# SADAKATHULLAH APPA COLLEGE

**(AUTONOMOUS)**

**(Reaccredited by NAAC at an 'A' Grade with a CGPA of 3.40 out of 4.00 in the III cycle An ISO 9001:2008 Certified Institution)**

**RAHMATH NAGAR, TIRUNELVELI- 11.**

**Tamilnadu**

# DEPARTMENT OF ZOOLOGY

**(Unaided)**

MY LORD
VOUCHSAFE ME WISDOM

# CBCS SYLLABUS

**For**

# M.Sc. ZOOLOGY

**(Applicable for students admitted in June 2017 and onwards)**
**(As per the Resolutions of the Academic Council Meeting held on 27.02.2017)**

**CONTENTS**


| Sl. No. | Subject Title | Subject Code | Page No. |
|---|---|---|---|
| 1 | Course Structure | - | 1 |
| 2 | Systematics and Animal Diversity | 15PZOC11 | 4 |
| 3 | Developmental Zoology | 15PZOC12 | 6 |
| 4 | Biochemistry | 15PZOC13 | 8 |
| 5 | Ecology | 15PZOC14 | 9 |
| 6 | Cell and Molecular biology | 15PZOC21 | 11 |
| 7 | Animal Physiology | 15PZOC22 | 12 |
| 8 | Genetics and Evolution | 15PZOC23 | 14 |
| 9 | Animal Biotechnology | 15PZOC24 | 16 |
| 10 | Core Practical – I | 15PZOC2P1 | 18 |
| 11 | Core Practical - II | 15PZOC2P2 | 20 |
| 12 | Immunology | 15PZOC31 | 22 |
| 13 | Sericulture | 15PZOC32 | 24 |
| 14 | Biostatistics and Bioinformatics' | 15PZOC33 | 26 |
| 15 | Non-Major Elective - Choose from the list.<br>Wild life management (or) Apiculture | 15PZON31A<br>15PZON31B | 28<br>30 |
| 16 | Core Practical – III | - | |
| 17 | Microbiology | 15PZOC41 | 32 |
| 18 | Aqua culture | 15PZOC42 | 34 |
| 19 | Project | 15PZOP41 | 36 |
| 20 | **Core Elective** – Entomology (or)<br>Poultry Science | 15PZOCE4A<br>15PZOCE4B | 37<br>39 |
| 21 | Core Practical – III | 15PZOC4P1 | 40 |
| 22 | Core Practical – IV | 15PZOC4P2 | 42 |
| 23 | Scheme of Examinations | - | 44 |

## M.Sc., Zoology Syllabus 2017 onwards

# Course structure

| I Semester | | | | II Semester | | |
|---|---|---|---|---|---|---|
| **Course** | **H/W** | **C** | | **Course** | **H/W** | **C** |
| **Core 1** | **6** | **4** | | **Core 5** | **6** | **5** |
| **Core 2** | **6** | **5** | | **Core 6** | **6** | **5** |
| **Core 3** | **6** | **5** | | **Core 7** | **6** | **5** |
| **Core 4** | **6** | **5** | | **Core 8** | **6** | **5** |
| **Core Practical-I*** | **6** | **-** | | **Core Practical-I*** | **-** | **3** |
| | | | | **Core Practical-II*** | **6** | **3** |
| **Total** | **30** | **19** | | **Total** | **30** | **26** |
| **III Semester** | | | | **IV Semester** | | |
| **Core 9** | **6** | **5** | | **Core 12** | **6** | **5** |
| **Core 10** | **6** | **5** | | **Core 13** | **6** | **5** |
| **Core11** | **6** | **5** | | **Core14- Project** | **6** | **5** |
| **Core Practical-III*** | **6** | **-** | | **Core Practical-III*** | **-** | **3** |
| **Non major Elective** | **6** | **5** | | **Core Practical-IV*** | **6** | **3** |
| | | | | **Core Elective** | **6** | **4** |
| **Total** | **30** | **20** | | **Total** | **30** | **25** |

* Practical Examinations will be conducted at the end of Even Semester

**Distribution of hours, Credits, No. of Papers & Marks**

| Subject | Hours | Credits | No. Of Papers | Marks |
|---|---|---|---|---|
| **Core theory + Core Practical** | **108** | **81** | **14+4** | **1800** |
| **Core Elective** | **6** | **4** | **1** | **100** |
| **Non Major Elective** | **6** | **5** | **1** | **100** |
| **Total** | **120** | **90** | **20** | **2000** |

**Total Credits = 90 credits**
**Total Hrs / week = 120 Hrs**
**Papers (20 x 100) = 2000 marks**

**Department of Zoology (PG)**
**CBCS Syllabus- M. Sc., Zoology**

| Sem | P | Title of the Paper | S. Code | H/ W | C | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | I | E | T |
| I | C1 | Systematics and Animal Diversity | 15PZOC11 | 6 | 4 | 25 | 75 | 100 |
| | C2 | Developmental Zoology | 15PZOC12 | 6 | 5 | 25 | 75 | 100 |
| | C3 | Biochemistry | 15PZOC13 | 6 | 5 | 25 | 75 | 100 |
| | C4 | Ecology | 15PZOC14 | 6 | 5 | 25 | 75 | 100 |
| | CP I | Core Practical - I | - | 6 | - | Examination II Semester | | |
| II | C5 | Cell and Molecular biology | 15PZOC21 | 6 | 5 | 25 | 75 | 100 |
| | C6 | Animal Physiology | 15PZOC22 | 6 | 5 | 25 | 75 | 100 |
| | C7 | Genetics and Evolution | 15PZOC23 | 6 | 5 | 25 | 75 | 100 |
| | C8 | Animal Biotechnology | 15PZOC24 | 6 | 5 | 25 | 75 | 100 |
| | CP I | Core Practical – I | 15PZOC2P1 | - | 3 | 40 | 60 | 100 |
| | CPII | Core Practical - II | 15PZOC2P2 | 6 | 3 | 40 | 60 | 100 |
| III | C9 | Immunology | 15PZOC31 | 6 | 5 | 25 | 75 | 100 |
| | C10 | Sericulture | 15PZOC32 | 6 | 5 | 25 | 75 | 100 |
| | C11 | Biostatistics and Bioinformatics' | 15PZOC33 | 6 | 5 | 25 | 75 | 100 |
| | E (NM) | Wild life management (OR) Apiculture | 15PZON31A 15PZON31B | 6 | 5 | 25 | 75 | 100 |
| | CP III | Core Practical – III | - | 6 | - | Examination IV Semester | | |
| IV | C12 | Microbiology | 15PZOC41 | 6 | 5 | 25 | 75 | 100 |
| | C13 | Aqua culture | 15PZOC42 | 6 | 5 | 25 | 75 | 100 |
| | C14 | Project | 15PZOP41 | 6 | 5 | - | 100 | 100 |
| | CP III | Core Practical – III | 15PZOC4P1 | - | 3 | 40 | 60 | 100 |
| | CP IV | Core Practical – IV | 15PZOC4P2 | 6 | 3 | 40 | 60 | 100 |
| | CE | **Core Elective** – Entomology (or) Poultry Science | 15PZOCE4 | 6 | 4 | 25 | 75 | 100 |
| | | | **Total** | **120** | **90** | **535** | **1465** | **2000** |

## DEPARTMENT OF ZOOLOGY (PG)

### Non-Major Elective Course offered to Other Major PG Students

| SEM | P | Title of the paper | S. Code | H/W | C | Marks | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | I | E | T |
| I | NME | WILD LIFE MANAGEMENT (OR) | 15PZON31A (OR) | 6 | 5 | 25 | 75 | 100 |
| | | APICULTURE | 15PZON31B | | | | | |

**LIST OF NON-MAJOR ELECTIVE COURSES OFFERED TO PG STUDENTS BY VARIOUS DEPARTMENTS**

| SEM | TITLE OF THE PAPER | S.CODE | H/W | C | MARKS | | |
|---|---|---|---|---|---|---|---|
| | | | | | I | E | T |
| **DEPT. OF ENGLISH (PG)** | | | | | | | |
| III | English For Business Communication | 15PENN31 | 6 | 5 | 25 | 75 | 100 |
| **DEPT. OF COMPUTER SCIENCE (PG)** | | | | | | | |
| III | Internet Concepts and Web Design | 15PCSN31 | 6 | 5 | 25 | 75 | 100 |
| **DEPT. OF MATHEMATICS (PG)** | | | | | | | |
| III | Basics in Mathematics | 15PMAN31 | 6 | 5 | 25 | 75 | 100 |
| **DEPT. OF PHYSICS (PG)** | | | | | | | |
| III | Renewable Energy Sources | 15PPHN31 | 6 | 5 | 25 | 75 | 100 |
| **DEPT. OF CHEMISTRY (PG)** | | | | | | | |
| III | Cheminformatics (OR) | 15PCHN31A | 6 | 5 | 25 | 75 | 100 |
| | Applied Chemistry | 15PCHN31B | | | | | |
| **DEPT. OF ZOOLOGY (PG)** | | | | | | | |
| III | Wild life management (OR) | 15PZON31A | 6 | 5 | 25 | 75 | 100 |
| | Apiculture | 15PZON31B | | | | | |

**M.Sc. (ZOOLOGY) - CBCS SYLLABUS (2017 – 2018)**

| I SEMESTER | | |
|---|---|---|
| **C 1** | **SYSTEMATICS AND ANIMAL DIVERSITY** | **15PZOC11** |
| **Hrs/ Week: 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits :4** |

**Objectives:** To realize the biodiversity potential of our country and to understand the principle and methods of nomenclature and systematics.

**UNITI I: INTRODUCTION TO ANIMAL TAXONOMY**

Importance of taxonomy, stages in taxonomy, Morphological, embryological, cytological, biochemical and Differential systematics.

**UNIT II: NOMENCLATURE AND TAXONOMIC TOOLS**

Classification, components and types of classification, Linnaean hierarchy. Species concepts, Kinds of species, Origin of code, ICZN, Zoological records. Collection methods, preservation of data, curating, storing and cataloging, methods of identification, description of taxonomic characters, taxonomic keys, taxonomic publication.

**UNITIII: ECOSYSTEM DIVERSITY**

Concepts on Biodiversity, Ecosystem of India, Species and genetic diversity, Biodiversity hotspots, Conservation plans and treaties, Wild Life Protection Act-1972, Zoos, Sanctuaries, National Parks, Bio sphere reserve sand protected areas in India. Extinct, critical, endangered and vulnerable fauna of India, Biotechnological tools for conservation of biodiversity.

**UNIT IV: DIVERSITY OF TERRESTRIAL AND FRESHWATER ECOSYSTEMS**

Wetlands, reserve forests, rain forests and desert plains in India and their faunal resources, animals of lotic and lentic ecosystems, Threats to wetlands and conservation. Rivers of India and their faunal diversity.

## UNIT V: DIVERSITY OF MARINE AND MANGROVE ECOSYSTEMS

Coastal, coral reef, mangrove, sea grass and seaweed ecosystems and their faunal resources. Threats to marine biodiversity. Animals of lagoons and estuaries. Pelagic and benthic animal of the sea. Marine productivity.

## REFERENCE BOOKS


1. Agarwal and MU.Gupta,2004.Animal Taxonomy,S.Chand,NewDelhi.86pp.
2. JohnMiltonMC,2008.(Ed) Training Manualon GIS and Marine Biodiversity, 320pp.
3. KapoorV.C.1998.Theoryand practice of animal taxonomy, Oxford .and IBH, NewDelhi, 247pp;
4. Negi,S.S.1996.BiosphereReservesinIndia:Landuse,BiodiversityandConservation.Indus,NewDelhi.
5. SinghB.K,2004.Biodiversity:ConservationandManagement,MangalDeepPublication,586pp.
6. Sivramiah Shantharam and Jane F.Montgomery, 1999. Biotechnology, Biosafety and Biodiversity, Oxford IBH,237pp.
7. Swaminathan,M.SandS.Jana.1992.,BiodiversityMac Millian,Chennai,326pp.
8. Traffic India,1990. TheWildLifeprotectionAct,1972,154pp.

| I SEMESTER | | |
|---|---|---|
| **Core 2** | **DEVELOPMENTAL ZOOLOGY** | **15PZOC12** |
| **Hrs/ Week: 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits :5** |

**Objectives:** To imbibe the principles of embryology and understand the various steps that lead to the formation of a new progeny. The process of spermatogenesis, oogenesis, cleavage and cleavage patterns, gastrulation, organogenesis, types of placenta and regeneration is handled.

**UNIT - I GAMETOGENESIS AND FERTILIZATION**

**Gametogenesis:** Spermatogenesis - Oogenesis Structure and types of sperms and eggs, egg membranes; Organization and polarity of eggs. **Fertilization**: Mechanism of fertilization. Significance of fertilization.

**Genes in development**

Gene expression and regulations- Chromatin and DNA methylation- signal transduction- nuclear transplantation- Cellular differentiation – differential action- developmental genetic defects- Role of cell death in development- Terattogenesis.

**UNIT - II PARTHENOGENESIS, CLEAVAGE AND FATE MAPS**

**Parthenogenesis - Cleavage:** Types of animal eggs; patterns of yolk on cleavage; cleavage rules; germ layers; cell lineage. Cleavage in *Amphioxus*, frog, chick and man. **Fate maps:** Fate maps of frog, chick and man.

**UNIT - III GASTRULATION AND ORGANOGENESIS**

**Gastrulation:** Morphogenetic movements; Gastrulation in *Amphioxus*, frog, chick and man. **Organogenesis**: Development of brain and heart in Chick.

**Role of Genes and cytoplasm in development**

*Caenorhaditis elegans:* life cycle, cell lineage, cell- cell interactions and polarity; *hox* gene; genetic control and micro RNAs. Ascidian- mosaic development; cytoplasmic factors, mesenchyme and notochord development.

**UNIT - IV**

**Extra embryonic membrane and placentation**: Development, types and physiology of Extra Embryonic Membrane**. Placenta**: Types and physiology. Post embryonic development in Amphibian (metamorphosis). **Organizer**: Concept; inductive tissue interactions.

**UNIT- V APPLICATION OF MODERN TECHNIQUES IN DEVELOPMENTAL BIOLOGY**

Induced ovulation in humans- multiple ovulation and embryo transfer in cattle- embryo splitting – invitro fertilization – IVF in human cryopreservation- prenatal diagnosis, human cloning and its ethical implications, embryo transfer metamorphosis, regeneration in planaria and amphibians, aging and developmental potential.

**REFERENCE BOOKS:**


1. Arora, M.P., Embryology, Himalaya Publishing House, Ramdrot, Dr. Balerao Mass, Gurgaon - Mumbai.
2. Balinsky, B.I.,1981 Introduction to embryology, W.B. Saunders.
3. Beril, N.J., Developmental biology, TATA McGraw Hill Publishing Company Limited.
4. Verma, P.S. and Agarwal, V.K.,2014. Chordate embryology, S Chand and Company Limited, New Delhi.
5. Subramoniam, T., 2013.Molecular Developmental Biology, Narosa Publishing House Private Limited, Chennai.

| I SEMESTER | | |
|---|---|---|
| **C3** | **BIOCHEMISTRY** | **15PZOC13** |
| **Hrs/Week: 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits :5** |

**Objectives**: Deals with Biochemical regulation systems found in living organisms required for normal physiological activity, the structural integrity of the substrate, functioning of enzyme systems, the different specific metabolic process and the thermodynamic laws governing them.

**UNIT I: INTRODUCTION**

Structure of an atom and molecule. Chemical bonds. Covalent bonds – Characteristic geometrics, non covalent bonds,properties of hydrogen bonds, Vanderwaals interaction, pH and acid base balance. Henderson – Hasselbech equation. Acidosis and Alkaloids. Chemical equilibrium and Biological fluids. Biochemical energetics.

**UNIT II: PROTEINS**

Aminoacid – Structure, classification, properties and functions. Metabolism of individual aminoacids- tryptophan, phenylalanine and tyrosine. Metabolism of Purines and Pyrimidines. Protein – Hierarchical structure, properties (folding, modification, degradation), Classification and functions.

**UNIT III: CARBOHYDRATES**

Structure, classification, properties and functions – metabolism – glycolysis, Kreb's Cycle, Gycogenesis, glycogenolysis and gluconeogenesis. HMP Shunt.

**UNIT IV: LIPIDS**

Lipid - structure, Classification, Properties and functions - Biosynthesis of fatty acids triglycerides and phospholipids. Metabolism – β oxidations, ketogenesis, Metabolism of Cholesterol.

**UNIT V: ENZYMES, VITAMINS AND HORMONES**

Enzymes – Nomenclature, Classification and functions. Enzyme Kinetics – Michael's menton equation. Coenzymes – Activators and inhibitors.

Vitamins – Composition, structure and functions.

Hormones – Classification

**REFERENCE BOOKS:**


1. A. Shanumugam, 2005. Fundamentals of biochemistry for medical students. Navabharat Printers and Traders, Madras-86.
2. Stryer, L., W. H., 2005. Biochemistry. Freeman and Company, San Francisco.
3. Lehninger, A. L., 2006. Principles of biochemistry. CBS Publishers and Distributors, New Delhi-32.
4. Murray, R. K., Granner, D. K., Mayes, P. A. and Rodwell, V. W., 1996. Harper's biochemistry (24th edition). Prentice Hall of Japan, Inc., Tokyo.
5. West E. S., Todd, W. R., Mason, S. H. and Van Bruggen, J. T., 1974.Textbook of biochemistry (4th edition). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi-2.
6. P. W. Kuchel & G. B. Ralston, 2003. Schaum's outlines of biochemistry (2nd edition). Tata McGraw-Hill Edition.
7. S. C. Rastogi. 2003. Biochemistry (2nd edition). Tata McGraw-Hill Publishing Company Ltd.
8. Jeremy M. Berg and John L. Tymoczko, Lubert Stryer 2015, Biochemistry W. H. Freeman,7th edition.

| I SEMESTER | | |
|---|---|---|
| **C4** | **ECOLOGY** | **15PZOC14** |
| **Hrs/Week: 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits :5** |

**Objectives:** Signifies the physiological adaptations associated with changes in the environment of organisms. Deals with animal adaptations associated with changes in various abiotic factors and environment. Association attributes related to predation and parasitism and their dynamics have been elucidated.

**UNIT I ECOSYSTEM**

**Ecosystem:** Concept – types - stability - food chain and food web – Ecological pyramids – energy flow in an ecosystem. Biochemical cycles: Carbon, nitrogen, oxygen, phosphorous and sulphur. **Productivity:** Primary productivity process – productivity of different ecosystems – measurement of primary productivity, Biogeography-majorterrestrial biomes,island Biogeography,biogeographical zones of India.(r and k selection)

**UNIT II POPULATION AND COMMUNITY ECOLOGY**

**Population:** Attributes ,characters- growth curves and regulation - life history strategies – competitive niche- concept. Biotic and abiotic interactions, community-nature, structure, attributes, edges and ecotones

**UNIT III BIODIVERSITY AND CONSERVATION**

**Biodiversity:** Genetic – species and ecosystem diversity, measurements- **Diversity indices:** Shannon-Weiner– Diversity an ecosystem processes. Hotspots – values and uses of diversity – loss of animal diversity – rare and Endangered species – red list – **Conservation practices:** Wildlife sanctuaries – National parks and biosphere reserves –tiger, major habitat types of the subcontinent.

**UNIT IV RESOURCE MANAGEMENT**

**Resources:** Natural resources – renewable and non-renewable resources. **Forest resources:** Renewable resources: Ecological and economic importance of forest – types and management –Non renewable resources. **Water resources:** Worldwide supply – renewable and distribution – Indian water resources – river water disputes.

**Energy resources:** energy resources types: solar, wind, hydel, tidal energy and biomass.

**UNIT V POLLUTION AND ENVIRONMENTAL AWARENESS**

**Pollution:** Air, water, soil, noise, thermal pollution – sources, effects and control measures – Nuclear hazards. **Social issues and environment:** Urban environmental problems –solid waste management, Succession-types, mechanism, concept of climax.Species interaction-inter and intra specific interaction, symbiosis-herbivore, carnivore.

**REFERENCE BOOKS:**


1. Agarwal, A. C., 1999, Environmental biology, Agro Botanica, Bikaner.
2. Anjaneyala, Y. B., 2004, Introduction to environmental science, S. P. B. S. Publications, Hyderabad.
3. Odum, E. P., 1983, Basic ecology, CBS College, Publishing, Saunders.
4. Saxsena, K. K., 2004, Environmental sciences, University Book Hour (P) Ltd., Jaipur.
5. Trivedi, P. C., Sharma, K. C., 2003, Biodiversity conservation, Aavishkar Publishers, Jaipur.
6. Sven Erik Jørgensen.2007,A New Ecology,1st Edition ,Elsevier Science

| II SEMESTER | | |
|---|---|---|
| **Core 5** | **CELL AND MOLECULAR BIOLOGY** | **15PZOC21** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credit : 5** |

**Objectives:** The detailed study of the fundamental unit of life with specific insight into the organization of pro and eukaryotes. Special emphasis has been placed on nucleic acids, the basic heredity units.

**UNIT I**

Eukaryotes and Prokaryotes – Structure and function. Structure and function of plasma membrane – models, membrane transport, structure and function of endoplasmic reticulum, lysosomes and Golgi bodies.

**UNIT II**

Structure and function of mitochondria. Ribosome – Membrane protein and Secretory protein – insertion in to Endoplasmic reticulum membrane. Post transitional modifications of proteins both in the RER and SER. Protein glycosylation in endoplasmic reticulum.

**UNIT III : NUCLEIC ACIDS**

Nucleic Acids – DNA – Structure and functions – DNA replication – unit of replication, enzymes involved, replication origin and replication fork. Plasmid replication (Transcription, translation, elongation and Termination).

RNA – Structure, types, RNA polymerase, RNA predating, edition and Transport.

**UNIT IV CANCER – CAUSES, DIAGNOSIS AND TREATMENT**

Oncogenes and anti – Oncogenes, P53 gene, Cancer cell cycle, Interactions of cancer cells with normal cells, apoptosis, Genetic rearrangements in progenitor cell.

**UNIT V GENE EXPRESSION**

Structure of chromatin and chromosomes, Heterochromatin, Euchromatin and Transposans. Regulatory mechanism in eukaryotes – Gene expression – Regulation at transcriptional and Translational levels. Control of regulatory mechanism of gene expression.

**REFERENCE BOOKS:**

1. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 2000, Molecular Cell Biology, 4th edition New York: W. H. Freeman; 2000.

2. B. Alberts, D. Bray, J. Lewis, M. Raff, K., Roberts and J. D. Watson. 1983. Molecular Biology of the Cell, Garland Publishing Inc., New York.

3. Gerald Karp, Janet Iwasa, Wallace Marshall. 2016, Cell and Molecular Biology. Concepts and Experiments, John Wiley and Sons, Inc., New York.

4.Schaum's Outlines of Molecular and Cell Biology, Tata McGraw-Hill Edition.

5. De Robertis, E. D. P. and De Robertis, E. M. F. 1980. Cell and Molecular Biology Saunders College, Philadelphia.

6.Gerald Karp, Janet Iwasa, Wallace Marshall, 2015, Karp's Cell and Molecular Biology,8th Edition, John Wiley and Sons, Inc., New York.

| II SEMESTER | | |
|---|---|---|
| **Core 6** | **ANIMAL PHYSIOLOGY** | **15PZOC22** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits : 5** |

**Objectives:** To understand the physiology of animals along with an in-depth discussion of the structure, working mechanism and functions of various organs such as the heart, nervous coordination, lungs and kidney is provided.

**UNIT I FOOD AND DIGESTION**

Balanced diet – malnutrition – digestive tract – structure and functions. Secretory functions of the alimentary tract and the glands. Gastro-intestinal hormones, digestion, absorption and metabolism of carbohydrates, proteins and lipids.

**UNIT II BLOOD AND CIRCULATION**

**Human:** Blood components – functions of blood – factors affecting RBC production. Functional anatomy of heart – cardiac cycle – cardiac output – regulation of cardio vascular function – blood pressure – nutrition and metabolism of the heart – coronary circulation – cerebral circulation – placental – foetal and neonatal circulation.

**UNIT III RESPIRATION AND EXCRETION**

Respiration in air and water. **Human**: Physiology and anatomy of the respiratory tract – gas transport between the lungs and tissues – regulation of respiration. Respiratory adjustments in health and diseases. Excretory products – organs of excretion in different animals. **Human:** Kidney – nephron – renal circulation – urine formation – renal disorders – micturition and dialysis.

**UNIT IV NEUROMUSCULAR AND SENSORY PHYSIOLOGY**

Neuron – nerve fibres – classification and properties – neurotransmitters – synapse – reflex activity – structure and function – spinal cord and brain – electroencephalogram (EEG). **Muscles:** Classification and properties – mechanism of muscular contraction – energetics of muscular contraction – neuromuscular junction.

**Sense organs and receptors**: Sense organs of vision, hearing and equilibrium, smell and taste, cutaneous, deep and visual sensations.

**UNIT V REPRODUCTIVE PHYSIOLOGY**

Reproductive physiology of human: Leydig and Sertoli cells – spermatogenesis and oogenesis – induced ovulation and *in vitro* oocyte maturation – fertilization and early

embryonic development – adolescence and senescence – embryonic stem cells, assisted reproduction techniques – GIFT, ZIFT, SUZI, ICSI, Population control – family planning.

**REFERENCE BOOKS:**


1. Kunt Schmidt-Nicolsen, 1997 Animal Physiology-Adaptation and Environment.5th Edition, Cambridge University Press.
2. K. Sembulingam and P. Sembulingam,2012.Essentials of Medical physiology,6th Edition, Jaypee Brothers Medical Publishers Ltd. New Delhi.
3. Kim E.Barrett and Susan M. Barman.2015. Ganong's Review of medical physiology. 25th edition. Lange Basic Science.
4. A. C. Guyton and J. E. Hall. 2011. Textbook of medical physiology.12th edition. Saunders Elsevier.Philadelphia..
5. Tuttle, W. W. and Bryon, A. and Schottlius 1969, Textbook of physiology. (Mosby International Edition), The C. V. Mosby Company, Saint Rocis, Toppa Co. Ltd., Tokyo, Japan.
6. J. J. Bray, P. A. Cragg, A. D. C. McKnight, R.G. Mills and D.W. Taylor, Lecture notes on human physiology. (3rd edition), Blackwell Scientific Publications.

| II SEMESTER | | |
|---|---|---|
| **Core 7** | **GENETICS AND EVOLUTION** | **15PZOC23** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits :5** |

**Objectives:**

- To facilitate the student to understand the genetic basis of inheritance
- To understand the basic concepts of evolution

**UNIT I MENDELIAN PRINCIPLES**

Segregation , independent assortment of genes, multiple alleles and genetics of ABO Rh blood groups in man, Six linked inheritance, linkage and crossing over, localization of DNA in chromosome and gene mapping. Extra nuclear DNA:DNA in mitochondria and plastid. Maternal effects and cytoplasmic inheritance.

**UNIT II CONCEPT OF GENE**

Cistron, recon and muton, DNA as the genetic material, Regulation of gene expression in prokaryotes and eukaryotes , inherited genetic disorder in man-Syndromes, Colour blindness, Haemophilia, Inborn Errors of metabolism- Sickle cell anaemia,Albinism.

**UNIT III GENETICAL DISORDERS.**

Dominant gene, recessive gene – sex linked and chromosomal genetic disorder – Huntington's chorea – cystic fibrosis – thalassemia - muscular dystrophy – phenylketonuria and Tay Sac's disease –screening for genetic disorders – amniocentesis – chorionic villus sampling – foetoscopy – gene therapy.

**UNIT IVTRADITIONAL EVOLUTION**

Origin and evolution of prokaryotes and eukaryotes – phylogenetic gradualism and punctuated equilibrium – major trends in the origin of higher categories – micro- and macroevolution.

**UNIT V MOLECULAR EVOLUTION**

Construction of phylogenetic trees – quantifying genetics – variability – genetic structure of natural population – phenotypic variation – pattern of genetic variation –

Founder's effect and bottle necks – models explaining changes in genetic structures of population.

**REFERENCE BOOKS:**


1. M. W. Strickberger. 2005. Genetics.3rd Edition, Prentice-Hall, India.
2. Benjamin Lewin. 2000. Genes VII. Oxford University Press.
3. Robert J. Brooker,2012. Genetics – Analysis and Principles,4th Edition,(International Edition), NY McGraw Hill, New York..
4. J. M. Smith. 1998. Evolutionary genetics.2nd Edition, Oxford University Press.
5. M. Ridley. 1996. Evolution. 2nd Edition, Blackwell Science Inc,Cambridge,Massachusetts.
6. G. Ledyard Stebbins. 1971. Processes of organic Evolution, 2hd edition. Prentice-Hall, Inc., Englewood cliffs, New Jersey.
7. William D. Stansfield. 1983. The science of evolution, MacMillan Publishing Co. Inc.
8. Paul Amos Moody. 2011. Introduction to evolution, Nabu Press, United States.
9. Douglas J. futuyma. 2013. Evolution, 3rd edition, Sinauer Associates.inc.

| II SEMESTER | | |
|---|---|---|
| **C8** | **ANIMAL BIOTECHNOLOGY** | **15PZOC24** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credit:5** |

**Objectives:** Recent branch of biology explaining basic applications of recombinant DNA technology, gene transfer and transgenecity. Deals with applications of biotechnology in the field of medicine like cell culture, drug delivery systems and gene therapy; in industries, like production of biopolymers, biofertilizers, SCPs and GEMs..

**UNIT I BIOTECHNOLOGICAL TOOLS AND TECHNIQUES**

Definition - principles and methods of recombinant DNA technology –exonuclease, endonuclease -Source of Gene, genomic, cDNA libraries – rDNA strategy, selection, insertion, culture, recovery, screening; Insertional, blotting, PCR, DNA sequences. Plasmids -pBR322, Ti plasmid, bacteriophage, M13, cosmids, phasmids, yeast shuttle vectors, transposons, bacterial artificial chromosome.

**UNIT II DNA TECHNIQUES**

Gene and gene function - gene transfer system - transgenic animals - production and application - animal bioreactors - targeted gene transfer; genome maps and human genome project - molecular markers – Restriction Fragment Length Polymorphism (RFLP) - Randomly Amplified Polymorphic DNA (RAPD) - Variable Number of Tandem Repeats (VNTR) - Short Tandem Repeats (STR), chromosome jumping - chromosome walking - DNA finger printing – DNA chip technology – biosensors and their applications.

**UNIT III GENETIC ENGINEERING FOR HUMAN WELFARE**

Animal cell and tissue culture - mammalian cell lines and their characters - media for the cultivation of mammalian cells - large scale cultivation of mammalian cells - cell culture products - organ culture technique - Somatic cell fusion and hybridoma technology - monoclonal antibodies production and applications - disease prevention, disease diagnosis and disease treatment - drug designing and drug delivery systems - gene therapy – pharmacogenetics and pharmacogenomics. *In vitro* fertilization and embryo transfer.

**UNIT IV BIOTECHNOLOGY AND INDUSTRY**

Industrial microbiology - isolation and screening of micro organisms - strain improvement - bioreactor - downstream processing - practical applications – antibiotic synthesis - Single Cell Proteins (SCP) and myco protein - production and application. Enzyme technology – immobilization of enzyme and its uses. Bioethics.

**UNIT V ENVIRONMENTAL BIOTECHNOLOGY**

Bioenergy – Biofuels - Biodiesel - Biogas production technology - biogas from waste water .Biopesticide, biofertilizer. Genetically Engineered Microbes (GEMS) - bioremediation, bioremediation for marine oil spills - types of bioremediation ,bioleaching; microbial degradation of xenobiotics.Short account on Synthetic biology

**REFERENCE BOOKS:**


1. Dubey R.C. Text book of biotechnology, 2012. S.Chand & company Limited, New Delhi.
2. Gupta .P.K. Biotechnology and Genomics.2013. Rastogi Publications, Meerut.
3. Atherly, Girton and McDonald, The Science of Genetics 1999. Harcourt College Publications.
4. Singh.B.D. Genetic Engineering and Animal Biotechnology,2005. Kalyani Publishers, Chennai – 17.
5. Kingsman,S.M and Kingsman.A.J. Genetic Engineering: An Introduction to Gene Analysis and Exploitation in Eukaryotes.1988. Blackwell Science Inc Publications.
6. M. W. Strickberger. 2005. Genetics.3rd Edition, Prentice-Hall, India
7. Bruce Alberts,Alexander Johnson,Julian Lewis,Martin Raff,Keith Roberts,Peter Walter. Molecular Biology of the Cell.5th Edition,2007. Garland Science.

| II SEMESTER | | |
|---|---|---|
| SYSTEMATICS AND ANIMAL DIVERSITY, DEVELOPMENTAL ZOOLOGY, BIOCHEMISTRY & ECOLOGY PRACTICALS | | |
| **CP I** | | **15PZOC2P1** |
| **Hrs/week : 6** | **Hrs / Sem : 90** | **Credits : 3** |

## CORE PRACTICAL – I

### Systematics and Animal Diversity Practical

1. Calculation of biodiversity indices using preserved specimens.
2. Diversity of planktons in freshwater.
3. Morphological features of prawn – penaeids and non-penaeids.
4. Visit to Zoo or wildlife sanctuary.

### Developmental Zoology Practical

5. Mounting and observation of various stages of onion root tip.
6. Mounting and observation of male or female gamete in fish
7. Temporary mounting and observation of chick embryos.
8. Observations on developmental stages of frog (fertilized eggs, stages of cleavage, blastula, gastrula, tadpoles).
9. Effect of growth hormones on amphibian metamorphosis ( minigroup project).
10. Induced ovulation in fish (Demonstration only).

### Biochemistry Practical

1. Effect of Salivary amylase on substrate concentration.
2. Effect of Salivary amylase on enzyme concentration.
3. Chromatographic separation of amino acids.
4. Estimation of Carbohydrate.
5. Estimation of protein.

### Ecology Practical

1. Measurement of primary productivity – factors affecting PP (light, biomass).
2. Qualitative estimation of plankton in fresh water or marine water samples.
3. Estimation of tolerance limits of fish to pesticides ($LC_{50}$ determination).
4. Study report of any one aquatic and terrestrial ecosystem.
5. Calculation of diversity indices.
6. Estimation of ammonia.

## MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

**Developmental Biology**

SPOTTERS: Frog a)T.S. of testis and Ovary, b)Fertilized Egg, c)Yolk Plug Stage, d)Neurula, e)Tadpole.

a).Chick embryo: Primitive streak, b)24 hours of chick embryo, c)36 hours of chick embryo,

d)48 hours of chick embryo, e)72 hours of chick embryo, f)96 hours of chick embryo.

Slides on cleavage: (Chick) 2 cell, 4 cell and 8 cell stages, blastula and gastrula.

Types of Placenta: a)discoidal. b)diffuse, c)cotyledonary placenta.

IVF Techniques in human-Chart.

**Biochemistry**

a) spectrophotometer b) pH meter, c) Paper Chromatography, d) Centrifuge.
MODEL: a)Atoms b) Enzyme- Substrate,Food and nutrients-vitamin.

**Ecology**

1. Spotters: Ecosystem- fresh water and marine, grassland and forest.
2. Food chain and food web, Biogeochemical cycle.
3. Endangered ,Endemic and Extinct Species.

| II SEMESTER | | |
|---|---|---|
| CELL AND MOLECULAR BIOLOGY, ANIMAL PHYSIOLOGY, GENETICS AND EVOLUTION & ANIMAL BIOTECHNOLOGY PRACTICAL | | |
| CP II | | 15PZOC2P2 |
| Hrs / Week : 6 | Hrs / Sem : 90 | Credits : 3 |

## CORE PRACTICAL – II

### Cell and Molecular Biology

1. Study of giant chromosomes in chironomous larva.
2. Preparation of squamous epithelial cells (human).
3. Preparation of blood smear (fish, human)

### Animal Physiology

1. Effect of Temperature on opercular movement of fish.
2. Effect of Temperature on human salivary amylase activity.
3. Estimation of Total Haemoglobin in human.
4. Haemin crystals in human blood.
5. Quantitative analysis of Nitrogenous waste products.
6. Virtual dissection of frog- Blood vascular system or Digestive system.
7. Bomb Calorimeter-Demonstration.

### Genetics and Evolution

1. Verification of Mendel's law-Monohybrid and Dihybrid crosses using coloured beads.
2. Human Mendelian traits.
3. ABO blood group data, in a large sample of human population or classroom sample.
4. Demonstration of density dependent selection in animal population using beads.

### Animal Biotechnology

1. Isolation of DNA and RNA by centrifugation.
2. Separation of DNA by Agarose gel electrophoresis and PAGE for protein.
3. Production of ethanol
4. Visit to biotechnology Laboratory and Research institution.
5. Report of visits to laboratories in the observation note book.

## MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

### Cell and Molecular Biology

a) Oncogene b ) Apoptosis c) Cancer cell cycle d ) Fine structure of Mitochondria f ) Types of DNA g) Types of RNA.

### Animal Physiology

a ) Simple muscle twitch b ) Sphygmomanometer

c ) Haemocytometer d) Reflex arc model

e) ECG model f) Cardiac cycle g) Dialysis h)Family planning devices

### Genetics and Evolution

1. Thalassemia , Haemophilia,Syndromes.
2. Construction of phylogenetic tree.
3. Colouration: Chamaeleon, Lycodon
4. Mimicry: Phyllium, Stick insect

### Animal Biotechnology

a) pBR 322 b) CaMV c ) Restriction enzymes d) Recombinant DNA

e) Electroporation Unit f) Stem cells g) Dolly h) Animal cloning

i) Transgenesis j) Gene knock out k) protoplast fusion

| III SEMESTER | | |
|---|---|---|
| **C9** | **IMMUNOLOGY** | **15PZOC31** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credit:5** |

**Objectives:** Explains the fundamental aspects of infective organisms and the potential of the living systems to resist infections. Elucidates the structure and function of cells associated with immunity and the techniques adopted to understand immune reactions.

**UNIT I INTRODUCTION, HISTORY AND TYPES OF IMMUNITY, CELLS AND ORGANS OF THE IMMUNE SYSTEM**

**Introduction:** History – basics – **Types of Immunity: Innate Immunity** – physical, mechanical, biochemical ,cellular, genetic and other factors. **Acquired immunity:** Natural and artificial active immunity – natural and artificial passive immunity – adoptive immunity. **Cells of immune system:** Lymphoid lineage – T cells and its types – B cells and its types – Null cells and its types. **Myeloid lineage:** eosinophil, basophil, neutrophil, mast cell, antigen presenting cells, platelets, monocytes and macrophages. **Organs of immune system:** Primary lymphoid organs – thymus – bone marrow- bursa of Fabricius – Secondary lymphoid organs – lymph node spleen, Payer's patches (GALT), tonsils (MALT),appendix.

**UNIT II IMMUNE RESPONSE**

**Humoral immune response:** Primary and secondary humoral immune response – importance of B cells in humoral immune response (antibody formation) – factors influencing antibody formation. **Cell mediated immune response**: cells involved in the cell mediated immune response – cytokines and their actions – anemnesis (immunological memory) in humoral and cell mediated immune response. **Hypersensitivity reaction:** Factors causing hypersensitivity – types of hypersensitivity – type I, II, III, IV and V – hypersensitivity reactions. **Complement system:** Classical and alternate pathways of complement system – biological functions of complement system – complement fixation test.

**UNIT III ANTIGENS AND ANTIBODIES**

**Antigens**: types of antigens – cross reacting antigen – heterophil antigens – Frossman antigens – chemical nature of antigen – essential factors for antigenicity. **Antibodies**: antibodies and immunoglobulins – structure of immunoglobulin – types of immunoglobulin – structure and biological properties of immunoglobulins G, M, A, D, and E –monoclonal and polyclonal antibodies.

Antigens and antibody reactions**:** Salient features and mechanism of immune complex.

**UNIT IV CLINICAL IMMUNOLOGY**

**Transplantation immunology:** Major histocompatibility complex – structure of MHC molecule – genetic polymorphism of class I, II and III MHC molecules. **Transplantation**: classification of grafts – mechanism of graft rejection – graft versus

host reaction – immuno suppressive therapy during transplantation. **Tumour immunology**: properties of tumour cells – causes of tumours – tumour antigens – immune response to tumour – immune surveillance – immuno diagnosis of tumour – immuno therapy of tumour.

## UNIT V: DISEASES

**Auto immune diseases**: characteristics of auto immune diseases – causes of auto immune diseases – classification of auto immune diseases – treatment of auto immune diseases. **Immune response to infectious diseases:** Protozoan parasite (malaria) – bacterial disease (Tuberculosis) – viral disease (HIV) – ELISA and Western Blot. **Immuno therapy:** Immunization and immunization schedule – vaccines – attenuated vaccine – killed vaccine – recombinant vaccine – vector vaccine – DNA vaccine – anti-idiotype vaccine – multivalent sub units vaccines.

**REFERENCE BOOKS:**


1. Janis Kuby, Immunology, 1999. W.H. Freeman and company, New York,
2. Klaus D. Elgert, Immunology: Understanding the Immune System. 2009.2nd Edition, Wiley-Blackwell Publishers Co.
3. R. M. Coleman, M. F. Lombard, R. E. S. Cord. Fundamental Immunology, 2000 2nd edition, W. C. Brown Publishers, USA.
4. I. M. Roitt. Essential Immunology. 1998. ELBS Publication.
5. Donald M. Weir and John Stewart. Immunology, 2001. 9th edition. ELBS Publication.
6. C. V. Rao 2004. An introduction to immunology. Narosa Publishing House.
7. Aruna Bhatia. Manual of Practical Immunology. 2006. Palani Paramount Publications, Palani
8. Talwar, G. P. A handbook of Practical Immunology. 2000. Vikas Publication House Ltd. New Delhi.
9. Hudson, L. and Hay, F. Practical Immunology, 2001. 3rd edition, Blackwell Scientific Publication.
10. Abul K. Abbas, Andrew H. H. Lichtman, and Shiv Pillai, Cellular and Molecular Immunology, 8th Edition.Elsevier science.

| III SEMESTER | | |
|---|---|---|
| **Core 10** | **SERICULTURE** | **15PZOC32** |
| **Hrs / week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits : 5** |

**Objectives:** To understand the various aspects of sericulture and to adopt and encourage the students for self employment. An in-depth discussion of the importance of mulberry farming, silkworm rearing and management is provided.

**UNIT I - INTRODUCTION**

Importance of Sericulture - Sericulture industry in India and Tamilnadu - Sericulture as a cottage industry - Role of central silk board, research institutes, National silk seed organization - Moriculture – Mulberry varieties, Artificial seed preparation - Morphology of Mulberry plant, package of practices for mulberry cultivation, harvesting and Preservation .

**UNIT II - DISEASES OF MULBERRY**

Diseases of mulberry - fungal diseases – (root&shoot diseases - Bacterial diseases (Tukra) - leaf blight disease, rot disease - Viral diseases – mulberry leaf mosaic disease, dwarf disease - Deficiency diseases – nitrogen deficiency, Phosphorus deficiency, magnesium deficiency and calcium deficiency symptoms and control measures of any three major pests.

**UNIT III - LIFE CYCLE**

Classification of mulberry and non mulberry silk worm - habit and habitat - voltinism, races - life cycle of mulberry and non mulberry silk worm - structure of egg, larva, pupa, and adult, sexual dimorphism of larva and pupa, fine structure of silk gland.

**UNIT IV - SILK WORM REARING**

Rearing of silk worm : Selection And Construction Of Rearing house, rearing appliances, rearing operation - disinfection –egg incubation-brushing - maintenance of optimum conditions - Feeding - Bed cleaning - spacing - Chawki rearing - Rearing of late age larva – Shelf &Shoot rearing – Cocoon Production, harvesting and marketing

- Characteristics of cocoons - defective cocoons. reeling techniques- lacing, skinning, twisting and re reeling.

**UNIT V - SILKWORM DISEASES**

Diseases of silk worm: Protozoan – Pebrine, Viral – Flacherie, Gattine, Bacterial – Septicemia, sotto, Fungal - Muscardine, Pests –Uzi fly, Silk reeling; cocoon stifling - storage of cocoons, cocoon boiling and deflossing, - Process of reeling - different methods, Raw silk and marketing.

**REFERENCE BOOKS:**


1. Dandin, S. B. , Jayant Jayaswal and K. Giridhas, Hand Book of Sericulture Technologies, 2000 Central Silk Board, Madivala, Bangalore - 68.
2. Ganga, G. and Sulochana Chetty.I - An Introduction to Sericulture. 1991. Oxford & IBH Publishing Company Private Ltd .New Delhi .
3. Ganga, G.- Comprehensive Sericulture, Vol. I, Moriculture, 2003,Science Publishers.U.S..
4. Ganga, G . Comprehensive Sericulture, Vol. II, Silk worm Rearing and Silk Reeling, 2004. India Book House Private Ltd.
5. Kesary, M . and M . Johnson, Sericulture , Department of Zoology, N. M. Christian College, Marthandam - 629 165 .

| III - SEMESTER | | |
|---|---|---|
| **C 11** | **BIOSTATISTICS AND BIOINFORMATICS** | **15PZOC33** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits : 5** |

**Objectives:** A unique branch of biology explaining the mathematical principles governing biological systems and gives an insight into statistical analysis of biological data. It touches upon the area of mathematical models for biological systems, applied in various areas of space, military, nuclear and ocean operations.

**UNIT I : TYPES OF DATA AND CENTRAL TENDENCY**

Types of biological data – Ratio scale, interval scale, ordinal scale, nominal scale – sample and population, statistical symbols and terms, types of mean-Arithmetic mean, harmonic mean, geometric, Average of position, median, mode – accuracy and precision – frequency distribution .

**UNIT II: DISPERSION AND TEST FOR SIGNIFICANCE**

Comparing two means, Measures of dispersion: standard deviation, coefficient of variation, measures of variation-mean deviation, standard deviation, variance, Theoretical probability-distribution-normal, binomial and poisson – skewness and kurtosis, standard error – student's 't' distribution: Chi-square analysis – test for goodness of fit – test for independence – types of errors- $\alpha$ and $\beta$.

**UNIT III: DATA TRANSFORMATION AND ANOVA**

Correlation-kinds, properties, methods-Karl pearson's, Rank,Regression analysis-simple, linear and non-linear regression and testing its significance. Analysis of variance – one-way, two-way, 'F' test, Post Anova, Turkey test. Important user friendly statistical packages – SPSS.

**UNIT IV: INTRODUCTION AND BIOINFORMATICS RESOURCES**

Knowledge of various databases and bioinformatic tools available at the resources, the major content of data bases, literature data bases- Nucleic acid sequence database-Gen bank, EMBL and DDBJ . Protein sequence data base. Swiss prot, TrEMBL, PIR, PDB, Genome data base- NCBI, EBI, TIGR, SANGER other database of patterns motifs system biology- gene and protein network database and resources. Biological databases NCBI, Swiss prot, DDJ, PDB, EMBl and their uses.

**UNIT V: SEQUENCE ANALYSIS**

Pairwise sequence alignment – local vs. global alignment – multiple sequence alignment– dot matrix analysis – substitution matrices – dynamic programming Bayesian methods – tools – BLAST – FASTA- machine learning – neural networks – statistical methods – Hidden Markov models – Homology Modeling.

**REFERENCE BOOKS:**


1. Bailey, N. T. J. 1997. Statistical methods in Biology (3rd edition). Cam. University Press, New York.
2. Sokal, R. and James, F. 1973. Introduction to Biostatistics. W H. Freeman and Company Ltd., Tokyo, Japan.
3. Snedecor, G. W. and Cochran, W. G. Statistical methods. Affiliated East-West Press, New Delhi.
4. Zar, J.H. 1984. Biostatistical Analysis (2nd edition). Prentice-Hall International, Inc. London.
5. Cantor,C.R and Smith, C.L 1999."Geneomics", John Wiley & Sons.
6. Pennington,S.R. and Dunn, M.J. 2002,"Proteomics: from Protein Sequence to Function", viva books publishers,
7. Liebler, D.L. 2002, Introduction to Proteomics : Tools for the new Biology, Humana press.

| III SEMESTER | | |
|---|---|---|
| **NME** | **WILDLIFE MANAGEMENT** | **15PZON31A** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits: 5** |

**Objective:** This paper examines the various principles of conservation and management of wildlife stating the various concepts of ecology and population and various methods such as telemetry and remote sensing that are used to maintain and manage a wildlife conservation sanctuary. It creates awareness among the student community about the importance of conserving and protecting biodiversity.

**UNIT – I WILDLIFE AND ECOLOGY**

Ecological concepts related to nature and natural resources: Ecosphere and Biosphere – fundamental ecological variables – biodiversity – ecological principles governing the use of natural resources: definition of a resource – renewable and non renewable resources – principles concerning diversity and populations – stability of population. Distribution of wildlife in India – organization and legislation – status of wildlife conservation in states and union territories – endangered fauna and flora – threatened species - rare species – vulnerable species – extinct species – red data book. Hotspots. Wildlife sanctuaries and National parks in India and around the world.

**UNIT – II POPULATION ECOLOGY**

Population dynamics – Population estimation – census – sampling indices – population manipulation and indices– transect – line transect – Emlen transects – change in frequency estimators – clutch effort estimators – mark recapture estimators. Age and sex criteria with special reference to Indian wildlife – consideration of special and unique habitats – the place of sangs in forest ecosystem – consideration of featured species – forage/ cover ratio as an integrating factor/ cover – forage areas and E/ K response to altered forage/ cover ratios.

**UNIT – III THREATS**

Biological diversity – threats to biological diversity – loss of biological diversity – vulnerability to extinction – habitat destruction, fragmentation and degradation – exotic species introductions – disease and over exploitation – ethical value of biological diversity – conservation at the population level – problems of small populations – population biology of endangered species – establishing, designing and

managing protected areas – working with people and restoring the environment – *ex situ* conservation strategies – establishing new populations – species and habitats legally protected.

**UNIT – IV CONSERVATION AND MANAGEMENT**

Concepts of conservation – need for conservation – factors for decline of wildlife – predation of wildlife in natural environment – conservation and management – guidelines for conservation and management of wildlife – fundamental principles of applied remote sensing – remote sensing application– radio telemetry as a wildlife research tool – application – radio transmitters and its application - planning a wildlife project – broad issues and general strategies – management plans. Silviculture for improved wildlife habitat – silviculture options to provide timber and wildlife – habitat prescription – wildlife response.

**UNIT – V CONSERVATION AND MAN**

Global perspective on the selection of natural resources – critical reserve area habitat. **Wildlife management principles:** ecological basis – hunting – refuges – predator control – artificial stocking – carrying capacity – habitat improvement – interspersion – territories. **Special projects for endangered species:** project tiger – the Gir lion sanctuary – crocodile breeding project. Exploitation of wildlife resources – man and biosphere – inter dependence of organisms – wildlife as a natural resource – wildlife values and their exploitation – man and wildlife survival – disease and wildlife survival. Conservation and human societies - international agreements – international funding.

**REFERENCE BOOKS:**


1. B. D. Sharma, High altitude wildlife of India,1994, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. V. B. Saharia, Wildlife in India, Nataraj Publishers, 17 Rajpur Road, Dehradun – 248001.
3. Francois & Ramode, Ecology of natural resources, John Wiley &Sons,
4. R. B. Singh, Suresh Mistra, Environmental law in India,1996, Concept Publishing Company, New Delhi.
5. Richard Teague, A manual of wildlife conservation,1971, The Wildlife Society, Washington, D.C.
6. Richard B. Primack, Essentials of conservation biology,2014, Sinauer Association Inc., Sunderland, Massachusetts, USA.
7. R. F. Dasmann, Environmental conservation,1984, John Wiley & Sons, New York.

| III SEMESTER | | |
|---|---|---|
| **NME** | **APICULTURE** | **15PZON31B** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits: 5** |

**Objectives:**

- To create an interest in the learner to understand the elaborate details about maintaining bee hives for profit and pleasure
- To provide in-depth applied knowledge in apiculture to enable the student takes up apiculture as a career.

**UNIT I**

Definition, scope, honey bee- classification of bees- rock bee, Indian bee, little bee and dammer bee – their identification and habits – choice of species in apiculture. Bee colony – distinctive features and identification of queen, drones and workers, functions of the members. - Anatomy and organ system of honey bee. - Development of honey bee – egg, larva and pupa – time taken for the development of queen, drone and worker, life history of *Apis indica*.

**UNIT II**

Apiculture techniques, arranging an apiary position – space, acquiring bees – care of newly captured colonies – handling the bees. - Bee keeping – primitive methods – modern methods. The bee hive and its architecture – different kinds of cells – burr comb. - Different types of hives – their identification, artificial hives their advantages – parts of artificial hive – other appliances used in apiaries.

**UNIT III**

Honey bee products. - Honey – extraction of honey – preservation and storage of honey – properties, chemical composition, nutritive value, medicinal values – honey as daily food. - Bee wax – production – method of extraction – characteristics and uses. - Bee venom – methods of extraction of venom – composition of venom – curative value

**UNIT IV**

Enemies of bees – greater wax moth, lesser wax moth, ants wasps, lice, beetles and birds and their control.

Diseases of bees – adult and brood diseases – prevention and control measures.

**UNIT V**

Swarming – prevention and control. - Robbing and fighting – prevention and control. - Uniting stocks – different methods - Queen rearing and introduction - Supersedure - Foraging - Inter- relationship of plants and bees.

**REFERENCE BOOKS**


1. Abrol, D.P.-Bees and Bee keeping in India. Kalyani Publishers, B.1/1292, Rajinder Nagar , Ludhiana- 141 008.
2. Abrol, D.P.Honey bee Diseases and their Management , Kalyani Publishers, B.1/1292, Rajinder nagar , Ludhiana- 141 008. .
3. Johnson, J. and I. Jeyachandra - Apiculture –Dept. of Zoology, N.M. Christian College, Marthandam.- 629 165.
4. Cherian MC and Ramachandran, Bee keeping in South India
6. Sharma P.L.& SinghS.-Hand book of Bee Keeping, Printing and stationary, Chandigarh.

| IV SEMESTER | | |
|---|---|---|
| **C 12** | **MICROBIOLOGY** | **15PZOC41** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits : 5** |

**Objectives**

Explains the importance of microorganisms and their characteristics. Deals with the principle related to microbial genetics and the implication of microbes in disease ecology.

**UNIT I: CLASSIFICATION OF MICROBES**

Introduction – Classification, Bergey's system of bacterial classification. Classification of fungi, protozoa and virus – Morphology, fine structure and function of bacteria, Virus and fungi.

**UNIT II: MICROBIAL GROWTH**

Requirements for growth – Physical and culture characteristics. Culture media – chemical composition. Culture techniques – growth of bacterial cultures – growth curve, measurement of microbial growth, microbial control – physical and chemical methods.

**UNIT III : MICROBIAL GENETICS**

Structure and function of genetic material – Transfer of genetic information – Transformation, Transfection, Conjugation, retro transfer. Transduction and Genetic recombination. Regulation of gene expression in bacteria.

**UNIT IV: MICROBIAL DISEASES**

Protozoan diseases - Plasmodium, Entamoeba. Fungal diseases – Mycotoxicorins, Aspergillosis and Permatomycotes. Bacterial diseases – Meningitis, Cholera, Typhoid, Gonorrhea and Syphilis. Viral diseases – Polio, Hepatitis B, Rabies and AIDS – Mode of transmission, diagnosis and treatment. Types of vaccines.

**UNIT V: APPLIED MICROBIOLOGY**

Fermentation – Definition and types. Bioconversion – Bio remediation – Industrial production of penicillin, ethanol. Vitamin B12 – Citric acid and glutamic acid production.

**REFERENCE BOOKS:**


1. R. C. Dubey and D. K. Maheshwari, A textbook of microbiology,2009. S. Chand & Company, New Delhi.
2. Prescott, Harley and Klein, Microbiology, 2004.6th Edition, McGraw-Hill Higher Education,, New York.
3. Pelzar, Chan and Krieg, Microbiology,1998, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. R. Y. Stainer, J. L. Ingraham, M. L. Wheelis and P. R. Painter, General microbiology,2007, Macmillan India Ltd.
5. S.S. Purohit, Microbiology: Fundamentals and applications,2002,Agro Bios,6th revised Edition,India.
6. N. Kannan, Laboratory manual in General Microbiology,2002, Palani Paramount Publications.
7. J. Cappuccino and N. Sherman, Microbiology: A laboratory manual,2013, Pearson Benjamin Cummings, 10th Edition.

| IV SEMESTER | | |
|---|---|---|
| **C13** | **AQUA CULTURE** | **15PZOC42** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credit : 5** |

**Objectives:** Explains in detail the salient features of aquaculture and imparts first hand information on the construction and maintenance of ponds for culture of different types of fish. Deals with different fishery resources of southeast coast, problems related to inshore fishing, fishery management, fish processing and preservation techniques. Fishery by products, ecto- and endoparasites of fishes and details about Indian Fishery Commission and institutions have been highlighted

**UNIT - I PRINCIPLES OF AQUACULTURE**

**Basis of aquaculture:** Scope and definition - **History of aquaculture and its present state:** Origin and growth of aquaculture - Present state of aquaculture - **Selection of sites for aquaculture:** General consideration - Land-based farms - Open-water farms- water quantity and quality - **Selection of species for culture:** Biological characteristics of aquaculture species - Economic and market considerations - Introduction of exotic species - Common aquaculture species. **Design and construction of aquafarms:** Inland and coastal pond farms - Tank and raceway farms - Cage farms- pen and enclosures.**Control of weeds, pests and predators:** Weed problem in aquaculture farms - Common aquatic weed - Methods of weed control - Control of predators and pests

**UNIT - II AQUACULTURE PRACTICES- I**

**Carps:** Main species of carp used for culture - Culture systems - Spawning and fry production – Grow-out and polyculture – Harvesting and marketing -**Shrimps and prawns:** Major cultivated species of shrimps and prawns - shrimp culture systems - Reproduction and larval rearing of shrimps - Grow-out of shrimps - Economics of shrimp farming **Oysters** – **Mussels** - **Seaweeds:** Culture systems - culture practices - **Integration of aquaculture with crop and livestock farming:** Rationale of integrated farming - Integrated farming of fish and livestock - Rice-field aquaculture.

**UNIT - III AQUACULTURE PRACTICES- II**

**Nutrition and feeds:** Feeding habits and food utilization - Energy metabolism- Energy requirements and sources - Live foods - Artificial feeds – **Fish pathology**: Ectoparasites and endoparasites – Protozoan, nematodes, viral and fungal diseases and their control, nutritional deficiency diseases. **Reproduction and genetic selection:** Induced reproduction – preservation of gametes – Use of sex steroids for sex reversal – Genetic selection and hybridization.

**UNIT - IV CAPTURE FISHERIES**

**Freshwater resources:** Riverine fisheries- Reservoir fisheries – Lacustrine (Lake) fisheries - Ponds. Cold water fisheries – **Estuarine fisheries:** Definition and estuarine fishery resources of India - **Marine fisheries:** Pelagic, Indian oil sardine - Indian Mackerel – Penaeid shrimps – Cephalopods – Lobsters. **Offshore and deep sea fisheries** – Potential yield from Indian EEZ.

**UNIT - V CRAFTS AND GEARS**

Fishing harbour and fish landing centres. **Craft -** country and mechanised craft. **Gears** passive and active gears. Fishing seasons - holidays – Socio-economic problems of fisher folk - **Post-harvesting Technology**: Processing and Marketing.

**REFERENCE BOOKS:**


1. N. M. Chakrabarti, 1998, Biology, Culture and production of Indian major carps, Narendra Publishing House .
2. Samuel Paul Raj, 1995, Shrimp farming - techniques, problems and solutions, Palani Paramout publications.
3. P. Velayutham & G. Indira Jasmine, 1996, Manual on fishery by-products, Fisheries College and Research institute .
4. S.K. Battish, 1992, Freshwater zooplankton of India, Oxford and IBH publishing Co. Pvt. Ltd.
5. G.W. Bennett, 1970, Management of lakes and ponds, Van Nostrand Reinhold Company.
6. K. Shigeno, 1978, Problems in prawn culture, Amerind Publishing Co. Pvt. Ltd.
7. S. Yamaguti, 1985, Parasitic copepoda and branchiura of fishes, Part 1 International Books and Periodicals supply service.
8. T.V.R. Pillay, 1992, Aquaculture and the environment, Fishing News Books.
9. V. Sundararaj and B. Srikrishnadhas, 2000, Cultivable aquatic organisms, Narendra Publishing House.
10. V. G. Jhingran, 1991, Fish and fisheries of India, Hindustan Publishing Corp.
11. T.K. Govindan, 1985, Fish processing technology, Oxford and IBH publishing Co. Pvt. Ltd.
12. M. Krishna Pillai, 1986, Introduction to planktonology, Himalaya Publishing House.

| IV SEMESTER | | |
|---|---|---|
| **C14-P** | **PROJECT** | **15PZOP41** |
| **Hrs / Week : 6** | **Hrs / Sem : 90** | **Credit : 5** |

**Objective:**

Every PG student is required to prepare the project subject related – based on the guidelines of his project guide.

**The following are the guidelines to be adhered to**

- The project should be an individual one
- The language for the project is **English**
- The Minimum number of pages should be **60**
- Project observations, suggestions and conclusion shall form part of the project.
- The Projects will be evaluated both by the Internal as well as External Examiner each for 100 marks. The distribution of mark should be **60 marks for the Project Report and 40 marks for the Viva-voce Examination**. The Division of marks for the Project Report is as mentioned below:

| Particulars | Internal Examiner | External Examiner |
|---|---|---|
| Wording of Title | 5 | 5 |
| Objectives/ Formulation including Hypothesis | 5 | 5 |
| Review of Literature | 10 | 10 |
| Relevance of Project to Social Needs | 5 | 5 |
| Methodology/ Technique/ Procedure Adopted | 20 | 20 |
| Summary/ Findings/ Conclusion | 5 | 5 |
| Bibliography/ Annexure/ Foot notes | 10 | 10 |
| **Total** | **60** | **60** |

The average mark of Internal and External Examiner is considered as marks of project report.

| IV SEMESTER | | |
|---|---|---|
| **CE4A** | **ENTOMOLOGY** | **15PZOCE4A** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits: 4** |

**Objectives:** Deals with a detailed study of insects incorporating aspects of insect classification and anatomy. The different organ systems and their physiological functioning are clearly explained. The paper incorporates a study of beneficial insects, ecology of insects, insect reproduction and neuroendocrine system of insects.

**UNIT I TAXONOMY**

Principles of insect classification – classification of insects up to order – key characteristics with Indian examples – coleopteran, Diptera, hemiptera, Dermoptera, and Lepidoptera.

**UNIT II STRUCTURE AND FUNCTION I**

General structure of head,thorax with appendages,abdomen. **Integumentary system:** structure and chemistry – structure and physiology of digestive system. **Respiration:** aerial and aquatic respiration – respiration in endoparasites. **Circulatory system:** structure of heart, mechanism of haemolymph circulation, haemolymph and its composition – diversity of haemocytes and their function. **Excretory system:** Malphigian tubules and their function – role of rectum in water and ion regulation.

**UNIT III STRUCTURE AND FUNCTION II**

**Receptors:** Fine structure of compound eye, coeloconia, Johnston's organ – chordotonal organs and stridulatory organ - bioluminescence. Endocrine control of moulting and metamorphosis, vitellogenesis – mating and oviposition – oviparity, viviparity,parthenogenesis.

**UNIT IV HARMFUL AND BENEFICIAL INSECTS**

Biology – damage and symptoms and control measures of insect pests of economically important crops: cotton, paddy, groundnut, based on mode of feeding or damage..**Insect vectors of human diseases:** Biology, mode of transmission of diseases and control – mosquito, housefly and sand fly. **Beneficial insects:** Biology, culture and economic importance of honey bees, and lac insects.

**UNIT V METHODS AND PRINCIPLES OF PEST CONTROL**

**Control measures:** cultural, mechanical, physical, legal, chemical, biological, genetic chemosterilants, pheromones, concepts of biointegrated pest control.

**REFERENCE BOOKS:**


1. Nayar, K. K., David, B. V. and Anantha Krishnan, T. N.,2004 General and applied entomology, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
2. David B. V. and Kumarasamy T., 2000, Elements of economic entomology, Popular Book Depot, Chennai.
3. D. P. Ambrose, 2004, The insects: Structure, function and biodiversity, Kalyani Publishers, Ludhiana,
4. Rathnasamy, A. K.,and Viswanathan,S. 1986, A handbook of medical entomology and elementary parasitology, Printers and Publishers Pvt. Ltd., Chennai.
5. Wigglesworth, V. B.1977,The principles of Insect physiology, ELBS, London.
6. Pedigo, L. P., 1996, Entomology and pest management ($2^{nd}$ edition) –Upper Saddle River, N. J. Prentice Hall.
7. D. P. Ambrose, 2007, The insects: beneficial and harmful aspects, Kalyani Publishers, Ludhiana.

| VI SEMESTER | | |
|---|---|---|
| **CE4B** | **POULTRY SCIENCE** | **15PZOCE4B** |
| **Hrs / Week : 6** | **Hrs / Sem : 90 Hrs/ Unit : 18** | **Credits : 4** |

**Objectives:**

- To make scope for self employment opportunities after their graduation in their career.

**UNIT I**

Definition, poultry in India- a survey- historical review- progress through 5 year plans. Types of poultry birds, choosing a commercial laying stock, sexing in day old chicks, poultry housing – general principles of building poultry house, deep litter system – principles of built up litter system, droppings pit- feeders and waters-nest boxes. Laying cages, Californian cages, management of cage birds.

**UNIT II**

Poultry manure-volume, composition and values, nutritional content of ages. Managements of chicks, growers, layers and broilers. Lighting for chicks, growers, layers and broilers. Summer and winter managements.

**UNIT III**

Debeaking, forced moulting, poultry nutrition- energy – gross energy, digestible energy and metabolizable energy, fibre level in poultry feeds, protein and amino acid requirements for chicks, growers, layers and broilers – symptoms of excessive dietary levels and deficiency. Brief account of carbohydrates and fats as energy sources – essential fatty acids – deficiency symptoms – requirements of vitamins and inorganic minerals for chicks, growers and layers – deficiency symptoms – supplementation of vitamins and minerals in poultry feed.

**UNIT IV**

Non-nutritive feed additives- merits and demerits of additives – feed stuffs for poultry – south Indian feed ingredients and agro- industrial by products in relation to M.E. level, protein level, amino acid level, minerals (C and P) and fibre contents.

**UNIT V**

Causes, symptoms, transmission, treatment, and management of the following diseases: New CASTLE disease, fowl pox, laryngobronchitis, Avian leucosis complex and Gumboro disease. Pullorum, fowl cholera, mycoplasmosis and coccidosis and lice. Avian flu virus H5B virus.

**TEXT BOOK**

1. Poultry Keeping – M.R. Gnanamani

**REFERENCE BOOKS - POULTRY SCIENCE**

1. The Rearing of Pullets – Bulletin No. 54, Her majesty's stationary office, London.
2. Intensive Poultry Managements for egg production. Bulletin No. 152. Her majesty's stationary office, London.
3. M.L.Scott et al., Nutrition of the Chicken
4. Biester , Diseases of Poultry – Oxford and IBH

| CP III | IMMUNOLOGY, SERICULTURE & BIOSTATISTICS AND BIOINFORMATICS PRACTICAL | 15PZOC4P1 |
|---|---|---|
| Hrs / Week : 6 | Hrs / Sem : 90 | Credits : 3 |

## CORE PRACTICAL - III
### Immunology

1. Antigen antibody interaction *in vitro* - ABO typing, Rh typing.
2. Radio immuno assay and ELISA (Demonstration).
3. Rocket immuno Electrophoresis
4. Dissection of lymphoid organs in fish.
5. Total Counting of WBC - differential count in a blood sample.
6. Visit to Medical microbiology laboratory and submission of report (compulsory).

### Sericulture

1. Dissection of silk gland and digestive system.
2. Calculation of Shell ratio.
3. Report on field visit to sericulture units (State/central)

### Biostatistics and Bioinformatics

1. Statistical analysis of mean, median and mode,variance,SD,SE,coefficient of variation using neem leaves.
2. Correlation co-efficient – height-weight relationship or length and width.
3. Problem related to Chi-square test.
4. Study of probability using coin toss.
5. Test of significance (student's t-test)
6. Processing data with statistical package. (SPSS) (Demonstration).
7. Types of Biological Databases and Using it- Anova,Chi-square,LC50,t-test.

## MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

### Immunology

1.Lymphoid organs

2.Blood grouping

3.Monoclonal antibodies

4.Flow cytometer

5.Elisa titre plate

## Sericulture

1. Life history of silk worm – egg, larva, pupa and adult.
2. Sexual dimorphism in larva, pupa and adult.
3. Mulberry varieties.
4. Rearing appliances- Chandrika and Netrika., . Rearing tray and rearing stand.
5. Silk worm diseases - Viral, Bacterial, pest and fungal.

## Biostatistics and Bioinformatics

1. Uniprot
2. Protein Data Bank
3. Genbank
4. Use of BLAST, FASTA (Nucleic Acids & Protiens)
5. Use of EMBOSS
6. Molecular Modelling
7. Homology Modelling – Swissmodeller

| IV SEMESTER | | |
|---|---|---|
| **CP IV** | **MICROBIOLOGY, AQUACULTURE & ENTOMOLOGY PRACTICAL** | **15PZOC4P2** |
| **Hrs / Week : 6** | **Hrs / Sem : 90** | **Credits : 3** |

## CORE PRACTICAL – IV

### Microbiology

1. Measurement of microbes using ocular and stage micrometer.
2. Preparation of culture media for micro organisms-liquid,semisolid and solid
3. Counting of viable cells (CFU/ ml) by serial dilution and spread plate or pour plate.
4. Differential staining and capsular staining.
5. Simple/gram staining ( Lactobacillus).
6. Test for antibiotic sensitivity- Well diffusion method
7. Isolation of nitrogen fixing symbiotic bacteria from root nodule. ( Rhizobium).

### Aquaculture

1. Morphometry of a pond.
2. Length-weight relationship of fish.
3. Identification of sex in fishes.
4. Determination of age and growth in fishes.
5. Visit to a coastal/ aquaculture research centre and submit report.

### Entomology

1. Mounting of mouthparts of housefly,mosquito,cockroach
2. Cockroach- Dissection of digestive systems .
3. Total and differential haemocytes counts in cockroach.
4. Study of larvae of insects.
5. Submission of insect box (5 marks).
6. Field study to collect different insect pests
7. Field study to FCI
8. Virtual dissection.

## MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

### Microbiology

1. Autoclave
2. Colony counting chamber
3. Laminar airflow
4. Identification of gram positive and gram negative bacteria.
5. Diseases - Protozoan, viral and fungal (any two from each)

### Aquaculture

Fish diseases

1.White spot

2. Ichthyophthiriasis

3.Costiasis

4. Anchor worm
5. *Limnaea*
6. Mycosis – Disease diagnosis.
7. Taxonomic description of some fishes – **Indian major carps:** *Catla catla, Labeo rohita, Cirrihinus mrigala*. **Exotic carp:** *Cyprinus caripo,* **Silver carp:** *Hypophthalmichthys molitrix*. **Grass carp:** *Ctenopharyngodon idella* **Cat fishes:** *Clarius batrachus, Heteropneustes fossilis* **Other cultivable fishes:** *Oreochromis mossambicus, Channa morulius*.

### Entomology

Representative insect from different orders – Agricultural and medical importance.

1.Honey bee

2.Silkworm.

3.lac insect

4.dragon fly

5.assassin bug

6.praying mantis.

## SCHEME OF EXAMINATIONS UNDER CBCS

The medium of instruction in all PG courses is English and students shall write the CIA Tests and Semester Examinations in English. However, if the examinations were written in Tamil, the answer papers will be valued.

### DISTRIBUTION OF MARKS FOR CIA AND SEMESTER EXAMINATIONS OF POSTGRADUATE COURSES

| SUBJECT | TOTAL MARKS | CIA TEST | SEMESTER EXAMINATION | PASSING MINIMUM | | |
|---|---|---|---|---|---|---|
| | | | | CIA EXAM. | SEM. EXAM. | OVER ALL |
| **Theory** | 100 | 25 | 75 | Nil | 38 | 50 |
| **Practical** | 100 | 40 | 60 | Nil | 30 | 50 |
| **Project** | 100 | nil | Report - 60 marks<br>Viva Voce - 40 marks | Nil | 50 | 50 |

**DIVISION OF MARKS FOR CIA TEST**

| SUBJECT | MARKS | ASSIGNMENT OR SEMINAR FOR PG | REGULARITY | RECORD NOTE | TOTAL MARKS |
|---|---|---|---|---|---|
| **Theory** | 20 | 5 | -- | -- | **25** |
| **Practical** | 30 | -- | 5 | 5 | **40** |

1. The duration of each CIA Test is ONE hour and the Semester Examination is THREE hours.
2. Three CIA tests of 20 marks each will be conducted and the average marks of the best two tests out of the three tests will be taken.
3. The I test will be based on the first 1.5 units of the syllabus, the II test will be based on the next 1.5 units of the syllabus and the III test will be based on the next 1.5 units of the syllabus.
4. Two assignments for Undergraduate, Certificate, Diploma and Advanced Diploma Courses and two assignments OR two seminars for Postgraduate Courses.
5. The duration and the pattern of question paper for practical examination may be decided by the respective Boards of Studies. However, out of 60 marks in the semester practical examination, 10 marks may be allotted for record and 50 marks for practical.
6. Three internal practical tests of 25 marks each will be conducted for science students in the even semester and the best two out of the three will be taken. The total 50 marks of the best two tests will be converted to 30 by using the following formula:

$$\left(\begin{array}{c}\text{Marks secured in the first best Practical Test (Out of 25)} \\ + \\ \text{Marks secured in the next best Practical Test (out of 25)}\end{array}\right) \text{X } 0.6$$

7. The Heads of Science Departments are requested to keep a record of attendance of practicals for students to assign marks for regularity.

## QUESTION PAPER PATTERN FOR CIA TEST (THEORY)

**Duration: 1 Hr** **Maximum Marks: 20**

| Section | Question Type | No. of Questions & Marks | Marks |
|---|---|---|---|
| **A** | No Choice<br>Answer should not exceed 75 words | 2 Questions<br>2 marks each | 2 x 2 = 4 |
| **B** | Internal choice<br>(Either or type)<br>Answer should not exceed 200 words | 2 Questions<br>4 marks each | 2 x 4 = 8 |
| **C** | Open Choice<br>(Answer ANY ONE out of Two)<br>Answer should not exceed 400 words | 1 Question<br>8 marks | 1 x 8 = 8 |
| | | **TOTAL** | **20 MARKS** |

## QUESTION PAPER PATTERN FOR SEMESTER EXAMINATION (THEORY)

**Duration: 3 Hrs** **Maximum Marks: 75**

| Section | Question Type | No. of Questions & Marks | Marks |
|---|---|---|---|
| **A** | No Choice<br>Answer should not exceed 75 words | 10 Questions - 2 marks each<br>(2 Questions from each unit) | 10 x 2 = 20 |
| **B** | Internal choice<br>(Either or type)<br>Answer should not exceed 200 words | 5 Questions with internal choice. Each carries 5 marks<br>(Two questions from each unit) | 5 x 5 = 25 |
| **C** | Open Choice<br>(Answer ANY THREE out of FIVE)<br>Answer should not exceed 400 words | 3 Questions out of 5 - 10 marks each<br>(1 Question from each unit) | 3 x 10 = 30 |
| | | **TOTAL** | **75 MARKS** |