

**A.VEERIYA VANDAYAR MEMORIAL SRI PUSHPAM COLLEGE
(AUTONOMOUS),
POONDI, THANJAVUR DIST.**

**Question Pattern for UG and PG Programmes for students to
be admitted during 2014 – 2015 and afterwards**

Total Marks: 75

QUESTIONS PATTERN

**SECTION – A
(Question 1 to 10)**

10 x 2 = 20 Marks

1. Short Answer Questions
2. Two Questions from each units (All are answerable)

**SECTION – B
(Question 11 to 15)**

5 x 5 = 25 Marks

1. 5 Paragraph type questions with “either / or” type choice.
2. One question from each unit of the Syllabus.
3. Answer all the questions.

**SECTION – C
(Question 16 to 20)**

3 x 10 = 30 Marks

1. 5 Essay type questions – any three are answerable.
2. One questions from each unit of the Syllabus.

M.Sc. Zoology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	14P1ZOC1	Core – BIOLOGY OF INVERTEBRATES AND CHORDATES	6	5

Objectives:

1. To understand the morphology and functional anatomy of both invertebrates and chordates in a comparative aspects.
2. To know the biological aspects of minor phyla in detailed way.
3. To study the types of fossils and their phylogenic relationship with higher group of animals.
4. To study the external features, inner anatomical features in a comparative manner with Chordate animals.
5. To study the evolution of chordate species.

Unit I

Hrs 18

Important human and veterinary parasites (protozoans and helminthes); Life cycle and biology of plasmodium, Trypanosoma, Ascaris, Wuchereria, Fasciola, Schistosoma and Leishmania, Cellular and physiological basis of host- parasite interaction.

Unit II

Hrs18

Arthropods and vectors of human diseases (mosquitoes, lice, flies, ticks); mode of transmission of pathogens by vectors; chemical, biological and environmental control of arthropod vectors; Biology and control of chief insect pests of agricultural importance- Paddy & Sugarcane, plant host-insect interaction.

Unit III

Hrs18

Study of minor phyla: General organization and phylogeny of Rotifera, Chaetognatha, Ectoprocta – Entoprocta, Phoronida; Study of invertebrate fossils – Trilobites, ammonoids, Living fossils- Peripatus, Limulus, Nautilus, Vertebrate fossil – Archaeopteryx – Sphenodon.

Unit IV

Hrs18

General characters of chordates–Comparative study of digestive, respiratory, circulatory and urinogenital system of shark, calotes, pigeon and rat.

Unit V

Hrs 18

Mesozoic Reptiles – Parental care in fishes and amphibians – Migration of birds – Primitive mammals – Monotremes and Marsupials.

Reference:

1. Barrington. E.J.W (1979) Invertebrate structure and Function II Edition – ELBS
2. Burner,R.D.(1982) Invertebrate Zoology. IV Edition Holt–Saunders, International Edn
3. Hyman, L.H. The invertebrates, Vol 3 to 6 – Mc Graw Hill Book Co., London.
4. Kotpal, R.L. Minor Phyla, Rastogi Publishers, Meerut.
5. Kotpal, R.L. Phyla Series, Rastogi Publishers, Meerut.
6. Mooe, R.C. Lallicker and A.G. Fisher (1952) "Invertebrate Paleontology". Mc Graw Hill book Co., New York.
7. Woods, H. (1961) Paleontology – Invertebrata Combridge University Press
8. Hyman L.H.(1967) Compaative Vertebrate anatomy. Mc Graw Hill BookCo. New Delhi
9. Parker and Haswell (1967), Text Book of Zoology Vol-I and Col-II.
10. Newmann, W.H. (1961) Phylum Chordate. The University of Chicago Press. Chicago.
11. Romer, A.S (1960) Vertebrate Paleontology, University of Chicago Press, Chicago.
12. Yong, J.Z. (1962) The life of vertebrates, Oxford University Press. London.
13. Colbert, E.H. (1970) Evoluton of vertebrates. John Wiley and Sons, New York.

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Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
I	14P1ZOC2	Core – CELL AND MOLECULAR BIOLOGY AND BIOPHYSICS	6	5

Objectives:

1. To understand, the working mechanisms of the different Cytological instruments and their applications in cell study.
2. To study the cellular interaction, cell signaling mechanisms
3. To study the ultra structure of different cell organelles in a detailed way.
4. To study the molecular aspects of Nucleus, Nucleolus, Chromosomes of prokaryotes and Eukaryotes and to study the process of cell division and protein synthesis.
5. To study the Biophysics with reference to the Law of Thermodynamics, U V radiation.
6. To understand the Osmo-ionic diffusion of molecules in to the cells.
7. To understand the Tyndall effect and their application in Radiobiology.

Unit I

Hrs 18

Structure of Prokaryotic cell- Bacteria-Structure of Eukaryotic animal cells-Plasma membrane-Cell cycle and its regulation and Cell Signalling -Cell-Cell Interaction;Cell adhesion molecules, CellularJunctions,Extracellular matrix, Signal transduction, Intracellular receptor and cellsurface receptors, Signalling via G-protein linked receptors(PKA, PKC,CaM kinase), Enzyme linked receptor signaling (Growth factor receptor signaling; JACK-STAT pathway) and Network and cross-talk between different signal mechanisms.

Unit II

Hrs 18

Structure and functions of cell organells – Mitochondria, ER, Golgi complex, Lysosome, Peroxisomes, Centrioles, Ribosomes, Nucleus and Nucleolus.

Structure and organization of chromosomes; Giant chromosome, polythene and lamp brush chromosome; Structure and Functions of Nucleic acids-DNA and RNAs;

Unit III

Hrs 18

Cancer biology-Genetic rearrangement of progenitor cells, oncogenes, tumour suppressor genes, cancer and the cell cycle-virus induced cancer, metastasis, interaction of cancer cells with normal cells; Apoptosis and cancer: Mechanism of apoptosis-proteins involved in apoptosis-Signaling pathways: types and their impact on apoptosis and oncogenesis-Principle and methods of cancer diagnosis:-Biochemical, Genetic, Cytotoxic and cell growth and viability tests

Unit IV

Hrs 18

Biophysics- Light-wave length-photoelectric effect-Biophysical Aspects of Vision, Thermodynamics laws-free energy-Natural radiation-properties-Photodynamics sensitization -effects of UV light and ioinizing radiation and X-ray diffraction, fluorescence.

Unit V

Hrs 18

Diffusion-Principles of diffusion and osmosis - methods of Transport phenomenon - determination of osmotic pressure.

Colloids: Sol/gel changes – Tyndall effect.

Isotopes: Methods of study, Geiger – Muller Counter.

Radiobiology-Principle and application in laser technique in biology – Radioactive isotopes and half life of isotopes, effect of radiation on biological systems, Autoradiograph.

Reference:

1. De Robertis, R.OP and De. Robertis, E.M.F. (1980) Cell and Molecular Biology, Holt Saunders imitational Edn, Japan.
2. DePraw, E.L (1960) Cell and Molecular Biology, Academic Press, New York.
3. Gieses, A.C. (1957) Cell Physiology, W.E. Saunders Co., Threadgold, L.T. (1975). The ultra structure of the animal cell, Pergmann Press, New York.
4. Brude Alberts, Bennis-bray Lewis, Martin Raff Kiety-Roverts and James D.Wastern (1963). Molecular Biology of the cell, Garland Publishing Inc, New York and London.
5. Ackerman, E. (1962). Biophysical science, Prentice Hall. Casey, E.J. Biophysics Concepts and mechanisms.
6. Epstein, J.F. (1963) Biophysics-Selected topics, Addition, Wesley Publishers Co. Thayen, J., Biophysical technique – Chapman and Hall.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	14P1ZOC3	Core – MICROBIOLOGY	6	5

Objectives:

1. To know the scope of Microbiology,
2. To learn the techniques on the isolation of Microbes.
3. To study the Food contamination by Bacteria.
4. To study the role of microbes in Industry.
5. To study the role of microbes in Environment.
6. To analyse the Pathogens and their treatment in human diseases.

Unit I

Hrs 18

Introduction and Scope of Microbiology – Classification of microorganisms – Prokaryotes and Eukaryotes – Ultrastructure and organization of Virus (Bacteriophages), Bacterial cell, Fungal cell and Yeast. Methods and isolation of microbes, Preservation and identification of Microbes. Preparation of culture media and culture methods for bacteria, algae, fungi and virus and maintenance of pure culture.

Unit II

Hrs 18

Food contamination, poisoning and spoilage – sources, symptoms and prevention of food borne infections – Bacterial and fungal toxins – methods of detection and detoxification – Food sanitation in food manufacturing industries and safety measures.

Unit III

Hrs 18

Biogeo-chemical role of microbes in nitrogen, carbon and phosphorous cycle- Biofertilizer-Bacteria – Phosphobacteria, mass culture techniques of Cyanobacteria, Mycorrhizae, Azolla – Anabaena sp., – Microbial biopesticides and biodegradation of herbicides and pesticides – Xenobiotics.

Unit IV

Hrs 18

Microbiology of water – Methodology of bacterial analysis industrial and municipal effluences- Microbiological sewage water purification methods – Role of microorganisms in oil pollution-soil pollution and water pollution-control microbes as indicator of pollution.

Unit V

Hrs18

Pathogen, Pathogenesis, Clinical conditions, diagnosis, Epidemiology, Chemotherapy and prevention of the following diseases in Man : Bacterial disease : Pneumonia, Diphtheria, Rheumatic fever, Whooping cough, Tuberculosis, Meningitis, Botulism, Typhoid Cholera, Gonorrhoea, Plague and leprosy, Viral diseases – Influenza, Measles, Mumps. Chicken Pox, hepatitis, Poliomyelitis, Rabies, Japanese encephalitis, Yellow fever and HIV infection (AIDS).

Reference:

1. Pelzer, M.J., R.D. Reind and ECS. Chan, Microbiology (McGraw Hill)
2. Purohit, S.S, Microbiology, Fundamentals and Applications (Agro botanical Publications).
3. Patel, A.H. Industrial Microbiology (Tata McGraw-Hill).
4. Ross, F.C., Introductory Microbiology (Bell and Howell Company, London)
5. Dubey, R.C. Microbiology, S. chand Co., New Delhi.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	14PIZOCP1	Core –PL-I-Invertabrates and Chordata, Cell and Molecular Biology and Microbiology	6	3

Objectives:

1. To know the internal organs of the Invertebrata and chordate animals.
2. To know the cells of Buccal smear, Blood smear and cell divisions.
3. To study the preparation of microbial culture medium and isolation of microbes.

DISSECTIONS

Invertebrates and Chordates:

Dissection of Nervous and Reproductive Systems of Prawn, Squilla, Pila and Ariophanta.
Dissection of Circulatory, Nervous and Reproductive Systems of Fish, Calotes and Rat.

MOUNTINGS

Parapodia of Neries – Mouthparts of Lepas – Aristotle’s lantern and Pedicellariae of sea Urchin- Brain and Hyoid of Frog and Calotes.

IDENTIFICATION OF INVERTEBRATE AND CHORADATE SPECIMENS

Trypanosoma, Physalia, Tape worm, Round worm, Nereis, Peripatus, King crab, Octopus, Sea cucumber, Sea urchin, Phylogenetic relationship of Trochophore, Veliger, Pluteus larve. Minor phyla forms: Rotifera, Chaetognatha. Chordate Specimens: Narcine, Echeneis, Diodon, Ostraction, Tetrodon, Hippocampus, Synapta, Periophthalmus, Rhacophorus, Ichtyyophis, Najanaja, Viper, Draco, Chaemeleon, Pyrinosoma, Uromastix, Bat. Study of Invertebrate and Vertebrate fossils.

CELL and MOLECULAR BIOLOGY

Study of Buccal smear-Blood smear in Frog and Man-Mitosis stages in Onion root tips-Meiosis stages in grass-hopper testes. Spectrophotometric analysis of nucleotides;

MICROBIOLOGY

1. Sterilization of Glasswares
2. Microbiological instruments and equipments
3. Media preparation
4. Culture Techniques : Streak plate and Pour plate
5. Bacterial and Fungal colony Counting and staining
6. Fermentation techniques
7. Water quality techniques- MPN
8. Isolation of microbes from spoiled foods – Wheat, Milk, Cereals, Bread

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	14P1ZOEL1A	Major Elective – I General and Human Genetics	6	4

Objectives:

- 1.To learn the General Principles and application of genetics in Human.
- 2.To understand, the genetic inheritance of blood groups, chromosomal and extra chromosomes in animals and man.
- 3.A thorough study on genes and their mutational effect at molecular level.
- 4.To study the human genetics with reference to their behavior genetic engineering and genetic counseling.

Unit I

Hrs 18

Introduction to principles of Genetics, Dominant and recessive Epitasis Multiples factor inheritance–Skin colour in Man. co-dominance – Pleotropism – Lethal genes in Man and Mice.

Unit II

Hrs 18

ABO and Rh type of Blood groups – Erythroblastosis foetalis, Haemophilia, Linkage and crossing over and mapping of chromosome, Non-disjunction-Free Martin, sex linked inheritance in Drosophilae and Man –Y-linked inheritance – Barrbody, Extrachromosomal inheritance – Kappa particles – coiling in snail – mirabilis – Episome.

Unit III

Hrs 18

Mutation of molecular level, Genetic structure of population – Application of Hardy Weinberg’s law – Fine structure and Functions of Gene. Methods of genetic transfer – transformation, conjugation, transduction and sexduction – structural and numerical alteration of chromosomes – Deletion, duplication, inversion, translocation, ploids and their genetic implication.

Unit IV

Hrs 18

Application of Mendel’s Law to Human Genetics – variation in Gene expression in man, Environment and gene expression in man – human chromosome and karyotype-sex chromosome and genetic theory. Genes and molecular diseases – Human biochemical diseases – Chromosomal anomalies and approaches to the problem of genetical disorders

Unit V

Hrs 18

Pedigree and probability – Banding techniques of chromosomes. Genetics of Human behaviour – Genetic Engineering and Gene Targeting. **Prenatal diagnosis:** Chorionic villi sampling - Foetoscopy, Ultrascopy - Amniocentesis.**Postnatal diagnosis:** Peripheral blood leucocyte culture - Sister Chromatid Exchange - Fragile site - Mitotic index. **Genetic Counseling.**

Reference:

1. Edge Alton burg, Genetics, Oxfor and IBH Publishing Co, New Delhi. Dinogg and Dunn, Genetics.
2. Dobzhansky, T. principles of genetics, Mc Graw Hill Book Co Ltd, New Delhi.
3. Norman, V. Rothwell, Human genetics – Prentice Hall of India Pvt Ltd – New Delhi.
4. Jenkins, J.B. Human Genetics, the Benjamin Cumming Publishing Co.
5. Jenkins, J.B. Human Genetics, The Benjamin Cumming Publishing Co. Anita Rozar-2002. Practical methods for Environmental Microbiology and Biotechnology, Krishna Prakasam Media (P) Ltd. Meerut.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	14P1ZOEL1B	Major Elective – I General and Microbial Genetics	6	4

Objectives:

1. To learn the General Principles and application of genetics in Microbes.
2. To understand, the genetic inheritance of Blood groups, chromosomal and extra chromosomes in animals and man.
3. A through study on genes and their mutational effect at molecular level.
4. to understand, the genetic natural and their molecular transfer mechanism in Bacteria, Virus and Fungi.

Unit I

Hrs 18

Introduction to principles of Genetics, Dominant and recessive - Epistasis Multiples factor inheritance - Skin colour in Man. co-dominance - Pleotropism - Lethal genes in Man and Mice.

Unit II

Hrs 18

ABO and Rh type of blood groups - Erythroblastosis foetalis, Haemophilia, Linkage and crossing over and mapping of chromosome, Non-disjunction-Free Martin, sex linked inheritance in Drosophila and Man -Y-linked inheritance - Barrbody, Extrachromosomal inheritance - Kappa particles - coiling in snail.

Unit III

Hrs 18

Mutation of molecular level, Genetic structure of population - Application of Hardy - Weinberg's law - Fine structure and Functions of Gene.

Unit IV

Hrs 18

Nature of genetic material in Virus-Bacteria -fungi- Structure and Life cycle of Bacteriophages - Virus and Cancer-Genetic recombination in bacteria, Gene mapping bacteria - Genetic engineering using bacterial system.

Unit V

Hrs 18

Regulation of gene expression in microbes - Mechanism of transcription and translation. Concept of gene, Genetic Code and operons-regulation at the level of DNA - Antisense DNA and RNA-RNA Polymerase - RNA processing -Capping and Polyadenylation, Ribozymes, Posttranslational regulation, signal sequences and protein transport.

Reference:

1. Edger Alton burg, Genetics, Oxford and IBH Publishing Co, New Delhi. Dinogg and Dunn, Genetics.
2. Dobzhansky, T. principles of genetics, Mc Graw Hill Book Co Ltd, New Delhi.
3. Norman, V. Rothwell, Human genetics - Prentice Hall of India Pvt Ltd - New Delhi.
4. Strick berger, Genetics, Collier Mc Milton. Dania and Harper-General MicroBiology.
5. Jenkins, J.B. Human Genetics, The Benjamin Cumming Publishing Co.
6. Anita Rozar -2002. Practical methods for Environmental Microbiology and Biotechnology, Krishna Prakasam Media (P) Ltd., Meerut.
7. Lewin. B., (1997). Genes VI. Oxfor University Press. Oxford.
8. David Freilfelder (1991). Microbial genetics-Narasa Publishing House, New Delhi.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
I	14P1ZOEL1C	Major Elective – I Genomics and Proteomics	6	4

Objectives:

1. To learn the Genome mapping, assembly and comparison
2. To understand, Sequence based approaches and Microarray based approaches
3. A thorough study on Proteomics
4. To understand, Protein-protein interactions and Applications of proteomics.

Unit I Genome mapping, assembly and comparison.

Hrs 18

Genome mapping, Genome sequencing, Genome sequence assembly: Base calling and assembly programs, Genome annotation: Gene ontology, Automated genome annotation, Annotation of hypothetical proteins and Genome economy. Comparative genomics: Whole genome alignment, Finding a minimal genome, Lateral gene transfer, Within-genome approach and Gene order comparison.

Unit II Functional Genomics.

Hrs 18

Sequence based approaches: EST, EST index construction and SAGE. Microarray based approaches: Oligonucleotide design, Data collection, Image processing, Data transformation and normalization, Statistical analysis to identify differentially expressed genes and Microarray data classification. Comparison of SAGE and DNA Microarrays.

Unit III Proteomics

Hrs 18

Technology of protein expression analysis: 2D-PAGE, Mass spectrometry protein identification, protein identification through database searching, Differential in-gel electrophoresis and Protein Microarrays. Post translational modification: Prediction of disulphide bridges and Identification of posttranslational modifications in proteomics analysis. Protein sorting

Unit IV. Protein-protein interactions.

Hrs 18

Experimental determination of protein-protein interaction, Prediction of protein-protein interactions: prediction interactions based on domain fusion, predicting interactions based on gene neighbors, predicting interactions based on sequence homology, predicting interactions based on phylogenetic information and prediction interactions using hybrid methods.

Unit V Applications of proteomics.

Hrs 18

Medical proteomics-disease diagnosis: Biomarkers, Biomarker discovery using 2DGE and mass spectrometry and Biomarker discovery and pattern profiling using protein chips. Pharmaceutical proteomics-drug development: The role of proteomics in target identification, Proteomics and target validation, Proteomics in

the development of lead compounds and Proteomics and clinical development. Proteomics and Plant biotechnology: Proteomics in plant breeding and genetics, Proteomics for the analysis of genetically modified plants and Proteomics and the analysis of secondary metabolism.

References

1. Xiong J. (2006). Essential bioinformatics. Cambridge, UK: Cambridge University Press.
2. Goodman N. (2002). Biological data becomes computer literature: New Advances in Bioinformatics. *Curr. Opin. Biotechnol.* 13: 68-71.
3. Hagen J.B. (2000). The origin of bioinformatics. *Nat. Rev. Genetics.* 1: 231-236.
4. Apweiler R. (2000). Protein sequence databases. *Adv. Protein Chem.* 54: 31-71.
5. Hughes A.E. (2001). Sequence databases and the internet. *Methods Mol. Biol.* 167: 215- 223.
6. Stein L.D. (2003). Integrating biological databases. *Nat. Rev. Genet.* 4: 337-45.
7. Batzoglou S. (2005). The many faces of sequence alignment. *Brief. Bioinformatics.* 6: 6- 22.
8. Xuang X.(1994). On global sequence alignment. *Comput. Appl. Biosci.* 10: 227-235.
9. Pearson, W.R. (1996). Effective protein sequence comparison. *Methods Enzymol.* 266: 227
10. Spang R. and Vingron M. (1998). Statistics of large scale sequence searching. *Bioinformatics.* 14: 279-284.
11. Mullan L.J. (2002). Multiple sequence alignment- The gateway to further analysis. *Brief. Bioinform.* 3: 303- 305.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	14P2ZOC4	Core – DEVELOPMENT BIOLOGY AND BIO-TECHNIQUES	6	5

Objectives:

1. To know organization and nature of aquatic and terrestrial animals in relation to egg activation during fertilization–cleavage and gastrulation.
2. To study the Embryonic organizers, nature of genetic information during cell differentiation.
3. To understand the important hormones in relation to growth and metamorphosis in amphibian and other important animals.
4. To know the Biotechniques for the preparation of permanent slides Homogenize, Chromatography, Electrophoresis, etc.

Unit I

Hrs 18

Scope of embryology–Gametogenesis, Egg polarity and Symmetry–Organisation of egg Cytoplasm. Egg activation during fertilization–parthenogenesis. Cleavage patterns–Types of eggs; Transplantation studies on nuclei of cleaving cells–Morphogenetics movements–Gastrulation–Metabolism during gastrulation–Activity of Genes during gastrulation.

Unit II

Hrs 18

Embryonic Induction and Competence–Organizers–Classical experiments on Organizers. Nuclear factors in development–Gene action in cell determination and differentiation – Nature of genetic information and its utilization during cell differentiation–Control of gene expression during development–Influence of cytoplasm on differentiation. Environmental regulation of normal development.

Unit III

Hrs 18

Influence of Hormones on growth and metamorphosis of amphibians, Regeneration – Regenerative ability in various animals–Release of regeneration stimulants–stimulation and suppression of regeneration– Polarity and Gradients in regeneration–Irradiation and radio labeling experiment in super regeneration – hormones and sexual cycles.

Unit IV

Hrs 18

BIOTECHNIQUES-Cell fractionation techniques–Homogenizer, Centrifugation–Principle, types of centrifuges. Cell and tissue preparations for microscopic studies–Fixatives, stains, Microtechnique principles: Preparation of permanent slides for whole mounts and tissue sections.

Unit V

Hrs 18

Separation techniques: Chromatography–principles and types of Column, Paper Chromatography, Thin Layer Chromatography (TLC) and Gas Liquid Chromatography (GLC), Electrophoresis : Principles, types - PAGE & SDS-PAGE

Reference:

1. Bodemer, C.W. (1968) Modern embryology, Holt Rinebert Winston, New York.
2. Balinsky, B.L. (1981) An introduction to Embryology, V. Edn. Saunders Co., Philadelphia.
3. Willer, B.H. Oppenheimer, J.M., (1964) Foundations of Experimental Embryology, Prentice Hall.
4. Rough, R. (1945) Experimental Embryology, Burgess Minneapolis
5. Needham, J (1958) a History of embryology, II Edn. University Press, Cambridge.
6. Willer, B.H. Oppenheimer, J.M. (1964) Foundations of Experimental Embryology, Prentice Hall.
7. Balinsky, B.L. (1981) An introduction to Embryology, Vedn, Saunders, Co., Phila elphia.
8. Berrill, N.J. (1961) Developmental biology TMH Edn., New Delhi.
9. Gry, P. (1958) Hand book of Basic Micro techniques McGraw Hill, New York.
10. Weesner, Principles of Microtechniques.
11. Baker, J.F. (1958) Hand book of Basic Microtechniques, McGraw Hill, New York.
12. T. Plummer, Introduction of Practical Bio-chemistry.
13. Oser (1968). Hawk's Physiological chemistry.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	14P2ZOC5	Core - ENVIRONMENTAL BIOLOGY AND CONSERVATION	6	5

Objectives:

- 1.To know the ecosystems of terrestrial and water in a comparative manner.
- 2.To study the various Biotic community and Biodiversity. To know the survey of natural resources and conservation and management.
- 3.To study the Air pollution, various pollutants – effects of ozone – green house effect and Noise pollution.
- 4.To know the water resources and its management. To study various water pollution and prevention an control of water pollution.
- 5.To study the radiation ecology – space ecology – Exobiology– hazards of space travel.

Unit I

Hrs 18

Dynamic aspects of Ecosystems comparative study of ecosystems – Terrestrial forest-grassland, salt marsh- cropland and aquatic ecosystems, food chain –food web. Ecological pyramids – primary and secondary production – energy flow – ecological niche.

Unit II

Hrs 18

Biotic community – organization and characteristics of community Biodiversity – importance of biodiversity – dominance, Ecotone and Edge effect -community Stratification – succession.

Survey of natural resources –conservation of natural area and biota – Soil conservation of biosphere reserve. Environmental quality standard. Wild life conservation-conservation of forest. Fishery resources and its management – CITES -Convention on international Trade of endangered species.

Unit III

Hrs 18

Population ecology – characteristics of population, population growth curve, regulation of population, life history strategies (r and k selection); concept of metapopulation – demes and dispersal – interdemic extinctions, age structured population, species interaction – Types of interactions, inter specific, Intra specific interactions.

Unit IV

Hrs 18

Air Pollution: Environmental effects ozone, depletion – Green house effect – Global warming – Noise pollution. Water resources and its management – Water pollution – sources and effects – industrial pollution – with reference to Distilleries, paper mills, Tanneries, Pesticides – Indicator organisms – Bioaccumulation and Bio-monitoring of pollutants – Prevention and control of pollution.

Unit V

Hrs 18

Radiation Ecology – comparative radio sensitivity, Remote sensing, Radio – Telemetry as tools for ecological research – Space ecology – Exobiology – hazards of space travel.

Reference:

1. Dowd swell, W.H. An introduction to Animal Ecology, Melthuen, London.
2. Odum, E.P. 1953. Fundamentals of Ecology. W.B. Saunders, Philadelphia.
3. Mellarnby, K., The Biology of Pollution.
4. Dash, M.C. Fundamental of Ecology

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Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
II	14P2ZOC6	Core - BIOTECHNOLOGY	6	5

Objectives:

1. To study the concept and scope of Biotechnology and techniques in Biotechnology.
2. To understand the recombination DNA technology.
3. To aware the programs of cell culture, preparations hormones and vaccines, engineered Hb, transgenic animals and Human genome project.
4. To study the Bio process Technology and their application.

Unit I

Hrs 18

Concepts and scope of Biotechnology – Gene cloning – the basic steps – various types of restriction enzymes – ligase – linkers and adapters – cDNA – transformation – Selection of recombinants. Gene probe – Molecular finger printing (DNA finger printing) – RFLP – the PCR techniques – Genomic library – Blotting techniques – Southern blotting – Northern blotting – Western blotting.

Unit II

Hrs 18

Plasmid biology – cloning vector based on E.coli, PBR322 and bacteriophage. Cloning vector for yeast. Cloning vector for Agro bacterium tumefaciens. Cloning vector for mammalian cells – Simian virus 40 – Gene transfer technologies.

Unit III

Hrs 18

Cell culture – Organ culture – Whole embryo culture- Embryo transfer – In vitro fertilization (IVF) technology – Dolly – embryo transfer in human. Transgenic animal. Human gene therapy – Cryobiology.

Unit IV

Hrs 18

Bioprocess and applications – Survey and uses of enzymes in industries – Isolation and purification of enzymes – Enzyme Immobilization techniques – Fermenters, their design and types – Down stream processing – Recovery of Fermented products; Commercial production of single cell protein (SCP) – Primary metabolites – Ethanol, Vitamins ;Secondary Metabolites – Penicillin.

Unit V

Hrs 18

Bioremediation – bioremediation of hydrocarbons – industrial wastes – Heavy metals- Xenobiotics – bioleaching – biomining – biofuels. Applications of biotechnology in agriculture, medicine and food science. Genetically modified organism (GMO'S) – GM food. Biotechnology & Biosafety – IPR – Levels of biodiversity – α_2 and β_1 biodiversity conservation.

Reference:

1. Dubey, R.C.-A text Book of Biotechnology, S. Chand and Co., Ltd., New Delhi. 1996.
2. Gupta, P.K. – Biotechnology and genomic, Restage Publications, Meerut 2004.
3. Rebert F. Weaver – Molecular Biology II Edn., Tata McGraw-Hill, New Delhi.
4. D. Balasubramanian et al – Concepts in Biotechnology – Concepts in Biotechnology – Concepts in Biotechnology.
5. Link, E.R. and Pastenak – J.J. Molecular biotechnology.
6. Putohit, S.S. –Biotechnology Fundamentals and Application-Agrobios, Jothpur-2005.
7. Alberghina – Protein Engg. In Industrial Biotechnology – New Era Books, Bangalore,
8. Eun – Enzymology primer for recombinant DNA Technology, Glazer-Microbial Biotechnology.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	14P2ZOC2	Core-PL- Developmental Biology, Biotechniques, Biotechnology & Environmental Biology	6	4

Objectives:

- A. Study and mounting of chick embryos – study of Amphioxus and Frog.
- B. MICRO TECHNIQUES: To know the slide preparation of Tissues, Organs and whole mount of invertebrate larvae.
- C. To learn the Techniques in Biotechnology
- D. To study about the dissolved O₂, pH, CO₂, Salinity in water samples, identification of plankton and animal relationship with suitable examples.

A.DEVELOPMENTAL BIOLOGY

Study of mounting of developmental stages – CHICK 24, 36, 48, 72, and 96 hours, developmental stages of Amphioxus and Frog, Metamorphosis of Tadpole larvae.

B. BIOTECHNIQUES

Micrometry, fixation, embedding, serial sections, cytological staining, mounting of tissues, organs, embryos and whole mounts of invertebrates larvae. Chromatography – Circular Paper Chromatography.

C.ENVIRONMENTAL BIOLOGY

- 1.Measurement of Physico-chemical parameters in aquatic environment.
 - a.Salinity
 - b.Dissolved oxygen
 - c.Free Carbon-di-oxide, carbonates and bicarbonates.
 - d.pH (using pH paper or pH meter or Lovidbond comparator)
- 2.Study of examples illustrating animal associates.

D.BIOTECHNOLOGY

1. Separation of proteins by SDS and PAGE electrophoresis.
2. Isolation of plasmid and genomic DNA.
3. Restriction, Ligation and transformation – demonstration.
4. Southern blotting.
5. Instrument and Equipments-Centrifuge, PCR, BOD incubator, Densitometer, Chromatogram, Transilluminator, Electrophoretic apparatus .

M.Sc. Zoology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	14P2ZOEL2A	Major Elective – II CELL AND TISSUE CULTURE	6	4

Objectives:

1. To know the plant cell, aseptic Techniques, callus induction.
2. To know about Micro propagation.
3. To know cell culture Manipulation.
4. To know the principles of cell and Tissue Culture.
5. To know Tissue Culture Techniques.

Unit I

Hrs 18

History of plant and animal cell, tissue and organ culture – laboratory organization – aseptic techniques – nutritional requirements and culture media – Types of cultures – solid – liquid – stationary – agitated – batch cultures–Organogenesis–Callus induction– Caulogenesis – Rhizogenesis techniques of hairy root production.

Unit II

Hrs 18

Micro propagation – mass production of plantlets – Hardening and mist chambers – transplantation to field – techniques for Maintaining plantlets in the field – somatic embryo genesis–induction of haploids and triploids–techniques of overcoming incompatibility barriers–embryo rescue protoplast and pansexual hybridization–exploitation of Somaclonal and Gametoclonal variations.

Unit III

Hrs 18

Mass culture of Cells– Manipulation of cell line selection – immobilization of cells and its application–synchronization of cell cultures and cell division – production of secondary metabolites–biotransformation–Induction of cell line mutants and mutations–cryo preservation–germplasm conservation and establishment of gene banks– synseed technology.

Unit IV

Hrs 18

Principles of Cell and Tissue Culture, Advantages and disadvantages of tissue culture methods – cell markers – types of cells–Primary and established cell lines – Kinetics of cell growth – genetics of cultured cells. – metabolism–applications of Animal Tissue Cultures.

Unit V

Hrs18

Techniques of Cell and Tissue Culture : Sources of cells – techniques of cell culture, Mechanical, biochemical and types of animal cells – equipment – cells culture media – culture procedures – preparation of animal materials – primary culture, cell lines and cloning – Slide and coverslip cultures, washing and feeding, double coverlid cultures, test tube culture – Organ culture – whole embryo culture – specialized culture techniques – cell synchronization – measurement of cell death – stemcell culture and transplantation.

Reference:

1. Kalyan Kumar De, 1992, Plant Tissue Culture, New Central Book Agency, Calcutta.
2. D.C.Daring and S.J.Morgan, 1994, Animal Cells, Culture and Media, BIOS Scientific Publishers Limited.
3. Robert N. Trigiano, Dennis J.Gray, 1996, Plant Tissue Culture Concept and Laboratory Excurses. CRC Press London.
4. Ann Harris, 1996, Epithelial Cell Culture, Cambridge University Press.
5. P.S.Srivasta, 1998, Plant Tissue Culture an Molecular Biology, Narosa Publishing House, New Delhi.
6. David W. Galbraith, Hans J. Bohnert an Don p. Bourque, 1995, Methods of Plant Cell Biology, Academic Press, New York.
7. Jennie P. Mathur and David Barnes, 1998, Methods in Cell Biology, Volume 57: Animal Cell Culture Methods Academic Press.
8. John H.Dods and Lorrin W. Roberts, 1995, Experiments in Plant Tissue Culture, Cambridge University Press, USA.
9. M-M-Ranga, 2000, animal Biotechnology, Agro bios (India).

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	14P2ZOEL2B	Major Elective – II WILD LIFE MANAGEMENT	6	4

Objectives:

1. Know the wild life–Tourism foreign exchange. Important wildlife sanctuaries of the world.
2. To know the wild life in India such as wild life resources and sanctuaries.
3. To know the behavior of grazers (Elephants) carnivores (Lion) and primates (Orange, chimps and Gorillas).
4. To study the behavior and migration of Birds – various Bird sanctuaries Bird watching, Fishing etc.
5. To know the wild life activities-By filming, Vediography and documentation and wild life protection acts and laws-wild life conservation.

Unit I

Hrs 18

WILD LIFE: Introduction Scope for the study of wildlife resources and forestry. Wild life Tourism. Foreign exchange and revenue from Wildlife Tourism – Employment prospects. Important wildlife sanctuaries of the world. Need for the production and conservation and conservation of wildlife and endangered species. Red databook.

Unit II

Hrs 18

WILD LIFE IN INDIA: Important wildlife game reserves and sanctuaries in India, Gir Lion forest, Jim Carbett Tiger reserve, Kasiranga Sancturary, Point Calimere, Bharatpur Kaleodeo bird sanctuaries, Rann of Kutch, Mudumalai, Karkudi and Wynad sanctuaries and their wildlife species – endangered species.

Unit III

Hrs 18

ETHOLOGY OF ANIMAL BEHAVIOUR

Grazers–Elephant–herds, their behaviour, family hierarchy, feeding, reproduction, and migration, Carnivores–Lions–family life, hunting behavior and feeding, mating and reproduction, hierarchy, Primates–larger primates – Orange, Chimps and Gorillas and group behavior.

Unit IV

Hrs 18

BIRD WATCHING as hobby–equipment needed for Bird watching, -Important migratory birds of India, checklist of birds, Migratory behavior, and influencing factors. Fishing and sport/game fishes. Point Calimere, Vedanthagal, Muthupert, Bharatpur and other bird sanctuaries.

Unit V

Hrs 18

Wildlife watching and tours as hobby and research. Wildlife filming. Videography and documentation. Silent Valley Project, Wildlife parks. Zoos, Treatment of animals in captivity and circuses. Wildlife conservation measures – Wildlife Production Acts and Laws, World Wildlife conservation and funding agencies and programmes (WWF). Tiger projects (UNEP), ICUN (International Union for conservation of Nature and Natural Productively).

Reference:

1. The International wild life encyclopedia. Eds. Mourice Burton and Robert Burtons.
2. Insearch of Wild India (1982) By Charlie – Pye Smith, North, South Productions. Publishers, Boxtree Ltcd.
3. Insearch of Wild India (1982) By Charile – Pye Smith, North, South Productions, Publishers, Boxtree Ltd.
4. The International wild life Encyclopedia. Eds. Mourice and Robert Burtons.
5. Mammalogy (1972), Terry Vaughan, A., W.B. Saunders Company. London.
6. Encyclopedia of Animal World. Vol. I-XX, By Smith, North, South Productions, Publishers, Boxtree Ltd.
7. Birds of India and Pakistan (1978), By Salim Ali, Hindustan Publishers, New York.
8. Animal Behaviour, Times Illustrated World of Science, Time Life Asia.
9. Encyclopedia of Animal World, Vol.I-XX, By stargazers – Tatis, Bay Books, Sydney.

M.Sc. Zoology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
II	14P2ZOEL2C	Major Elective – II Conservation Biology	6	4

Objectives:

1. To know the Biodiversity; Species Concepts; Animal Diversity.
2. To know the loss of animal diversity, status of species
3. To study the tools in animal conservation
4. To know the animal laws and policies in india

Unit I - BIODIVERSITY; SPECIES CONCEPTS; ANIMAL DIVERSITY Hrs 18

Biodiversity- Components of Biodiversity (Ecosystem, Genetic and Species diversity)
- Assigning values to biodiversity - Species concepts - Animal diversity: (Distribution, inventory, species richness) - Biodiversity Hotspots (Western Ghats, Indo-Burma region).

Unit II - LOSS OF ANIMAL DIVERSITY, STATUS OF SPECIES Hrs 18

Extinctions: Past rates of Extinctions - Concepts of Island biogeography and extinction rates on Islands - Human induced, Modern and local extinctions - Population reduction-threats to wildlife (examples)- Habitat loss, degradation and fragmentation. Threats to animal diversity in India – Status of species: Rare, endemic and threatened species - Measuring status of species in the wild - IUCN Red list (Assessments and methodologies) - Status of Indian animals.

Unit III CONSERVATION: TOOLS IN ANIMAL CONSERVATION Hrs 18

Conservation biology - In situ and Ex situ conservation of Indian animals (Case studies) - Population management -Project Tiger and Elephant - Captive breeding programme - peoples participation in conservation - Successes and failures of conservation actions in India (Case study) -Tools in Conservation: Interpretation of various data on wildlife - GIS - remote sensing - Landscape model – PVA and CAMP processes

Unit IV ANIMAL LAWS AND POLICIES IN INDIA; ECONOMICS OF BIODIVERSITY CONSERVATION Hrs 18

Wildlife (Protection) Act of India (1972)- Protected Area network - forest policy - Prevention of cruelty to Animal Act-Convention on Biological diversity, International Trade in endangered species-Zoo policy- Laws and their applications in Zoological parks, wildlife sanctuaries and biosphere reserves - Economics of biodiversity conservation

Unit V CONSERVATION EDUCATION AND AWARENESS Hrs 18

Wildlife/Animal magazines, Journals- How to write popular and Scientific articles - Magazine and Journal information - Wildlife, nature, environment games (examples) – Role of NGO's and Government organizations in wildlife conservation - Wildlife celebration days in India - Biotechnology in conservation.

References:

1. R. B. Primack 1993. Essentials of Conservation Biology, Sinauer Associates, USA
2. G. K. Meffe and C. R. Carroll 1994. Principles of Conservation Biology, Sinauer Associates, USA
3. B. Groom bridge 1992. Global Biodiversity. Status of the Earth's Living Resources. Chapman and Hall, London.
4. R. A. Mittermeier, N. Meyers, P.R. Gil and C. G. Mittermeier 2000. Hotspots: Earth's Biologically richest and most endangered Terrestrial Ecoregions. Cemex/Conservation International, USA
5. M.E. Soule 1986. Conservation Biology: The Science of Scarcity and Diversity, Sinauer Associates Inc., USA.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	14P3ZOC7	Core – IMMUNOLOGY	6	5

Objectives:

1. To study the History of Immunology.
2. To study the important of Immunology.
3. To study the cell mediated antigen and antibody reaction.
4. To study the different types of antigens.
5. To learn the techniques in organ transplantation.
6. To know the common, Auto Immune diseases.

Unit I

Hrs 18

History of Immunology – important discoveries – kinds of Immunities – Innate, Acquired, Natural, artificial and passive -LYMPHOIDAL ORGANS in Man – Primary Lymphoidal organs – Thymus, Bursa Fabricii, Bone marrow. Secondary Lymphoidal organs – Lymph nodes, Payer’s patches, Histomorphology of the Lymphoidal organs.

Unit II

Hrs18

ANTIGENS – Types of Antigens

IMMUNOGLOBULINS–Classification and properties of IgG, IgM, IgA, IgD and IgE. Biosynthesis of ImmunoglobulinsG. Humoral immunity and Cell Mediated Immunity- various Theories of Antibody formation; Killer Lymphocytes, Lymphokinins, Lymphotoxins, Interferon.

Unit III

Hrs 18

ANTIGEN–ANTIBODY INTERACTIONS: Binding sites of Ig–Ab–Precipitation, Agglutination, Opsonisation, Cytolysis, Flocculation, Complement fixation. Histocompatibility, Hypersensitivity and this types, Allergic reactions- Classification - Type I- Anaphylactic Hypersensitivity Type II- antibody dependent hypersensitivity. Type III- Immune complex mediated hypersensitivity, IV –cell mediated hypersensitivity, V-Stimulated hypersensitivity, Tolerance.

Unit IV

Hrs 18

COMMON AUTOIMMUNO DISEASES-Thrombo-cytopenia, Thyrotoxicosis, Addison’s diseases’ Rheumatoid Arthritis, Autoimmune haemolytic anaemia-brief descriptions.

IMMUNOTECHNIQUES: Brief procedureof ELISA, HLA Typing, VDRL Test, Immunolectrophoresis, Radioimmuno Assay, ABO Blood typing, Hybridoma technology

Unit V

Hrs 18

TRANSPLANTATION: Types of Transplantations – Autoplastic Transplantation (skin), Homoplastic (eye, Kidney) transplantations, Graft acceptance, Immunosuppressors, Graft rejection. Types of allograft rejection, and prevention of allograft rejection.

Transfusion of blood – Rh factor – Erythro – blastosis foetals.

References :

1. IMMUNOLOGY – Jean Francois Bach (1982) 6th Edition Wily Medical Publications, New
2. IMMUNOLOGY – An Introduction (1984) – By Tizard Saunders College Publishing
3. Structure and Function of Antibodies (1977) Glynn. L and Steward M.W. John Wilk sons, New York.
4. ESSENTIALS OF IMMUNOLOGY (1984) Hidemann W.H. Elsevier Publication, Oxford.
5. IMMUNOLOGY – An Introduction (1984) 6th Edition Wiby Medical Publications, New Yo
6. Stucture and Function of Antibodies (1977) Glynn, L and StewardM.W. Johy Wiley New York.

M.Sc. Zoology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	14P3ZOC8	Core-ANIMAL PHYSIOLOGY AND BIOCHEMISTRY	6	5

Objectives:

1. To study the physiology of Nutrition, Respiration, and circulation.
2. To learn the physiology of Excretion, Muscular coordination.
3. To know the physiology of nervous coordination, Sensors exhibition
4. To know the biochemistry of water and minerals.
5. To study the Enzymes and their kinetics and the role of Nucleic acid.

Unit I

Hrs 18

Nutrition: Structure and functions of digestive organs of man. Respiration: Types of respirations, respiratory pigments–Transport of O₂ and CO₂ in man–Respiratory quotient–Regulatory mechanisms. Circulation: Chemistry of Blood coagulation–Types of transport mechanisms–physiology of mammalian heart–blood pressure–pacemaker, Regulatory mechanisms.

Unit II

Hrs 18

Excretion: Excretion in relation to different habitat–Excretory Physiology of Man detoxification pathways of Ammonia–Regulation of nitrogen excretion. Osmo-Ionic Regulations: Osmoregulations in freshwater, marine and estuarine fishes. Thermo regulation in animals. Muscles: Types-ultra structure–Properties–Mechanisms of muscle contraction–chemistry, Energetics and Regulation of Muscle contraction–Electric organs and Bioluminescence.

Unit III

Hrs 18

Nervous Co-ordination: Structure and types of nerves - transmission of nerve impulse – Synapses – Reflex Action – Animal behavior and learning.
Receptors: Photo, Chemo and Mechano reception.
Chemical Co-ordination: Reproductive cycle in Mammals – hormonal regulation of ovulation – implantation – Gestation - Lactation – Family planning.

Unit IV

Hrs 18

Biochemistry: water and minerals– (functions) – hormonal regulation of mineral metabolism – pH – buffers, Structural properties and classification of carbohydrates, proteins, fat and their metabolism, hormonal regulation.

Unit V

Hrs 18

Classification of enzymes - enzymes kinetics –Mechanism of enzyme action – Regulation of enzymatic activity– Co-enzymes – Isoenzymes – functions of enzymes - Energy rich compounds and their roles, Nucleic acids: DNA and RNA – Polymerization.

Reference:

1. Hoar, S.W., 1978. General and comparative Physiology, Prentice Hall, London, New York.
2. Prosser, O.D. and Brown, A.F. (Jr), 1961. Comparative Animal Physiology, W.B. Saunders Co., New York, London.
3. Prosser, O.D. and Brown, A.F. (Jr), 1961. Comparative Animal Physiology, W.B.Saunders Vo., New York, London.
4. Verma, P.S., Tyagi, B.S, and Agarwal, Animal Physiology, Saras Publications, S.Chand and Co., New Delhi.
5. Verna, P.S., Tyagi, B.S. and Agrwa, Animal Physiology, Saras Publications, S.Chand Co., New Delhi.
6. Ambika Shanmugam, Biochemistry for medical students.
7. Join, J.L. Biochemistry
8. David T. Plummer, An introduction to Practical Biochemistry, Tata McGraw Hill Publishing Co-Ltd., New Delhi.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	14P3ZOC9	Core-CLINICAL BIO-CHEMISTRY	6	5

Objectives:

1. To study the lab setup and safety measures
2. To learn about the metabolic disorders
3. To study about the disorders of kidney and liver
4. To know about drug design and their types

UNIT I: LABORATORY SETUP AND SAFETY

Hrs 18

Requirements of setting up of clinical laboratory, SI units in clinical laboratory, Collection, preparation, preservation and handling of clinical samples, quality control and Safety measures in clinical laboratory. Formulation of clinical and diagnostic kits,

UNIT II METABOLIC DISORDERS

Hrs 18

Disorders of Carbohydrate Metabolism – Diabetes mellitus, glucose and galactose tolerance tests, sugar levels in blood, renal threshold for glucose, factors influencing in blood glucose level, glycogen storage diseases, pentosuria, galactosemia.

Disorders of Lipid metabolism – Plasma lipoproteins, cholesterol, triglycerides & phospholipids in health and disease, hyperlipidemia, hyperlipoproteinemia, Gaucher's disease, Tay-Sach's and Niemann-Pick disease, ketone bodies, Abeta lipoproteinemia.

UNIT III

Hrs 18

NEUROLOGICAL AND PSYCHIATRIC DISORDERS: Schizophrenia – types, symptoms, antipsychotic drugs - Affective disorders - Unipolar and bipolar disorders, antidepressants, Alzheimer's disease, Wernicke-Korsakoff syndrome, dementia, Wilson's disease

Ageing- Physiological and biochemical changes in aging. Different theories of aging, importance of superoxide dismutase in ageing, plasticity and regeneration

UNIT IV

Hrs 18

Disorders of liver and kidney–Jaundice, fatty liver, normal and abnormal functions of liver and kidney. Inulin and urea clearance. Digestive diseases– Maldigestion, malabsorption, creatorrhoea, diarrhoea and steatorrhoea- Electrolytes and acid-base balance – Regulation of electrolyte content of body fluids and maintenance of pH. Disorders of acid-base balance and their respiratory and renal mechanisms

UNIT V

Hrs 18

Inborn errors of Metabolism- Disorders of amino acid metabolism – Phenylalanaemia, homocystinuria, tyrosinemia; Disorders of nucleic acid metabolism- Disorders in purine / pyrimidine metabolism

Hormonal imbalances: Protein hormones, steroid hormones, adrenocorticosteroids

Reference:

1. Burger, A., Med. Chem.
2. Wilson and Gisvold, Organic Med. Pharmaceutical Chem.
3. Ariens, Drug Design, Academic press, NY, 1975.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	14P3Z0CP3	Core-PL-Animal physiology, BioChemistry, Immunology, Clinical Chemistry & Drug Design	6	3

Objectives:

1. To learn the physiology of proteins, carbohydrates lipids.
2. To study the concentrate of the sugar, Glycogen, aminoacids, Salt in selective species.

ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

1. Determination of chemical nature of tissues –proteins, carbohydrates and lipids.
2. Estimation of blood sugar/Glycogen in muscles.
3. Chromatographic analysis of amino acids.
4. Estimation of chlorides in biological samples.
5. Salt-loss and Salt-gain in Crab.
6. Quantitation estimation of ammonia and urea.
7. Estimation of oxygen consumption in fish.
8. Study of cardiac cycle of frog and its response to temperature
9. Effect of salinity on oxygen consumption of crab
10. RBCs in different vertebrates and in different physiological condition.

CLINICAL CHEMISTRY & DRUG DESIGN

1. Estimation of Haemoglobin in blood samples
2. Estimation of Bile pigments
3. Estimation of Creatinine
4. Estimation of triglycerides, steroids

IMMUNOLOGY

1. Dissection of Lymphoid organs in Rat.
2. Inoculation of Antigens and observation of Blood parameters.
3. Immuno Electrophoresis(demonstration).

Reference:

1. Experimental physiology – S.C. Rastogi.
2. Lab Manual in Biochemistry – K. Jayaraman.
3. Biochemical methods By S.Sadasivam and A.Manickam.
4. ELIZA as a Diognostic Tool – S.Ialakshi, S. Mohan (eds).
5. Methods in biotechnology-Schmauder, New Era Books, Bangalore.
6. Basic SeparationTechniques in biochemistry by R.O.Okotore.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	14P4ZOC10	Core – GENERAL AND APPLIED ENTOMOLOGY	6	5

Objectives:

1. To Study the taxonomy of Insects.
2. To study the Morphology of Insects.
3. To know the Anatomy and Physiology of Insects.
4. To know the insect Ecology and their welfare aspects.
5. To study the Biology and Bionomics of insects and Integrated Pest management.

Unit I

18 Hrs

TAXONOMY : Classification of insects upto orders with South Indian examples – Bionomics of Aptergotes, Orthoptera, Diptera, Hemiptera and Coleoptera.

Unit II

18 Hrs

MORPHOLOGY : Integument, Head, antennae, Mouthparts, Thorax, abdomen wings, Legs, and external genitalia.

Unit III

18Hrs

ANATOMY AND PHYSIOLOGY : General organization and physiology of digestive, respiratory, circulatory, excretory, nervous and reproductive systems of insects. Insect hormones and metamorphosis, pheromones.

Unit IV

18 Hrs

INSECT ECOLOGY : Hibernation, Aestivation, Diapause and Migration.
SOCIAL BEHAVIOUR : Isoptera and Hymenoptera.
Insects of Medical and Veterinary Importance : Vectors of Diseases – Mosquito – bedbug, fleas and housefly, BENEFICIAL INSECTS : Sericulture, Apiculture, Lac and Cochineal insects.

Unit V

18 Hrs

Biology and Bionomics of pests of Crops : Sugarcane, Paddy and Pest of stored products - pests of common fruits and vegetables, Pest Management : Mechanical, Chemical, Biological and Intergrated Pest management (IPM) and Biotechnological Pest Management.

Reference:

1. Manim, M.S., 1973 General Entomology, Oxford and IEM, London.
2. A.D.Imms and Richards, General Entomology, Vol.1 & II, English Language Book Society (ELIBS), London.
3. Chapman, Insect Structure and function.
4. Snodgrass, Morphology of Insects.
5. Fox and Fox, General Entomology.
6. Wigglesworth, W.B., Physiology of Insects
7. Rockstein, M.Physiology of Insects, academic Press, London.
8. Rockstein, M.Physiology of Insects, Vol.1 – 111, Year Volumes, Academic Press London.
9. Fox and Fox, General Entomology,
10. Novak, V.J.A., Insect Hormones, Chapman Halls, London,
11. Vincent and Wigglesworth, Insect Hormones, Freeman and Co.Inn.Franchises.
12. Economic Entomology – Vasantha Rao David.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	14P4ZOC11	Core - RESEARCH METHODOLOGY	8	5

Objectives:

1. The course aims to train students in the statistical analysis and presentation of the data with the interpretation based on the already existing literature.
2. To write report/thesis/dissertation and or for publications in appropriate research journals.
3. The aim of the paper thus is to lay a strong foundation for the student for thesis writing, editing, analysis and interpretation of the generated data with hands on experience with model sums.

Unit I

Hrs 24

Collection of data-diagrammatic representation: Bar, Pie diagrams; graphic representation-Histogram, frequency polygon; Measures of central tendency: Arithmetic mean, median & mode(direct methods and model sums) Measures of dispersion: Universe and population-delimiting population-sampling methods: random sampling, stratified random sampling-standard deviation-standard error-coefficient of variation: elucidation with model sums.

Unit II

Hrs 24

Bivariate relationship: Types of Correlation and Karl Pearson's correlation coefficient: model sums with elucidation - Regression analysis: Components of regression equation - Confidence intervals of regression line. Fitting simple regression lines: model sums, calculations of equation and fitting of regression line, estimated and calculated Y. Comparison between correlation and regression.

Unit III

Hrs 24

Probability- Theorems: Addition and Multiplication-Patterns of distributions: Poisson, Normal and Binomial; Test of significance - Comparison of means: Chi square test, student t test, ANOVA, model sums on one way ANOVA with interpretation of data - Introduction to MANOVA AND STASTICA - Use of statistical softwares.

Unit IV

Hrs 24

Research: Selection of problem - stages in the execution of research: choosing a topic to publication-preparation of manuscript - report writing - format of journals-proof reading - sources of information: journals, reviews, books, monographs etc-How to write thesis and their standard format-standard organization of bibliography. Planning of research: Research proposals, time scheduling of research, available sources and generation of funds and facilities.

Unit V

Hrs 24

Journals: Standard of research journals - paid and refereed journals - impact factor - citation index - choice of journals for publication. Information retrieval: access to archives and databases, search engines: Google, Pubmed, NCBI, etc.,National Informatic Center - Online data base library.

Reference:

1. Davis, G.B. and C.A. Parkar 1997, Writing the doctoral dissertation. Barons Educational series, 2nd e 160. ISBN: 0812098005.
2. Duncary, P.2003. Authoring a Ph.D. thesis: how to plan, draft, write and finish a doctoral diss Plagrave Macmillan, Pp 256. ISBN 1403905843.
3. Saxena, S. 2001, MS office, Vikas Publishing House Pvt. Ltd. New Delhi 110014.
4. Snedecor, G.W. and W.G.Cocharn, 1978. Statistical methods. Oxford and IBH Publishing Co Pvt. Ltd.
5. Sokal, R.R. and F.J. Rohif, 1981. Biometry. W.H. Frecman, New York.
6. Zar. J.H. 1996. Biostatistical analysis. Prentice Hall, Uppar Saddle River, New Jersey, USA.
7. Biostatistical Analysis, Zar (2004).

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	14P4Z0CP4	PRACTICAL IV (RESEARCH METHODOLOGY AND GENERAL AND APPLIED ENTOMOLOGY)	6	3

Objectives:

1. To study the preparation of microbial culture medium and isolation of microbes.
2. To study Internal systems of the insects.
3. To study the Techniques of mounting of mouth parts and wings.
4. To study the biology and Bionomics of insect
5. To study the methods involved in writing a research paper.

A-Research methodology

1. Prepare flat file in NCBI, DDBJ & EMBL format for the given query sequence.
2. Search for similar DNA sequence of the query DNA using BLAST.
3. Retrieve a query sequence from NCBI and predict the secondary structure of the query using PDB & PEP TOOL.
4. Retrieve any five microbial gene sequence from any DNA data bank and using the server 123 Genomics and malign program found in 123 genomics construct a phylogenetic tree.
5. Methods involved in writing a research paper
6. Presentation of a research paper

B – Entomology

Mounting of Mouthparts, wings and external genitalia of common insect.

1. Collection and identification of insects of economic importance. Preparation of key for classification of insects upto orders with examples.
2. Dissection of digestive, nervous and reproductive systems of insects of representative orders (Orthoptera, Hemiptera, Coleoptera, Lepitoptera) Endocrine system of cockroach.
3. Ligature experiments to demonstrate the role of hormones in mounting and metamorphosis. Demonstration of allocate in cockroach. Demonstration of the role of cubucula lipids, in prevention and evaporation. Demonstration of the functioning of Malpighian tubules, demonstration of insect with reference to temperature, demonstration of efficacy commonly used pesticides, demonstration of LD₅₀ for the common insecticide concentrations.

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Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	14P4ZOEL3A	Major Elective - III Estuarine Biology And Aquaculture	6	4

Objectives:

1. Introduction of Estuaries and its salient feature
2. To study the Biology of the Estuarine biotic community.
3. To Understand the present status of Aquaculture in India.
4. To Study the Engineering and culture aspects of Aquaculture system.
5. To know the induced breeding and pathology of culturable species.

Unit I

18 Hrs

Estuary: Definition – Classification – Estuaries of India – physico-chemical and biological characteristics of Estuaries – Primary and Secondary productivity of Estuary – Estuarine fishery resources of India.

Mangroves: Ecology and adaptations of mangrove – Mangrove fauna and flora – Conservation of mangroves.

Unit II

18 Hrs

Aquaculture : History and present status in India – site selection – pond construction – Pond maintenance – Ploughing, liming, Irrigation, Fertilization, weed control, water quality management – control of predatory organisms.

Unit III

18 Hrs

Cultivable species – fin fishes and shell fishes – composite carp culture, Tilapia culture in freshwater – shrimp farm in coastal water.

Feeding biology – Live feed organisms (Algae, Phytoplankton, Rotifers, Artemia etc.) – Supplementary feeds – Simple feed, compound feed, food conversion Ratio (FCR), Feed formulation, Types of feed.

Unit IV

18 Hrs

Seed transportation and stocking – growth and reproductive biology of prawn – Crab and carp fish – Harvesting - Processing and Marketing – Commercial products of fisheries.

Unit V

18 Hrs

Hypophysation or Induced breeding in carps, preservation of gametes, genetic selection and hybridization – pathology – parasitic infection – Diseases of fish and prawns and their control measures.

1. C.M.F.R.I. Coastal Aquaculture – Marine Prawn culture
2. V.C. Jhingarn and Gopalakrishnan Ray, P. and Ghosh, A., Methodology for survey of brackish water areas V. in India, for coastal – Aquaculture Indopacific fish Council, 14th session.
3. T.A. Anson and Goodwin, H., Shrimp and prawn farming in the Hemisphere, Downdon Authchinson and Rea, Ind., Pennsylvania.
4. T.A. Qureshi and N.A. Qureshi, Indian Fishes, Brig, Brothers, Sullania Road, Bhopal, India.
5. Donald, Mc Lusky, Ecology of Estuaries, Heinemann publications Glasgow and London.
6. Barton Lias, Estuarine Chemistry.
7. Kennedy, Estuarine Perspective.

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Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
IV	14P4ZOEL3B	Major Elective - III FISHERIES	6	4

Objectives:

The aim of the paper is to understand the morphology, classification and identification of fishes and the fisheries and fishery resources of India. Moreover information about the biology of the fishes goes a long way in managing the fishery resources and their sustainable utilization. As fishes constitute perishable commodity, preservation and processing are also quite essential.

Unit I BIOLOGY OF FISHES AND CLASSIFICATION

18Hrs

General morphology and outline classification of fishes - major groups of fishes and their characteristics - morphometric and meristic characters of elasmobranchs and teleost fishes. Basic anatomy of fish - digestive, circulatory, respiratory, nervous and reproductive systems. Food and feeding habits, maturity, fecundity, spawning and survival of Indian fishes.

Unit II GROWTH AND POPULATION DYNAMICS

18Hrs

Length-weight relationship and factors influencing growth condition, age determination Theory of fishing, unit stock, recruitment, growth, mortality, migration, fish tagging and marking.

Unit III INLAND CAPTURE AND MARINE CAPTURE FISHERIES OF INDIA

18Hrs

Fishery zones and type of fisheries in India. Riverine, Estuarine, Coldwater, Reservoir and Pond fisheries. Present status and scope of inland capture fisheries - their fishery characteristics, distribution and importance. Present status and scope of marine capture fisheries-crustaceans (prawn/shrimp, lobster and crabs), Molluscs(clam, cockle, mussel, oyster, cephalopods) and fishes-their fishery characteristics, distribution and importance.

Unit IV FISHERY SURVEY METHODS

18Hrs

Methods of surveying the fishery resources-acoustic method, aerial method, survey of fish eggs and larvae, analyzing population features-growth mortality selection.

Unit V: CRAFTS AND GEARS

18Hrs

Principal methods of exploitation of fishes - indigenous and modern gears and crafts. Principal methods of fish preservation and processing in India Types of spoilage, causative factors - marketing and economics.

REFERENCES

1. Day, F. 1981. Fishes of India, Vol.I and Vol.II. William Sawson & Sons Ltd., London.
2. Jhingran, C.G. 1981. Fish and Fisheries of India. Hindustan Publishing Co., India.
3. Maheswari, K. 1993. Common fish diseases and their control. Institute of Fisheries Education, Powakads, M.P.
4. Santhanam, R. 1980. Fisheries Science. Daya Publishing House, New Delhi.
5. Yadav, B.N. 1997. Fish and Fisheries. Daya Publishing House, New Delhi
6. FAO Volumes for fish identification.
7. Bal D.V. and Rao, K.V. 1990. Marine Fisheries of India. Tata McGraw Hill Publishing Co. Ltd., New York.
8. Biswas, K. P. 1996. A Text Book of Fish, Fisheries and Technology. Narendra Publishing House, Delhi.
9. Srivastava, C.B.L. 1999. Fish Biology. Narendra Publishing House, Delhi.

M.Sc. Zoology

Semester	Subject Code	Title of the Paper	Hours of Teaching /Week	No. of Credits
IV	11P4ZOEL3C	Major Elective – III Bio-Informatics, Intellectual Property Rights and Nanotechnology	6	4

Objectives:

1. To know the ultra structure of Prokaryotic and Eukaryotic cellular organisms.
2. With the help of instruments, to know the basic principles of protein.
3. To know the internet and E-mail.
4. General aspects of patenting.
5. To know about Nanotechnology.

Unit I

18 Hrs

Cell structure, Ultra structure of Prokaryotes and Eukaryotes Cellular Organisms.

Unit II

18 Hrs

Protein confirmation – Predication of Protein structure – fold recognition, comparative modelling (homology), Basic principles of X- ray diffraction studies, NMR, Mass spectroscope in identifying protein confirmation.

Unit III

18 Hrs

Basic concepts of Bioinformatics, sequence Databases, sequence formats – Gene basic -Networking – Network access, Internet, E – mail servers – use of databases biology, Sequence databases, Sequence Analysis – Protein and Nucleic acids, Structural comparisons.

Unit IV

18 Hrs

A general account of patenting, Artificial intelligence, Biosafety and Bioethics.

Unit V

18 Hrs

Nanobiotechnology – Basic principles and scope of Nanotechnology – Structural and Brownian assembly – Important characteristics – Molecular manufacturing – Decisive military capabilities – Molecular mills – in the fields of agriculture, Medicine, future perspectives of Nanotechnology in Life Sciences -Applications of Nanotechnology.

1. Sequence Analysis primer by M Gribskov, J. Devercux (1989) Stockton Press.
2. Nucleic acid and protein sequence analysis, A practical approach by MJ Bishop and C.J. Ramslings (1987) IRL Press.
3. Information theory and living system by L.I. Garfield, (1992), Columbia University Press.
4. Glossary of Biotechnology and Nanobiotechnology – Narendhra Publications.
5. Molecular databases for for protein and structure studies by Sillince, J.A. and Sillince M (1991) Springer Verlag.
6. Biotechnology Fundamentals and Application – S.S.Purohit, Agrobios, India
7. Nanotechnology – A gentle introduction to the next big idea, Ratner – Tamil Nadu Book House.
8. Information of Biostatitics by Sokal and Rhld (1973) Toppan Company, Japan.

M.Sc. Zoology

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
IV	14P4ZOPR	PROJECT	-	4

Aim: (a) Application of knowledge to real life situation (b) to introduce research methodology.

Topic of dissertation may be chosen from the broad area of Zoology and may be laboratory based, field based or both or computational, with emphasis on originality of approach. It may be started during 2nd/3rd semester and shall be completed by the end of the 4th semester. The Dissertation to be submitted should include (a) background information in the form of Introduction (b) objectives of the study (c) materials and methods employed for the study (d) results and discussion thereon (e) summary and conclusions and (f) bibliography. Apart from these sections, importance of the results, originality and general presentation also may be taken into consideration for evaluation.