IV	<p>Gastrulation in Chick upto primitive streak. Foetal membranes of chick – development; structure and function of foetal membranes</p> <p>Role of organizers in development: Transplantation experiments of Spemann and Mangold,</p> <p>Placenta: Types - Yolk sac and Chorio-allantoic placentation. Deciduate and non deciduate placenta; morphological and histological types with suitable examples.</p> <p>Regeneration: Definition and types – morphollaxis and epimorphosis with examples. Regeneration in Planarians.</p> <p>Early development of Human foetus: fertilization; morula; blastocyst; implantation; placenta; twins and multiple births. Sexually transmitted diseases and prevention.</p>	14 hrs

References:

1. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. VI Edition John Wiley and Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VII Edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. (2009). *The Cell: A Molecular Approach*. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). *Molecular Biology of the Cell*, V Edition, Garland publishing Inc., New York. and London.
5. Lodish, H., D. Baltimore, A. Berk, L. Zipursky, M. Matsudaira and J. Darnell. (2010). *Molecular Cell Biology*, Eds. 3, Scientific American & W. H. Freeman. New York.
6. Powar C B.: *Cell Biology*, Himalaya Publication, Meerut
7. Gilbert, S. F. (2010). *Developmental Biology*, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
8. Balinsky B. I. and Fabian B. C. (1981). *An Introduction to Embryology*, V Edition, International Thompson Computer Press.
9. Carlson, R. F. *Patten's Foundations of Embryology*.
10. Kalthoff (2008). *Analysis of Biological Development*, II Edition, McGraw-Hill Publishers.
11. Lewis Wolpert (2002). *Principles of Development*. II Edition, Oxford University Press
12. Patten, Bradley M. (1957). *Early embryology of Chick* McGraw-Hill Book Company.



B.Sc. Semester – V
Discipline Specific Core

Course Title: Endocrinology and Histology (Theory)

Course Code: 24-SEP-ZT-5.2

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC	Theory	03	04	56 hrs	3hrs	20	80	100

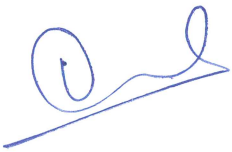
Course Outcomes (COs): At the end of the course, students will be able to:

- Know about the diseases affecting hypothalamus, pituitary, parathyroid and thyroid.
- Knowledge about poly-endocrine disorders, disorders involving adrenal and reproductive system.
- Endocrinology of normal growth and aberrant growth disorders.
- Updated knowledge of technologies used in Endocrinology
- Describe and discuss different structures and functions of tissues and organs.
- Trained to work in a histopathology laboratory
- To get an idea about the basics of histopathology technique.
- To gain both theoretical and practical knowledge with good laboratory practices.
- To get acquainted with different histological procedures used to prepare stained slides from tissue samples.

Units	Course Title: Endocrinology and Histology (Theory) Course Code: 24-SEP-ZT-5.2	56 hrs
Unit-I	Endocrinology: Introduction to Endocrinology: Aim and scope of Endocrinology. Characteristics and transport of hormones. Hormones- types, Hormones in invertebrates. Pituitary gland; hormones, functions and disorders, hypothalamo-hypophysial portal system.	14 hrs
Unit-II:	Endocrine Glands: Structure, function and hormones of following glands and their hypo and hyper secretion disorders: -Pineal -Thyroid -Parathyroid -Adrenal – Pancreas. Gastro-intestinal and Reproductive endocrine glands: Structure, function and hormones of gastro-intestinal tract- hormonal disorders. Structure, function and hormones of ovary, testis and placenta and hypo and hyper secretion disorders.	14 hrs
Unit-III	Histology: Definition and Scope of Histology, (epithelial, connective, nervous and muscular tissue). Study of histological structure and functions of the following mammalian organs: Tongue, Stomach, Intestine, Testis, Ovary, Liver, Pancreas, Thyroid, Adrenal and Kidney.	14 hrs
Unit-IV	Histochemistry: Stains and staining – Types: natural and synthetic dyes, mordents and their mode of action. Immuno-histochemical staining methods. Histopathology -Degenerative changes and histopathological manifestations in liver cirrhosis and nephrosis.	14 hrs

References:

1. Molecular Endocrinology by Bolander F.F. Academic Press International, 1989.
2. Vertebrate Endocrinology by Norris D.O. 2nd Edition, Lea and Febiger
3. Comparative Endocrinology by Turner and Bugnara
4. Endocrinology by Mac E Hadley. Prentice – Hall International
5. Text Book of Endocrinology 6th Edition by Williams R.H. Saunders Company
6. Ross, M. H. & W. Pawlina (2010). Histology: A Text and Atlas, 6th Edition, Lippincott Williams & Wilkins, Maryland.
7. Histology by Bailey (1975)
8. Histology by Bevelander (1979)
9. Histology by Ham (1987)
10. Histology by Berry (2015)

A handwritten signature in blue ink, consisting of a stylized 'O' followed by a flourish and a horizontal line underneath.

B.Sc. Semester – V
Discipline Specific Core

**Course Title: Molecular Cell Biology, Developmental Biology and
Endocrinology and Histology (Practical)**

Course Code: 24-SEP-ZP-5

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC	Practical	02	04	56 hrs	3hrs	10	40	50

Course Outcomes (COs): At the end of the course, students will be able to:

- Understand the properties of various chemicals used in preparation of fixatives and preservatives used for biological materials.
- Understand various stages of cell division.
- Learn the staining techniques for cytological materials and prepare permanent slides
- Understand developmental processes in animal models.
- Prepare stained permanent slides of developmental stages in Chick embryo
- Updated knowledge of technologies used in Endocrinology
- Learn the technique of fixing and processing the animal tissue for microtomy
- Understand different staining methods to process the tissue and prepare the slides.
- Describe and discuss different structures and functions of tissues and organs.

Molecular Cell Biology:

1. Observation and study of permanent slides for mitosis, meiosis, and salivary gland chromosomes.
2. Squash preparation of onion root tip to study stages of mitosis.
3. Preparation of polytene chromosome in Chironomus larvae.
4. Squash preparation of Grass hopper testis/flower bud to study different stages of meiosis.

Developmental Biology

5. Stages of development of frog: the study of cleavage stages, blastula, gastrula and neurula and various stages of tadpole.
6. Observation of various stages of frog development in nature.
7. Study of permanent slides of chick embryo: 18 hrs, 24 hrs, 36 hrs and 48 hrs whole mounts and T.S. of 18 hrs and 24 hrs, 36hrs chick embryos
8. Mounting of chick embryo (Window method).

Endocrinology:

- 9 Display of endocrine glands in fish and rat/mice
- 10 Mounting of pituitary and pineal gland in fish and rat / mice
- 11 Study of procedure for adrenalectomy in rat



- 12 Preparation of permanent histological slides of endocrine glands
Histology:
- 13 Preparation of paraffin block and section cutting and spreading
- 14 Observation of mammalian histology slides of the organs ; Tongue, Salivary gland, Stomach, Intestine, Testis, Ovary, Liver, Pancreas, Thyroid, Adrenal and Kidney
- 15 Staining of histological tissues
- 16 Submission of two histology slides at the time of practical examination
- 17 Any other practical based on feasibility

SCHEME OF PRACTICAL EXAMINATION

1. Preparation and staining of histological slide/Mounting of chick embryo	10
2. Squash preparation of onion root tip to study mitosis/Mounting of salivary gland chromosomes	08
3. Identifications (MCB-1, DB-2, Endocrinology and Histology-02)	10
5. Submission of two (02) permanent slides based on MCB,DB, END and Histology	04
6. Viva	04
7. Journal	<u>04</u>
Total	40

Note: Same scheme may be used for IA (formative assessment test) and should be reduced to ten (10) marks.



SEP BSc-V Semester: Elementary Research Methodology
(for Biochemistry, Biotechnology, Botany, Chemistry, Electronics, Environmental Science, Food Technology, Microbiology, Zoology)

Subject	Elementary Research Methodology	Semester	V
Number hr/week	2 hours	Total hours	22
Duration of the exam	2 hours	Credits	2

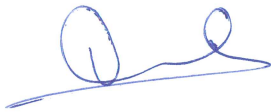
Learning Outcomes:

After the completion of this course the learner will be able to:

- Describe the basic concepts of research and its methodologies.
- Identify the appropriate research topics and set up hypothesis.
- Perform literature survey using library (print) and internet (online) sources.
- Design experiments/surveys, collect data and and represent data in table and figure forms.
- Analyze data with appropriate software tools, internet results and draw conclusions.
- Write scientific report/ review and prepare seminar/ conference presentations oral or poster.
- Understand the methods of citations and referencing styles, check plagiarism.
- Identification of lacuna (finding gap-areas), hypothesis formulation, framing objectives, and preparation of questionnaire.

Unit-1	<p>Scientific Methods and Research: Concept, Definitions of research; Purpose, importance, steps levels and rigor of research; different paradigms of research.</p> <p>Types of Research: Fundamental/Applied research, Descriptive/Analytical research, Quantitative /Qualitative research, Conceptual/Empirical research, Diagnostic/Hypothesis testing research, Conclusion oriented/Decision oriented research, Theoretical / Action research, Longitudinal /Cross sectional research</p> <p>Research Question: Introduction, types and identification; Research Problem: Definition, identification of problem, ways of understanding problem, criteria of a good problem, guidelines for selecting meaningful problem; Research Objective: Definition, broad and specific objectives, goals;</p> <p>Research Hypothesis: Meaning of research hypothesis, sources of hypothesis, qualities of workable hypothesis, utilities of hypothesis;</p>	8 h
Unit-2	<p>Introduction and review of sampling: Definition, needs, steps; Definitions of population, sample, sampling unit, sampling frame, sampling error and non sampling error; Steps in sampling; Fundamentals, characteristics, advantages and disadvantages of sampling.</p> <p>Types of sampling: Probability (simple, stratified, systematic, cluster and multistage –in brief), Process of selecting random sample; non probability sampling (convenience, purposive, quota, snowball, self selecting); Advantages and disadvantages (brief discuss only)</p> <p>Size of sample: Factor affecting size of sample, Testing the reliability of sample, Methods of estimating sample size, Process of selecting random sample</p>	8 h
Unit-3	<p>Designing of research work: Introduction, Purposes, Characteristics of a research design, Principles of designing a research, conceptual framework and its operationalization, Sectors of research design, Research methods as research designing, similarities and differences between Research design and research method. Conventional research method: Principle and Importance conventional methods, Scientific methods as conventional methods, Characteristic of a scientific method; Aspects of scientific Method, Evolution of scientific Studies Steps in scientific methods,</p>	8 h

Unit-4	<p>Historical Research Method: Nature and Steps in Historical method, Importance and fundamentals of Historical method, Sources of Historical data, Limitations.</p> <p>Experimental Research Method: Introduction, Types of experiments, steps in experimental research, Problems in experimentation; Ex-post facto research: definition and technique.</p> <p>Survey Research Method: Introduction, and Importance of survey method, Comparison of survey method with other methods; Objectives of social and survey and technical survey, types of social and technical survey, Steps in social and technical surveys, Pilot survey</p> <p>Case study: Introduction, Types of case studies: Exploratory and Hypothesis testing; Steps in case studies, Sources of case data, limitations.</p> <p>Analysis of data- introduction, data analysis tools.</p> <p>Project time line, literature review and references, research report structure, plagiarism.</p>	8 h
--------	--	-----



Davanagere University, Davanagere

Zoology (UG)

B.Sc. Semester – VI

Discipline Specific Core

Course Title: Immunology and Parasitology (Theory)

Course Code: 24-SEP-ZT-6.1

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC	Theory	03	04	56 hrs	3hrs	20	80	100

Course Outcomes (COs): At the end of the course, students will be able to:

- Promote critical thinking among students.
- Provide students with a foundation in immunological processes
- Provide students with knowledge on how the immune system works building on their previous knowledge
- Clearly state the role of the immune system.
- Compare and contrast the innate versus adaptive immune systems.
- Provide an overview of the interaction between the immune system and pathogens.

Units	Immunology and Parasitology (Theory) Course Code: 24-SEP-ZT-6.1	56 hrs
Unit-I	<p>Immunology: Introduction to immunity: History; Types of Immunity –Innate and Acquired immunity. Cells and organs of immune system: Immune cells: Lymphocytes (T & B cells), Monocytes, Macrophage; Eosinophills, Basophills, Neutrophils and Mast cells. Primary and secondary lymphoid organs: Bone marrow, Thymus, Spleen and Lymph nodes. Antigens: Antigens, factors influencing immunogenicity, Adjuvant, Epitope, Hapten. Immunoglobulins: Structure of the immunoglobulins; Types and functions of Immunoglobulins, Monoclonal antibodies.</p>	14 hrs
Unit-II	<p>Antigen-antibody reactions and immune-techniques: Agglutination; Precipitation; Immunofluorescence; RIA; ELISA, Southern blotting and Western blotting. Immune response: Humoral and cell mediated immune responses, Primary and secondary immune modulation; Cytokines; Role of complement system in immune response (Classical pathway, Alternate pathway); Immune response against bacterial (tuberculosis), Parasitic (malaria) and viral (HIV) infections; Congenital and acquired immune-deficiencies; Autoimmune disorders. Major histo-compatibility complex (MHC) and hypersensitivity; Vaccines and vaccination: Types of vaccines and their significance.</p>	14 hrs
	<p>Parasitology: Introduction: Concepts of Parasitism, Classification, Distribution and types of</p>	

Unit-III	parasites. Parasitic diseases of humans: Structure, Life cycle, mode of transmission, pathogenicity and control of. Protozoan parasites: <i>Trypanosoma, Plasmodium,</i> Nematoda: <i>Ascaris, Ancylostoma, Waucheraria,</i> Trematoda : <i>Fasciola. Taenia,</i>	14 hrs
Unit-IV	Ectoparasites: Habitat, Life cycle, Pathogenicity and Prevention of: (a) Mites, (b) Ticks, (c) Lice. (d) Mosquitoes. Host- Parasitic Relationship: Cellular, Physiological, Immunological, Molecular, Social, Behavioural aspects, Larval migrants. Parasitoids: Types, ecobiology, Chemical cues with suitable examples. Bacterial Infection: Cholera, Tuberculosis. Diphtheria, Typhoid, Tetanus, Leprosy. Viral Infection: Rabies, Dengue fever, Japanese encephalitis, KFD, Hepatitis.	14hrs

References:

Immunology:

1. Judy Owen, Jenni Punt, Sharon Stranford 2013 Kuby Immunology: International Edition W. H. Freeman
2. Abbas AK, 2011, Cellular and Molecular Immunology 7th Ed. Elsevier Health Sciences – India.
3. Delves P, Martin S, Burton D, Roitt IM 2011 Roitt's Essential Immunology. 12th Ed. Wiley Blackwell Scientific Publication, Oxford.
4. Murphy K, 2011 Janeway's Immunobiology. 8th Ed. Garland Science Publishers, New York.
5. Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.
6. Richard Coico, Geoffrey Sunshine 2008 Immunology: A Short Course, 6th Edition WileyBlackwell
7. Sudha Gangal 2013 Textbook of Basic and Clinical Immunology Orient Blackswan Private Limited - New Delhi

Parasitology:

8. Smyth, J.D. Animal Parasitology, Cambridge low Edition.U.K., 2000
9. Arora, D.R. and Arora, B. Medical Parasitology. 1st Edition. Satish kumar jain for CBS Publisher ad Distributors, New Delhi, 2001.
10. Chatterjee, K.D. Parasitology (Protozoology and Helminthology). 12th Edition. Chatterjee Medical Publishers, Calcutta, 2001.
11. Thomas C. Cheng. General Parasitology. 2nd Edition. Academic Press, California, 1999.
12. Solti, R.C. Medical Zoology. Shoban Lal Nagin Chand & Co. Jalandhar. India, 1999.
13. Roberts L.S. and Janovy J. Foundations of Parasitology, McGraw-Hill Publishers, New York,USA.
14. Modern Parasitology: A Textbook of Parasitology, FEG Cox., Wiley-Blackwell, U. K.
15. Qaise H. Baqri and M.Shami Jairajpuri, Bibliography of Nematology of India. CBS Publishers, 1995.
16. Ravichandra N.G. Methods and Techniques in Plant Nematology, 2001.



B.Sc. Semester – VI
Discipline Specific Core

Course Title: Wildlife Biology, Environmental Biology, and Animal Behaviour (Theory)

Course Code: 24-SEP-ZT-6.2

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC	Theory	03	04	56 hrs	3hrs	20	80	100

Course Outcomes (COs): At the end of the course, students will be able to:

- Develop an understanding of how animals interact with each other and their natural environment
- Get knowledge about all types of ecosystems, food chains, webs and energy models.
- Develop the ability to use the fundamental principles of wildlife ecology to solve local, regional and national conservation and management issues.
- Gain an appreciation for the modern scope of scientific inquiry in the field of wildlife conservation management.
- Develop an ability to analyze, present and interpret wildlife conservation management information. Comprehend various types of animal behaviour and their importance.
- Observe, analyse, interpret and document the different types of behaviour.
- Enhance their skills by taking short projects pertaining to Animal behaviour.

Units	Course Title: Wildlife Biology, Environmental Biology and Animal Behaviour (Theory) Course Code: 24-SEP-ZT-6.2	56 Hrs
Unit-I	<p>Distribution of Wildlife in India: The Himalayan ranges, The peninsular India sub-region, Deccan plateau, Western ghats, Aravali ranges, Indian desert, Tropical rain forests, Wildlife in Andaman and Nicobar Islands.</p> <p>Wild life problems: Hunting, overharvesting, habitat destruction & degradation, over population, and possibilities of climatic changes.</p> <p>Wildlife Management and Conservation: In-situ and ex-situ conservation methods; Wildlife sanctuaries, National parks, Biosphere reserves, Project Tiger, Project Elephant Project Lion, Zoological Gardens,</p> <p>Habitat preservation and Captive breeding. Wildlife Protection Act, 1972, Causes and depletion of Wildlife, General strategies and issues, Concept of home range and territory, Animal census, Tracing movement and Remote sensing and GIS.</p>	14hrs
Unit-II	<p>Ecology: Introduction to ecology, Definition, Types of ecosystem: Terrestrial, Aquatic, Desert, Grassland.</p> <p>A biotic factors: Temperature and Light. Food chain, Food web and Ecological pyramids.</p> <p>Marine habitat: Zonation of the sea and ecological classification of marine biota, coastalecology, estuarine ecology and mangroves.</p> <p>Freshwater habitat: Lentic and Lotic systems. Ecological classification of fresh water animals.</p>	14hrs

Unit-III	<p>Environmental Pollution: Definition, types of pollutants, air, noise, soil, water and thermal pollution, ozone layer depletion, bio-magnifications, bioaccumulation and bioremediation.</p> <p>Toxicants – Natural and synthetic toxicants and toxicity measurements.</p> <p>Global warming, Acid rain, Green-house effect, Eutrophication, Types and its impact.</p>	14hrs
Unit-IV	<p>Animal Behaviour:</p> <p>Types of animal behavior with example: Innate behavior - reflexes, instinct, motivation; Learning behavior - habituation, imprinting, conditioned reflexes, insight learning; Aggression and territoriality. Pheromones and behavior.</p> <p>Social organization in animals: Honeybee (with communication)- Termites, Macaques and Elephant.</p> <p>Animal migration: A) Migration in fishes - types, Anadromous and catadromous migration with salmon and Eel as examples. B) Migration in birds - Types/pattern, Methods of study, advantages, mechanics, preparation, orientation and navigation.</p> <p>Courtship behavior: General principle, courtships of Three spined stickle back fish, Betta splendens, Frog, Peacock.</p> <p>Parental care in Animals: In fishes - Hippocampus & Arius In amphibians – Ichthyophis & Rhacophorus.</p> <p>Nesting behavior - in Waver bird, bower bird & tailor bird Biological clock: Its nature, types and significance.</p>	14 hrs

References:

Wildlife Biology and Environmental Biology:

1. Caughley, G., and Sinclair, A.R.E. (1994) Wildlife Ecology and Management. Blackwell Science.
2. Woodroffe, R., Thirgood, S. and Rabinowitz, A. (2005) People and Wildlife, Conflict or Coexistence? Cambridge University.
3. Bookhout, T.A. (1996) Research and Management Techniques for Wildlife and habitats (5th edition) The Wildlife Society, Allen Press.
4. Sutherland, W.J. (2000) The Conservation Handbook: Research, Management and Policy. Blackwell.
5. Colinvaux, P.A. (1993) Ecology (2nd edition) Wiley, John and Sons, Inc.
6. Krebs, C.J. (2001) Ecology (6th edition) Benjamin Cummings.
7. Odum, E.P., (2008) Fundamentals of Ecology. Indian Edition. Brooks/Cole. (3rd Edition) Blackwell Sci.
8. Kendeigh, F.C. (1984) Ecology with Special Reference to Animal and Man. Prentice Hall Inc.

Animal Behaviour:

9. An Introduction to animal behaviour: Aubrey Manning and Marian S. Dawkins, Cambridge University Press 1995.
10. Essentials of organizational behaviour 5th ed : Stephan Robbins, Prentice Hall of India New Delhi, 1997.
11. Animal Behaviour : McFarland D. ELBS With Longman, 1985.
12. A. Barnett. Modern Ethology: Science of Animal Behaviour. 12 March 1981



B.Sc. Semester – VI
Discipline Specific Core

Course Title: Immunology and Parasitology, Wildlife Biology, Environmental Biology and Animal Behaviour (Practical)

Course Code: 24-SEP-ZP-6

Type of Course	Theory / Practical	Credits	Instruction hour per week	Total No. of Lectures/Hours / Semester	Duration of Exam	Formative Assessment Marks	Summative assessment Marks	Total Marks
DSC	Practical	02	03	56 hrs	3hrs	10	40	50

Course Outcomes (COs): At the end of the course, students will be able to:

- Estimation of different components which are the cause of the immune disease or are the diagnostic/prognostic markers.
- Undergo training medical laboratory technology are made to learn the techniques of collection of samples, their processing and identification of various parasitic pathogens,
- Use different procedures with special reference to their habitat, morphology, life cycle and their isolation, identification for diagnostic purpose.
- Understand the basic concepts of environmental sciences, ecosystems, natural resources, population, environment and society.
- Understand the basic concepts of toxicology, their impact on human health and remedial measures
- Provide understanding and knowledge on modern concepts in wildlife management and relevant conservation policies and legislation and their enforcement mechanism at Global and Local Level.
- Understand the scientific approach to wildlife management and planning.
- Develop scientific skills for resolving human wildlife conflict including capture, handling, care and management of wild animals.
- Developing hands-on skills in observing, recording, and analyzing animal actions, understanding the evolutionary/ecological basis of behaviour, designing simple experiments
- Communicating findings through reports and presentations, ultimately enhancing animal welfare and conservation knowledge.

Course Title: Immunology and Parasitology, Wildlife Biology, Environmental Biology, and Animal Behaviour (Practical)

Immunology:

1. Study of permanent slides of lymphoid organs: spleen, thymus, and lymph node
2. Preparation blood film and study of various types of blood cells
3. Determination of ABO blood grouping.
4. Estimation of the haemoglobin content by Sahli's Adams method.



Parasitology:

5. Study of protozoan parasites: *E. histolytica*, *Plasmodium*, *Trypanosoma*, *Opalina*, *Giardia*.
6. Study of intestinal parasites of frog and insects.
7. Study of insect vector mouth parts: a) Mosquito b) Flea c) Ticks d) Housefly e) Cockroach
8. Study of ecto-parasites - Lice, Leech, Ticks and Mites.
9. Study of helminthes parasites - *Taenia*, *Wucheria*, *Fasciola*, *Ascaris*, *Ancylostoma* .

Wildlife Biology, Environmental Biology and Animal Behaviour:

10. Collection of water sample and analysis of physical parameters of water: Temperature, pH, Electrical Conductivity.
11. Estimation of chemical parameters of water: Dissolved Oxygen (O₂), Carbon Dioxide (CO₂), Chloride and TDS.
12. Collection, and study of zooplanktons.
13. Study of threatened animals of India (charts/models/pictures): Tiger, Lion, one horned Rhinoceros, Golden langur, Lion tailed monkey, Musk deer, Kashmir stag, Great Indian horn bill and Indian rock python
14. Location of Tiger reserves, National parks, Biosphere reserves, Wildlife sanctuaries of India on Map.
15. Identification of castes in social insects
16. Observation of courtship behaviour in animals (Charts)
17. Observation of parental care in animals (Charts)
18. Observation of different types of nests and nest materials (Charts)
19. Study of colouration and mimicry (Charts)
20. Visit to zoo/Sancturies/National parks/Study tour (Compulsory)

SCHEME OF PRACTICAL EXAMINATION

1.	Identification of blood group/ Estimation of Hemoglobin	06
2.	Estimation of O ₂ /Co ₂ / Hardness/ Chloride/TDS	08
3.	Mounting of insect mouth parts/ Identification of zooplanktons	04
4.	Identification – Immunology-01, Parasitology-02 Wildlife , EB & Animal Behaviour-02	10
4.	Submission of Field /Tour report	04
5.	Viva	04
6.	Journal	<u>04</u>
	Total	40

Note: Same scheme may be used for IA (formative assessment test) and should be reduced to ten (10) marks.



B. Sc. Semester-VI

Course Title: Project work/Internship

Course Code:

Project Work:

The project work may include experimental work/ surveys studies may involve studies on qualitative or quantitative measurements. The students have to submit project report/ dissertation at the time of final examination.

Total marks: 50

Internal marks: 10


Credits: 02

Final semester end exam: 40

1. Submission of project report/dissertation: 25

2. Presentation: 10

3. Viva: 5


Chairman
PG BOS
DOS in Zoology
Davangere University
Davangere - 577 007


Prof. M. Govindappa
Dean-Science & Technology
Davangere University
Shivagangotri, Davangere-577007


Registrar
Davangere University
Shivagangotri, Davangere