# FACULTY OF LIFE SCIENCES

**SCHEME OF SYLLABUS**

**FOR**

**B. Sc. Medical PART-I, II& III**

**(Semester: I, II, III, IV, V & VI)**

**Session: 2021–22, 2022-23, 2023-24**



**Sri Guru Teg Bahadar Khalsa College**

**Sri Anandpur Sahib-160118, Punjab**

\*An Autonomous College

\*NAAC Accredited 'A' Grade

\*College with Potential for Excellence Status by UGC

**--------------------------------------------------------**

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**SCHEME OF THE COURSE**

**B.SC. MEDICAL (FIRST, SECOND AND THIRD YEAR)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Semester** | **Course Category** | Course Code | **Course Title** | **Credits** | **Marks Distribution** | | **Total** | **Grand Total** |
| **Theory** | |
| **External** | **Internal**  **Assessment** |
| **I** | **I** | Core Course | BSC (ZOO)  107 A | Animal Diversity – I | 2 | 35 | 15 | 50 | 150 |
| BSC (ZOO)  107 B | Animal Diversity – II | 2 | 35 | 15 | 50 |
| BSC (ZOO)  107 P | Zoology Practical I | 2 | 50 | 00 | 50 |
| Ability  Enhancement Course | SAE 1.1 | Drug Abuse: Problem, Management And Prevention | NC | 35 | 15 | 00 | 00 |
| **II** | Core Course | BSC (ZOO)  207 A | Comparative Anatomy  of vertebrates | 2 | 35 | 15 | 50 | 150 |
| BSC (ZOO) 207 B | Developmental Biology of vertebrates | 2 | 35 | 15 | 50 |
| BSC (ZOO) 207 P | Zoology Practical II | 2 | 50 | 00 | 50 |
| Ability  Enhancement Course | SAE 1.2 | Environmental and  Road safety Awareness | 4 | 70 | 30 | 100 | 100 |
| **II** | **III** | Core Course | BSC(ZOO)  307 A | Animal Physiology | 2 | 35 | 15 | 50 | 150 |
| BSC(ZOO)  307 B | Biochemistry | 2 | 35 | 15 | 50 |
| BSC(ZOO) 307 P | Zoology Practical III | 2 | 50 | 00 | 50 |
| Skill Enhancement Course | SEC (ZOO)I | Economic Entomology | 2 | 35 | 15 | 50 | 50 |
| **IV** | Core Course | BSC(ZOO)  407 A | Genetics | 2 | 35 | 15 | 50 | 150 |
| BSC(ZOO)  407 B | Evolutionary  Biology | 2 | 35 | 15 | 50 |
| BSC(ZOO)  407 P | Zoology Practical IV | 2 | 50 | 00 | 50 |
| Skill Enhancement Course | SEC (ZOO)II | Aquaculture | 2 | 35 | 15 | 50 | 50 |
| **III** | **V** | Discipline Specific Elective Course | DSE(ZOO)  507 A | Animal Biotechnology | 2 | 35 | 15 | 50 | 150 |
| DSE(ZOO)  507 B | Reproductive Biology | 2 | 35 | 15 | 50 |
| DSE(ZOO)  507 P | Zoology Practical V | 2 | 50 | 00 | 50 |
| Skill Enhancement Course | SEC (ZOO)III | Medical Diagnostics | 2 | 35 | 15 | 50 | 50 |
| **VI** | Discipline Specific Elective Course | DSE(ZOO)  607 A | Immunology | 2 | 35 | 15 | 50 | 150 |
| DSE(ZOO)  607 B | Parasitology | 2 | 35 | 15 | 50 |
| DSE(ZOO)  607 P | Zoology Practical VI | 2 | 50 | 00 | 50 |
| Skill Enhancement Course | SEC (ZOO) IV | Research Methodology | 2 | 35 | 15 | 50 | 50 |

**SEMESTER-I**

**CORE COURSE I**

**BSC (ZOO) 107 A**

**ANIMAL DIVERSITY – I**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

To understand the animal kingdom, their taxonomic position, their general characteristics, body organization of different phylum, origin and evolutionary relationship of different phylum.

**LEARNING OUTCOMES**

Student should be able to describe unique characters of different phylum, student should be able to recognize life functions, recognise the ecological role, and recognise the diversity.

**SECTION A**

**Unit 1: Kingdom Protista**

General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa

**General characters and classification up to classes of the following phyla-**

**Unit 2: Phylum Porifera**

Canal System in *Sycon*

**Unit 3: Phylum Cnidaria**

Polymorphism in *Obelia*

**Unit 6: Phylum Platyhelminthes**

Life history of *Taenia solium*

**SECTION B**

**General characters and classification up to classes of the following phyla-**

**Unit 5: Phylum Nemathelminthes**

Life history of *Ascaris lumbricoides* and its parasitic adaptations

**Unit 6: Phylum Annelida**

Metamerism in Annelida

**Unit 7: Phylum Arthropoda**

Vision in Arthropoda, Metamorphosis in Insects

**Unit 8: Phylum Mollusca**

Torsion in Gastropods

**SEMESTER I**

**CORE COURSE I**

**BSC (ZOO) 107B**

**ANIMAL DIVERSITY – II**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

To understand the animal kingdom, their taxonomic position, their general characteristics, body organization of different phylum, origin and evolutionary relationship of different phylum.

**LEARNING OUTCOMES**

Student should be able to describe unique characters of different phylum, student should be able to recognize life functions, recognise the ecological role, and recognise the diversity.

**SECTIONA**

**Unit 1: Phylum Echinodermata**

Water-vascular system in Asteroidea

**Unit 2: Protochordates**

General features and Phylogeny of Protochordata

**Unit 3: Agnatha**

General features of Agnatha and classification of cyclostomes up to classes

**General features and Classification up to orders-**

**Unit 4: Pisces**

Osmoregulation in Fishes

**SECTIONB**

**General features and Classification up to orders-**

**Unit 5: Amphibia**

Parental care

**Unit 6: Reptiles**

Poisonous and non-poisonous snakes, Biting mechanism in snakes

**Unit 7: Aves**

Flight adaptations in birds

**Unit 8: Mammals**

Origin of mammals

**SEMESTER I**

**ZOOLOGY PRACTICAL I**

**BSC (ZOO) 107 P**

**ANIMAL DIVERSITY**

|  |  |  |  |
| --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | Pass Percentage: 35% | Pass Marks:  17 |

1. Study of the following specimens:

*Amoeba*, *Euglena, Plasmodium, Paramecium, Sycon*, *Hyalonema,* and *Euplectella, Obelia, Physalia, Aurelia, Tubipora, Metridium, Taeniasolium,* Male and female *Ascarislumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer*, *Limulus*,*Palamnaeus, Scolopendra*, *Julus*, *Periplaneta, Apis, Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus, Asterias, Ophiura, Echinus, Cucumaria*and*Antedon, Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis,* Any six common birds from different orders, Scaly ant eater, Lion, Kangaroo, Bat, *Funambulus, Loris*

2*.* Study of the following permanent slides:T.S. and L.S. of *Sycon*, Study of life history stages of *Taenia,* T.S. of Male and female *Ascaris,* Earthworm spermetheca, Nephridium and T.S. through Typhlosolar region of Earthworm, Trachea of cockroach, T.S. of Starfish arm.

3. Key for Identification of poisonous and non-poisonous snakes

4. A visit to Zoological Park/Museum.

5. An Animal album containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

**SUGGESTED READINGS**

* Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
* Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science
* Young, J. Z. (2006). *The Life of Vertebrates*. III Edition. Oxford university press.
* Pough H. *Vertebrate life,* VIII Edition, Pearson International.
* Hall B.K. and Hallgrimsson B. (2008). *Strickberger’s Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
* R K Saxena and Sumitra Saxena (2008) Comparative anatomy of vertebrates. 2nd Revised edition edition, Viva Books.
* R L Kotpal (2019) Modern Text Book of Zoology: Vertebrates, 6th Reprint (6th Edition), Rastogi Publications.

**SEMETER II**

**CORE COURSE II**

**BSC (ZOO) 207 A**

**COMPARATIVE ANATOMY OF VERTEBRATES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A& B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

Comparative Vertebrate Anatomy examines the evolutionary history of vertebrate morphology with a primary focus on structure-function relationships. Lectures will trace the evolutionary origin of vertebrates through the vast diversity of animals living today. Emphasis will be placed on the analysis of similarities and differences across groups using systems based approach to assess the significance of adaptations.

**LEARNING OUTCOMES**

Several critical Learning Outcomes are sought in this course. Students will learn how to use the comparative method to analyze and critically evaluate the structure and function of vertebrate systems. This course will enable them to examine the evolutionary history of vertebrate species and assess the functional significance of morphological adaptations.

**SECTION A**

**Comparative Anatomy of following systems of Vertebrates-**

**Unit 1: Integumentary System**

Derivatives of integument w.r.t. glands and digital tips

**Unit 2: Skeletal System**

Evolution of visceral arches

**Unit 3: Digestive System**

Brief account of alimentary canal and digestive glands

**Unit 6: Respiratory System**

Brief account of Gills, lungs, air sacs and swim bladder

**SECTION B**

**Comparative Anatomy of following systems of Vertebrates-**

**Unit 5: Circulatory System**

Evolution of heart and aortic arches

**Unit 6: Urinogenital System**

Succession of kidney, Evolution of urinogenital ducts

**Unit 7: Nervous System**

Comparative account of brain

**Unit 8: Sense Organs**

Types of receptors

**SEMESTER II**

**CORE COURSE II**

**BSC (ZOO) 207B**

**DEVELOPMENTAL BIOLOGY OF VERTEBRATES**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

This course compares and contrasts embryos of different species, showing how all animals are related. They pass from single cells to multi-celled zygotes, clumps of cells and hollow balls of cells, before they differentiate, creating the organs and systems of the body. All have a set of very similar genes that define their basic body plan. As they grow, the differences that will distinguish the embryos as adults become more and more apparent. The study of this development can yield insights into the process of evolution.

**LEARNING OUTCOMES**

Students who successfully complete this course will be able to:

* Outline and compare the developmental stages in animal phyla.
* Explain the mechanisms which lead to cell determination.
* Describe the evolutionary conservation of developmental mechanisms.
* Generate a hypothesis from a set of observations and then design experiments to test the hypothesis.

**SECTION A**

1. Gametogenesis: Spermatogenesis and Oogenesis w.r.t. mammals, Vitellogenesis in birds; role of follicle/ sub testicular cells in gametogenesis.

2. Egg maturation: egg membranes, polarity of egg.

3. Fertilization; Types, Blocks to polyspermy, Parthenogenesis, Cleavage patterns.

6. Basic concepts of organizers and inducers and their role.

5. Fundamental processes in development (brief idea) - Determination, Induction, Differentiation, Morphogenesis, Intercellular communication, Cell movements.

**SECTION B**

**6**. Embryonic development of Herdmania, Frog, Chick (development upto three germ layers)

**7.** Metamorphic events inHerdmania and Frogand its hormonal regulation.

8. Formation of mammalian placenta, Types and Functions.

9. Cell Death and Apoptosis.

**SEMESTER II**

**ZOOLOGY PRACTICAL II**

**BSC (ZOO) 207 P**

**COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES**

|  |  |  |  |
| --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | Pass Percentage: 35% | Pass Marks:  17 |

1. Osteology:
2. Disarticulated skeleton of fowl and rabbit
3. Carapace and plastron of turtle /tortoise
4. Mammalian skulls: One herbivorous and one carnivorous animal.
5. To identify different types of feathers
6. Frog - Study of developmental stages - whole mounts and sections through permanent slides – cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole external and internal gill stages.
7. Study of the different types of placenta- histological sections through permanent slides or photomicrographs.
8. Study of placental development in humans by ultrasound scans.
9. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs.
10. Study the process of Spermatogenesis and Oogenesis through T.S. of Testis and L.S. of Ovary.

**SUGGESTED READINGS**

* Kardong, K.V. (2005) *Vertebrates’ Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
* Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
* Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
* Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.
* Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
* Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.
* Carlson, Bruce M (1996). Patten’s Foundations of Embryology, McGraw Hill, Inc

**SEMESTER III**

**CORE COURSE III**

**BSC (ZOO) 307 A**

**ANIMAL PHYSIOLOGY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A& B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

Students are taught the detailed concepts of digestion respiration excretion the functioning of nerves and muscles. Students gain fundamental knowledge of animal physiology. Students will gain skill to execute the roles of a biology teacher or medical lab technicians with training as they have basic fundamentals

**LEARNING OUTCOMES**

Students who successfully complete this course will be able to:

* Describe the function and structure of cells.
* Identify and distinguish between tissues in the animal body.
* Explain the structure and function of organ systems in the animal body.

## SECTION A

**Unit 1: Nerve and muscle**

Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibers, Ultra-structure of skeletal muscle, Molecular and Chemical basis of muscle contraction

## Unit 2: Digestion

Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins and lipids

## Unit 3: Respiration

Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and Carbon dioxide in blood

## SECTION B

**Unit 6: Excretion**

Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism

## Unit 5: Cardiovascular system

Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle

## Unit 6: Reproduction and Endocrine Glands

Physiology of male reproduction: hormonal control of spermatogenesis

Physiology of female reproduction: hormonal control of menstrual cycle

Structure and function of pituitary, thyroid, Parathyroid, pancreas and adrenal

**SEMESTER III**

**CORE COURSE III**

**BSC (ZOO) 307 B**

**BIOCHEMISTRY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

## LEARNING OBJECTIVES

This course is designed to develop understanding of the chemical nature of biological macromolecules, their three- dimensional construction, and the principles of molecular recognition are included to help the learners in understanding basic biochemical process inside the animal body.

## LEARNING OUTCOMES

Students who successfully complete this course will be able to: Can understand the biochemical processes of animal world, can define the underlying processes in metabolic pathways.

## SECTION A

**Unit 1: Introduction**

Biochemistry and its scopes, Carbohydrates, Protein, Lipids

## Unit 2: Nucleic Acids

Their classification and function

## Unit 3: Enzymes

Importance, Mode of action, Inhibitors, Nomenclature, Classification

## SECTION B

**Unit 6: Carbohydrate Metabolism**

Glycolysis, Krebs cycle, Pentose phosphate pathway, Glycogenesis,

Glycogenolysis

## Unit 5: Lipid Metabolism

Beta oxidation of fatty acids, Fate of glycerol and gluconeogenesis, Interaction of carbohydrates and lipids, ketosis

## Unit 6: Protein metabolism

Transamination, Oxidative deamination, Decarboxylation and Urea Cycle

**SEMESTER III**

**ZOOLOGY PRACTICAL III**

**BSC (ZOO) 307 P**

**ANIMAL PHYSIOLOGY AND BIOCHEMISTRY**

|  |  |  |  |
| --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | Pass Percentage: 35% | Pass Marks:  17 |

1. Determination of coagulation and bleeding time of blood in human.

2. Recording of blood pressure of man.

3. Estimation of haemoglobin content.

4. Determination of blood groups of human blood samples.

5. Study of permanent slides of mammalian pituitary, thyroid, pancreas, adrenal gland, spinal cord, duodenum, liver, lung, and kidney

6. Identification of food stuff: Starch, glucose, protein and fats in given solution.

7. Demonstration of Osmosis

8. Demonstration of Diffusion

9 .Analysis of urine for urea and glucose

10. Field study visit to clinical lab

## SUGGESTED READINGS

* Tortora, G.J. and Derrickson, B.H. (2009).*Principles of Anatomy and Physiology*, XII Edition, John Wiley & Sons, Inc.
* Widmaier, E.P., Raff, H. and Strang, K.T. (2008) *Vander’s Human Physiology*, XI Edition., McGraw Hill
* Guyton, A.C. and Hall, J.E. (2011). T*extbook of Medical Physiology*, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company
* Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006).*Biochemistry*.VI Edition. W.H Freeman and Co.
* Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009).*Principles of Biochemistry*. IV Edition. W.H. Freeman and Co.
* Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009).*Harper’s Illustrated Biochemistry*. XXVIII Edition. Lange Medical Books/Mc Graw3Hill.

## SEMESTER III

## SKILL ENHANCEMENT COURSE I

## SEC (ZOO) I

## ECONOMIC ENTOMOLOGY

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

## INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short- answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

## INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

## LEARNING OBJECTIVES

To have a deeper understanding of several aspects of the biology of insects.

To appreciate the impact that insects have (both positive and negative) on human society, including human health, agriculture, and the environment.

## LEARNING OUTCOMES

Students who successfully complete this course will be able to:

* Describe the importance of beneficial and pest insects to humans.
* Match insect morphology with their ecological function.
* Outline the classification and major evolutionary trends among the insect orders. Properly mount and preserve insect specimens.
* Identify insect orders and important families.

## SECTION A

**Unit 1 Apiculture**

Biology of Bees: History, Classification and Biology of Honey Bees, Social Organization of Bee Colony

Rearing of Bees: Artificial Bee rearing (Apiary), Beehives, Selection of Bee Species for Apiculture, Bee Keeping Equipment, Methods of Extraction of Honey (Indigenous and Modern)

Bee Diseases and Enemies, Control and Preventive measures

Bee Economy: Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis), Pollen etc, Entrepreneurship in Apiculture

## Unit 2: Sericulture

Sericulture: Definition, history and present status; Silk route, Types of silkworms, Distribution and Races Exotic and indigenous races, Mulberry and non-mulberry Sericulture

Biology of Silkworm: Life cycle of *Bombyx mori,* Structure of silk gland and secretion of silk, Rearing of Silkworms

Rearing appliances, Disinfectants: Early age and Late age rearing, Types of mountages, Spinning, harvesting and storage of cocoons

Pests and Diseases: Uzi fly, Dermestid beetles and Vertebrates

Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial, Control and prevention of pests and diseases

Entrepreneurship in Sericulture: Prospectus of Sericulture in India

## Unit 3: Lac culture

Lac culture: Definition, history and present status

Lac insect Biology: life cycle

Lac insect culturing: requirements, steps

Diseases and pests of Lac insect

Economy and industry of Lac culture

## SECTION B

**Unit 4: Insects as Vectors**

General Features of Insects, Morphological features, Head – Eyes, Types of antennae, Mouth parts w.r.t. feeding habits

Concept of Vectors: Brief introduction of Carrier and Vectors (mechanical and biological vector), Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity

Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphunculata, Hemiptera

## Unit 5: Dipteran as Disease Vectors

Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies

Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral

encephalitis, Filariasis; Control of mosquitoes

Study of sand fly-borne diseases – Visceral Leishmaniasis, Cutaneous,

Leishmaniasis, Phlebotomus fever; Control of Sand fly

Study of house fly as important mechanical vector, Myiasis, Control of house fly

## Siphonaptera as Disease Vectors

Fleas as important insect vectors

Host-specificity

Study of Flea-borne diseases – Plague, Typhus fever

Control of fleas

## Unit 6: Siphunculata as Disease Vectors

Human louse (Head, Body and Pubic louse) as important insect vectors;

Study of louse-borne diseases –Typhus fever, Relapsing fever, Trench fever, Vagabond’s disease, Phthiriasis

Control of human louse

## Hemiptera as Disease Vectors

Bugs as insect vectors

Blood-sucking bugs

Chagas disease

Bed bugs as mechanical vectors

Control and prevention measures

## SUGGESTED READINGS

* Singh S., *Beekeeping in India*, Indian council of Agricultural Research, NewDelhi Handbook of Practical Sericulture: S.R. Ullal and M.N. Narasimhanna CSB, Bangalore
* Appropriate Sericultural Techniques; Ed. M. S. Jolly, Director, CSR & TI, Mysore. Handbook of Silkworm Rearing: Agriculture and Technical Manual-1, Fuzi Pub. Co.

Ltd., Tokyo, Japan1972.

* Improved Method of Rearing Young age silkworm; S. Krishnaswamy, reprinted CSB, Bangalore, 1986.
* Imms, A.D. (1977). *A General Text Book of Entomology*. Chapman & Hall, UK
* Chapman, R.F. (1998). *The Insects: Structure and Function.* IV Edition, Cambridge University Press, UK
* Pedigo L.P. (2002). *Entomology and Pest Management.* Prentice Hall Publication
* Mathews, G. (2011). *Integrated Vector Management: Controlling Vectors of Malaria and Other Insect Vector Borne Diseases*. Wiley-Blackwell

**SEMESTER IV**

**CORE COURSE IV**

**BSC (ZOO) 407A**

**GENETICS**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A& B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

The course is designed to make students familiar with the Mendelian and non Mendelian inheritance, Concept behind genetic disorder, gene mutations- various causes associated with inborn errors of metabolism.

**LEARNING OUTCOMES**

Upon successful completion, students will have the knowledge and skills to: Explain the key concepts in genetics including: the basis of genetic variation; heritability; Hardy-Weinberg Equilibrium; roles of migration, mutation.

## SECTION A

**Unit 1: Introduction to Genetics**

Mendel’s work on transmission of traits, Genetic Variation

Molecular basis of Genetic Information

## Unit 2: Mendelian Genetics and its Extension

Principles of Inheritance

Chromosome theory of inheritance

Incomplete dominance and codominance

Multiple alleles, Lethal alleles, Epistasis, Pleiotropy

Sex linked inheritance, Extra-chromosomal inheritance

## SECTION B

**Unit 3: Linkage, Crossing Over and Chromosomal Mapping**

Linkage and crossing over

Recombination frequency as a measure of linkage intensity

Two factor and three factor crosses, Interference and coincidence

Somatic cell genetics - an alternative approach to gene mapping

## Unit 6: Mutations

Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation,

Aneuploidy and Polyploidy

Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor

mutations

## Unit 5: Sex Determination

Chromosomal mechanisms

Dosage compensation

**SEMESTER IV**

**CORE COURSE IV**

**BSC (ZOO) 407 B**

**EVOLUTIONARY BIOLOGY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A& B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

The aim of the course is to provide students with a deeper insight into the evolutionary processes - both selective and random - which can explain the genetic composition of populations, form, behaviour and distribution of organisms, and to teach students the basic methods of analysing the evolutionary relationships among animals.

**LEARNING OUTCOMES**

After completion of the course, a student should be able to: understand and explain the main forces of evolution (natural selection, sexual selection, genetic drift) and the interplay among them, both over ecological and evolutionary time, generate evolutionary hypotheses for a wide variety of biological phenomena.

## SECTION A

**Unit 1: History of Life**

Major Events in History of Life

## Unit 2: Introduction to Evolutionary Theories

Lamarckism, Darwinism, Neo-Darwinism

## Unit 3: Direct Evidences of Evolution

Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of Horse

## Unit 4: Processes of Evolutionary Change

Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection

## SECTION B

**Unit 5: Species Concept**

Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric)

## Unit 6: Macro-evolution

Macro-evolutionary Principles (example: Darwin’s Finches)

## Unit 7: Extinction

Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of Extinction in evolution

**SEMESTER IV**

**ZOOLOGY PRACTICAL IV**

**BSC (ZOO) 407 P**

**GENETICS AND EVOLUTIONARY BIOLOGY**

|  |  |  |  |
| --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | Pass Percentage: 35% | Pass Marks:  17 |

1. Study of Mendelian Inheritance and gene interactions (Non Mendelian Inheritance) using suitable examples. Verify the results using Chi-square test.
2. Study of Linkage, recombination, gene mapping using the data.
3. Study of Human Karyotypes (normal and abnormal).
4. Study of fossil evidences from plaster cast models and pictures
5. Study of homology and analogy from suitable specimens/ pictures
6. Charts:
7. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors
8. Darwin’s Finches with diagrams/ cut outs of beaks of different species
9. Visit to Natural History Museum and submission of report

## SUGGESTED READINGS

* Snustad, D.P., Simmons, M.J. (2009).*Principles of Genetics* V Edition. John Wiley and Sons Inc.
* Klug, W.S., Cummings, M.R., Spencer, C.A. (2012).*Concepts of Genetics*. X Edition. Benjamin Cummings.
* Russell, P. J. (2009).*Genetics- A Molecular Approach.* III Edition. Benjamin Cummings.
* Ridley, M. (2006).*Evolution*. III Edition. Blackwell Publishing
* Barton, N. H., Briggs, D. E. G., Eisen, J. A., Goldstein, D. B. and Patel, N. H. (2007).

*Evolution*. Cold Spring, Harbour Laboratory Press.

* Campbell, N. A. and Reece J. B. (2011).*Biology*. IX Edition, Pearson, Benjamin, Cummings.
* Douglas, J. Futuyma (1997).*Evolutionary Biology*. Sinauer Associates.

## SEMESTER IV

## SKILL ENHANCEMENT COURSE II

## SEC (ZOO) II

## AQUACULTURE

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

## INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short- answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

## INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

## LEARNING OBJECTIVES

Course provides them comprehensive understanding about aquatic ecosystem and various economical important fishes. Students gain knowledge in the areas of responses characterization and classification, knowledge of integumentary system.

## LEARNING OUTCOMES

After completing the course the students should have a thorough understanding of biological challenges related to aquaculture and production planning, design and management of aquaculture farms, fish health, genetics and breeding, and international aquaculture.

## SECTION A

1. **Basis of Aquaculture:**

* Scope and definition
* Cultural and socio-economic basis
* Biological and technological basis
* Role in fishery management

1. **Selection of Sites for Aquaculture:**

* Land-based farms – conflicts
* Open-water farms
* Water quantity and quality
* Sources of pollution and user conflicts
* Social aspects of site selection and management

1. **Selection of Species for Culture**:

* Biological characteristics of aquaculture species
* Economic and market considerations
* Common aquaculture species

1. **Design and Construction of Aqua farms**

## SECTION B

1. **Nutrition and Feeds**:

* Feeding habits and food utilization
* Energy metabolism
* Energy requirements and sources
* Brood stock and larval nutrition
* Artificial feeds

1. **Health and Diseases**:

* Viral diseases
* Bacterial diseases
* Fungus diseases

1. **Aquaculture Practices**:

* Prawn Culture
* Oysters culture

1. **Aquariums:**

* Fish for the Aquarium
* Managing the Aquarium

## SUGGESTED READINGS

* Aquaculture Science : By Rick Parker 3rd Edition
* Aqaculture Principles and Practices : By T. V. R. PILLAY & M. N. KUTTY ;Backwell Publishing 2nd Edition
* Goldman : Limnology, 2nd Edition
* Pawlowski : Physicochemical Methods for Water and Wastewater Treatment, 1st Edition
* Wetzel : Limnology, 3rd edition
* Trivedi and Goyal : Chemical and biological methods for water pollution studies
* Welch : Limnology Vols. I-II

**SEMESTER V**

**DISCIPLINE SPECIFIC ELECTIVE COURSE I**

**DSE (ZOO) 507A**

**ANIMAL BIOTECHNOLOGY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

The course is designed to explain

* Definitions, Activities and scope of [Animal biotechnology](http://ecoursesonline.iasri.res.in/mod/page/view.php?id=138799)

**LEARNING OUTCOMES**

Students will be able to describe the structure of virus, animal genes and genomes. Be able to describe how genes are expressed and what regulatory mechanisms contribute to control of gene expression. Be able to describe basic principles and techniques in genetic manipulation and genetic engineering. Students can better understand viruses, their diseases, vaccines and preventions.

**SECTION A**

**Unit 1: Introduction**

Concept and scope of biotechnology

**Unit 2: Genetically Modified Organisms**

Introduction tothe methodsfor Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection

Applications of transgenic animals.

**SECTION B**

**Unit3: Brief Account of Molecular Techniques in Gene manipulation**

Cloning vectors: Plasmids, Cosmids, Phagmids, Lambda Bacteriophage, BAC, YAC, MAC and Expression vectors (characteristics), Restriction enzymes

Transformation techniques: Calcium chloride method and electroporation.

**Unit 4: Brief Account of cDNA technology**

Construction of genomic and cDNA libraries and screening by colony and plaque hybridization; Southern, Northern and Western blotting;

DNA sequencing: Sanger method, Polymerase Chain Reaction, DNA Finger Printing and DNA micro array

**SUGGESTED READINGS**

* Brown, T.A. (1998). *Molecular Biology Labfax II: Gene Cloning and DNA Analysis*. II Edition, Academic Press, California, USA.
* Glick, B.R. and Pasternak, J.J. (2009). *Molecular Biotechnology - Principles and Applications of Recombinant DNA*. IV Edition, ASM press, Washington, USA.
* Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009). *An Introduction to Genetic Analysis*. IX Edition. Freeman and Co., N.Y., USA.
* Snustad, D.P. and Simmons, M.J. (2009). *Principles of Genetics.* V Edition, John Wiley and Sons Inc.
* Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007). *Recombinant DNA Genes and Genomes- A Short Course*. III Edition, Freeman and Co., N.Y., USA.

**SEMESTER V**

**DISCIPLINE SPECIFIC ELECTIVE COURSE I**

**DSE (ZOO) 507 B**

**REPRODUCTIVE BIOLOGY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

The major objective of this course is to provide students with a sound coverage of reproductive biology. This is achieved by first covering fundamentals of the structure and function of the male and female reproductive tracts, gametogenesis, fertilization, early embryogenesis, fetal development and preparation for birth, and maternal adaptations to pregnancy

**LEARNING OUTCOMES**

At the completion of this unit students should be able to: Scientific principles and general biology. Describe the reproductive system of animals. Describe how medical treatment of perinatal loss has changed over time and the reasons behind the changes.

**SECTION A**

**Unit 1: Functional anatomy of male reproduction**

Outline and histological of male reproductive system in human; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract

**Unit 2: Functional anatomy of female reproduction**

Outline and histological of female reproductive system in human; Ovary: folliculogenesis, ovulation, corpus luteum formation and regression; Reproductive cycles in human and their regulation, implantation; Hormonal regulation of gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition; Lactation.

**SECTION B**

**Unit 3: Reproductive Health**

Reproductive Health- Problems and strategies, Population Stabilization and birth control methods, Infertility in male and female: causes, diagnosis and management

**Unit 4: Assisted Reproductive Technology**

*In vitro* and *in vivo* fertilization;

Different techniques of assisted reproductive technology viz; Sperm banks, frozen embryos, ET, EFT, IUT, ZIFT, GIFT, ICSI, AI, IUI.

**SUGGESTED READINGS**

* Austin, C.R. and Short, R.V. reproduction in Mammals. Cambridge University Press.
* Degroot, L.J. and Jameson, J.L. (eds). Endocrinology. W.B. Saunders and Company.
* Knobil, E. et al. (eds). The Physiology of Reproduction. Raven Press Ltd.
* Hatcher, R.A. et al. The Essentials of Contraceptive Technology. Population Information Programme.

**SEMESTER V**

**ZOOLOGY LAB V**

**DSE (ZOO) 507 P**

**ANIMAL BIOTECHNOLOGY AND REPRODUCTIVE BIOLOGY**

|  |  |  |  |
| --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | Pass Percentage: 35% | Pass Marks:  17 |

1. To study following techniques through photographs

a) Southern Blotting

b) Northern Blotting

c) Western Blotting

d) DNA Sequencing (Sanger's Method)

e) PCR

f) DNA fingerprinting

2. Project report on animal cell culture

3. Visit of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.

4. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.

5. Study of modern contraceptive devices

## SEMESTER V

## SKILL ENHANCEMENT COURSE III

## SEC (ZOO) III

## MEDICAL DIAGNOSTICS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

## INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short- answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

## INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

## LEARNING OBJECTIVES

This paper imparts the required skills for the detection of diseases, operation and application of various advance techniques.

## LEARNING OUTCOMES

After the exposure of the current paper students would find themselves equipped with a full package of skill development in order to work in an advance diagnostic setting.

## SECTION A

**Unit 1: Introduction to Medical Diagnostics and its Importance**

**Unit 2: Diagnostics Methods Used for Analysis of Blood**

Blood composition, Preparation of blood smear and Differential Leucocyte Count (DLC) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (ESR), Packed Cell Volume (PCV)

**Unit 3: Diagnostic Methods Used for Urine Analysis**

Urine Analysis: Physical characteristics; Abnormal constituents

## SECTION B

**Unit 4:Non-infectious Diseases**

Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit

## Unit 5: Infectious Diseases

Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis

## Unit 6: Tumours

Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT scan (using photographs)

## SUGGESTED READINGS

* Park, K. (2007), Preventive and Social Medicine, B.B. Publishers
* Godkar P.B. and Godkar D.P. Textbook of Medical Laboratory Technology, II Edition, Bhalani Publishing House
* Cheesbrough M., A Laboratory Manual for Rural Tropical Hospitals, A Basis for Training Course
* Guyton A.C. and Hall J.E. Textbook of Medical Physiology, Saunders Robbins and Cortan, Pathologic Basis of Disease, VIIIEdition, Saunders Prakash, G. (2012), Lab Manual on Blood Analysis and Medical Diagnostics, S. Chand and Co. Ltd.

## SEMESTER VI

**DISCIPLINE SPECIFIC ELECTIVE COURSE II**

**DSE (ZOO) 607 A**

**IMMUNOLOGY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

The course is designed to discuss normal functions of body components during immune responses, to explain adverse functions of these cellular and molecular components during abnormal circumstances.

**LEARNING OUTCOMES**

Students who successfully complete this course will be able to:

* Identify major components of the immune system at organ, cellular and molecular levels.
* Elucidate the relationship between major cellular and molecular components of immune system.
* Apply immunologic techniques to solve certain clinical and research problems.

**SECTIONA**

**Unit 1**: **Overview of the Immune System**

Introduction to basic concepts in immunology, components of immune system, principles of innate and adaptive immune system

**Unit 2**: **Cells and Organs of the Immune System**

Hematopoiesis, Cells of immune system and organs (primary and secondary lymphoid organs) of the immune system.

**Unit 3: Antigens**

Basic properties of antigens, B and T cell epitopes, haptens and adjuvants

**SECTION B**

**Unit 4**: **Antibodies**

Structure, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions

**Unit 5**: **Working of the immune system**

Structure and functions of MHC, Antigen presentation method

**Unit 6**: **Immune system in health and disease**

Brief description of various types of hypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency

**SUGGESTED READINGS**

* Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI
* Edition. W.H. Freeman and Company.
* David, M., Jonathan, B., David, R. B. and Ivan R. (2006). Immunology, VII Edition,
* Mosby, Elsevier Publication.
* Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular
* Immunology. V Edition. Saunders Publication.

**SEMESTER VI**

**DISCIPLINE SPECIFIC ELECTIVE COURSE II**

**DSE (ZOO) 607 B**

**PARASITOLOGY**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

**INSTRUCTIONS FOR THE PAPER-SETTER**

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short-answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

**INSTRUCTIONS FOR THE CANDIDATES**

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

**LEARNING OBJECTIVES**

The course is designed with objectives to clear the concepts of parasites, insects, dairy and poultry animals, fisheries and their use for the betterment of human race.

**LEARNING OUTCOMES**

Students who successfully complete this course will be able to:

* Explain basics of the parasitic life-mode in context of ecological and evolutionary forces.
* Identify major fish groups and local native species, and describe their key characteristics.
* Identify human impacts on cattle and poultry animals, and the ecosystems in which they live.
* Describe the importance of beneficial and pest insects to humans.

**SECTION A**

**Unit 1: Introduction to Host-parasite Relationship**

Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis

**Unit 2: Epidemiology of Diseases**

Transmission, Prevention and control of diseases: Tuberculosis, typhoid

**Unit 3: Parasitic Protozoa**

Life history and pathogenicity of *Plasmodium vivax* and *Trypanosoma gambiense*

**SECTION B**

**Unit 4: Trematodes**

Brief account of *Fasciola hepatica* and *schistosones*

**Unit 5: Parasitic Helminthes**

Life history and pathogenicity of *Ancylostoma duodenale* and *Wuchereria bancrofti*

**Unit 6: Insects of Medical Importance**

Medical importance and control of *Pediculus humanus corporis*, *Anopheles, Culex, Aedes, Xenopsylla cheopis*

**SUGGESTED READINGS**

* Park, K. (2007). *Preventive and Social Medicine*. XVI Edition. B.B Publishers.
* Arora, D. R and Arora, B. (2001). *Medical Parasitology*. II Edition. CBS Publications
* Atwal, A.S. (1986). *Agricultural Pests of India and South East Asia*, Kalyani Publishers.
* Hafez, E. S. E. (1962). *Reproduction in Farm Animals*. Lea & Fabiger Publisher
* Dunham R.A. (2004). *Aquaculture and Fisheries Biotechnology Genetic Approache*s. CABI publications, U.K.
* Pedigo, L.P. (2002). *Entomology and Pest Management*, Prentice Hall.

**SEMESTER VI**

**ZOOLOGY LAB VI**

**DSE (ZOO) 607 P**

**IMMUNOLOGY AND PARASITOLOGY**

|  |  |  |  |
| --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | Pass Percentage: 35% | Pass Marks:  17 |

1\*. Demonstration of lymphoid organs

2. Histological study of spleen, thymus and lymph nodes through slides/ photographs

3. Preparation of stained blood film to study various types of blood cells.

4. ABO blood group determination.

5. Study of *Plasmodium vivax*, *Trypanosoma gambiense, Ancylostoma duodenale* and *Wuchereria bancrofti* and their life stages throughpermanent slides/photomicrographs or specimens.

6. Study of arthropod vectors associated with human diseases: *Pediculus, Culex, Anopheles, Aedes* and *Xenopsylla.*

**(\*Subject to UGC guidelines)**

## SEMESTER VI

## SKILL ENHANCEMENT COURSE IV

## SEC (ZOO) IV

## RESEARCH METHODOLOGY

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Total Credits:  2 | Total Marks: 50 | | Pass Percentage: 35% | Pass Marks: 17 | |
| Theory  35 | Internal Assessment  15 | Theory  12 | Internal Assessment 5 |

## INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three sections: A, B & C. Section A & B will have four questions in each section from the respective sections of the syllabus and will carry 5 marks each. Section C will consist of 5 short- answer type questions will cover the entire syllabus uniformly and each will carry 3 marks.

## INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt two questions from each section A & B of the question paper and the entire section C.

## LEARNING OBJECTIVES

Understanding of scientific method, concepts and steps in research, Understand the various techniques of Data Collection- Observation, Questionnaire, Interview Schedule; Case Study, Social Survey, Content Analysis, Describing various types of Sampling, Data Processing and Data Analysis

## LEARNING OUTCOMES

Upon completing this course, each student will be able to:

* Demonstrate knowledge of research processes (reading, evaluating and developing)
* Identify, explain, compare, and prepare the key elements of a research proposal/report
* Describe sampling methods, measurement scales and instruments, and appropriate uses of each

## SECTION A

**Unit 1: Foundations of Research**

Meaning, Objectives, Motivation: Research Methods *vs* Methodology

Types of Research: Analytical *vs* Descriptive, Quantitative *vs* Qualitative, Basic *vs* applied

## Unit 2: Research Design

Need for research design: Features of good design, important concepts related to good design- Observation and Facts, Prediction and Explanation, Development of Models. Developing a research plan: Problem identification, Experimentation, Determining experimental and sample designs

## SECTION B

**Unit 3: Data Collection, Analysis and Report Writing**

Observation and Collection of Data-Methods of data collection- Sampling Methods, Data Processing and Analysis Strategies, Technical Reports and Thesis writing, Preparation of Tables and Bibliography. Data Presentation using digital technology

## Unit 4: Ethical Issues

Intellectual property Rights, Commercialization, Copy Right, Royalty, Patent law, Plagiarism, Citation, Acknowledgement.

## SUGGESTED READINGS

* Anthony, M, Graziano, A.M. and Raulin, M.L. 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
* Walliman, N. 2011. Research Methods- The Basics. Taylor and Francis, London, New York.
* Wadhera, B.L. 2002. Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications, Universal Law publishing.
* C. R. Kothari 2009. Research Methodology, New Age International.
* Coley, S.M. and Scheinberg, C.A. 1990. Proposal writing. Stage Publications.