ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN
(Autonomous)
(Re-Accredited with 'A' Grade by NAAC)
(A Government Aided College - Affiliated to Mother Teresa Women's University, Kodaikanal)
CHINNAKALAYAMPUTHUR (PO), PALANI -624 615.

PG DEPARTMENT OF ZOOLOGY

SYLLABUS

M.Sc (ZOOLOGY) - 2014-2017

P.G DEPARTMENT OF ZOOLOGY
PG Syllabus 2014-16

SEMESTER - I

PAPER -I

BIOCHEMISTRY

SUBJECT CODE : **CONTACT HOURS : 06/ week**

CONTACT HOURS : 72 /Sem

Unit I

Historical Background - Structure and properties of molecules 10 hrs

Association of Atoms into Molecules (Chemical bonds: Hydrogen bond - Vander Wall's bond)

Water and Electrolytic dissociation: Acid - Base balance, Concept of pH and buffers, Acidosis and Alkalosis

Unit II

Carbohydrates and Carbohydrate Metabolism 15 hrs

Structure, Classification, Biological importance.

Glycolysis, Kreb's cycle, Electron Transport System.

Hexose Monophosphate Shunt (Pentose phosphate pathway).

Gluconeogenesis, Glycogenesis, Glycogenolysis.

Cori's lactic acid cycle and Blood sugar level. (Including the Energetics of all Metabolic Pathways).

Unit III

Proteins and Amino acids 10hrs

Protein - Structure, Classification, Biological importance.

Amino acid - Structure, Classification, Properties of Amino acids.

Isomerism.

Deamination, Transamination and Transmethylation of Amino acids.

Formation of Ammonia and Urea.

Unit IV

Lipids - Lipid Metabolism **15 hrs**

Classification of lipids - Simple lipids, Compound lipids & Derived Lipids.

α oxidation, ß oxidation & omega - oxidation

Oxidation of Palmitic acid and its Bioenergetics.

Biosynthesis of Palmitic acid.

Formation of Ketone bodies.

Unit V

Nucleic Acids **10hrs**

Watson & Crick model of DNA

Purine Metabolism

Pyridine Metabolism

Replication of DNA

Unit VI

Enzymes & Hormones **12 hrs**

Definition, Properties of enzymes.

Factors influencing Enzyme activity. Enzyme inhibitors.

Classification of Enzymes, Mechanism of Enzyme Action.

Coenzyme : Definition, Mechanism of Coenzyme Action, NADH, NADPH,

CoA, COQ, FADH2, Isoenzyme : Definition, LDH

Chemistry of Hormones –Protein and Steroid Hormones

Mechanism of Hormone Action

Reference Books:

1. Dr. (Mrs) Ambikashanmugam., (2003) , Fundamentals of Biochemistry, Kartik offset printers, 12 Aranganathan subway road, Chennai.

2. Evic.E.Conn, paul, K,stumpf, George bruening Roy H.Doi, (1976), Wielyeaster, Delhi.

3. Jerenu.M.Bera, John.L.Tycoczki, Lubertstryer. (1975). Biochemistry, V Ed., W.M. Freeman and Company, Newyork.

4. Emil.SmithRober.L.Hill, Principles of Biochemistry Mammalian Biochemistry, VII Ed., Mc G. Raw Hill Book Company ,New Delhi.

5. R.K.Murry ,D.K.Granner, P.A.Mayes, (1988). Harper's Biochemistry, 25th Ed., Prentice- Hill of India Private limited, New Delhi.

SEMESTER -I

PAPER -II

CELL & MOLECULAR BIOLOGY

SUBJECT CODE : **CONTACT HOURS : 06/week**

CONTACT HOURS : 72 /Sem

Unit I **15hrs**

Microscopy: Principles & applications - Electron Microscope (TEM and SEM), Phase Contrast Microscope, X-ray microscope and Fluorescent microscope. Prokaryotic cells :E.coli, Cyanobacteria and Mycoplasma, Structure of Viruses and Virion.

Unit II **15hrs**

Bio membrane - structure, membrane transport, membrane potentials, Cell adhesion - intercellular junctions, Cell signaling, Structure and functions of Peroxisomes, Glyoxisomes, Ribosomes and Centrioles. Cell cycle components and Cell cycle regulation.

Unit III **12 hrs**

Nucleus and Nucleolus – Structure and Functions

Chromosomes : Chromatin, Nucleosomes, mobile DNA, and formation of Chromosomes from Cellular DNA.

Unit IV **10 hrs**

DNA &RNA **:** Forms of DNA, Denaturation and Renaturation. Replication- Semi conservative - experimental evidences, Okazaki fragments, Enzymology of Replication, bi-directional replication, Rolling circle replication. DNA damage and repair mechanisms. Types of RNA - mRNA, rRNA, tRNA, - structure & functions.

Unit V **10 hrs**

Protein synthesis : Transcriptionin Prokaryotes and Eukaryotes, mechanism of transcription - initiation, elongation and termination. Transcription factors - Zinc fingers, Leucine zippers. Processing of RNA. Translation - initiation of protein synthesis - activation of amino acids, aminoacylation of tRNA, elongation & termination of polypeptide chain. enzymes& factors involved in protein synthesis.

Unit VI **10 hrs**

Regulation of gene expression - Lac operon - components, repressor mechanism. Ara operon, Arabinose metabolism in E.coli. trp operon - tryptophan metabolism. Cancer : types, properties, Genetics of Cancer, Nanotechnology and cancer.

Reference Books:

1. C.B.Powar, (2007), Cell Biology Himalaya Publishing House, Mumbai
2. David Freifelder (2008), Molecular Biology, Naras Publishing House Pvt Ltd., New Delhi.
3. S.C.Rastogi, (2006), Molecular Biology, CBS Publishers & Distributors, New Delhi.
4. P.C.Turner, A.G.Mclennan, A.D, Bates &M.R.H.White, (2002), Molecular Biology Viva Books Private Limited, New Delhi.
5. Lodish, Berk, Zipursky, Matsudarie, Baltimore, Darnell, (2000), Molecular Biology, Freeman and Company, Newyork.

SEMESTER - I

PAPER -III

MICROBIOLOGY

SUBJECT CODE: **CONTACT HOURS : 06/week**

CONTACT HOURS : 72 /Sem

Unit I

Introduction **10hrs**

History of Microbiolgy, Microbial Culture, Pure culture, Streak Plate Technique, Microbial growth, Culture Media, Types and Preparation of Media, Staining.

Unit II

Microbial Genetics **12 hrs**

Transfer of genetic Material in Prokaryotes : Transformation, Conjugation, Transduction.

Genetic Recombination: Mechanism of Recombination.

Concept of Gene Cloning : Recombinant DNA Technology – Slicing of DNA into Vectors, Plasmids - Ti Plasmid

Use of Genetically Engineered Microorganisms in Control of Pollution – Superbug.

Unit III

Microbiology of Milk, Dairy and food **15hrs**

Microbiology of Milk and Dairy Industry. Dairy Products : Yoghurt, Butter Milk, Butter, Cheese.

Microbial Spoilage : Microbial Contamination of Spoilage of Poultry, Fish & Sea Foods.

Food Preservation Methods : Physical Preservation Methods, Chemical Preservation Methods

Unit IV

Medical Microbiology **15 hrs**

Bacterial diseases: Air borne disease (Diphtheria, Meningitis, Pertussis, Streptococcal pneumonia). Food - borne and water -borne disease (Cholera & Typhoid fever); Soil - borne disease (Tetanus,

Anthrax); Sexually Transmitted Disease (Gonorrhea); Contact Disease (Leprosy); Viral diseases : Air - borne viral diseases (Influenza); Direct contact disease (hepatitis B, Rabies.)

Unit V

Industrial microbiology 10hrs

Alcohol production - Ethanol, Production of Acid - Lactic acid, Vinegar, Production of Antibiotics - Penicillin, Streptomycin , Production of Amino acid - L-lysine, L- glutamic acid, Production and Application of Microbial Enzymes & Immobilization of Enzymes.

Unit VI

Agricultural and Environmental Microbiology 10 hrs

Role of Ti Plasmid and Nif gene in Agriculture.

Biofertilizers&Biopesticides,

Bacterial Insecticides - Bacillus thuringenesis& Virus Insecticides.

Potable water & Sewage treatment.

Water Pollution Management – Bioaugmentation& Bioremediation

Use of Enzymes in Waste Water Treatment.

Biodegradation – Microbial degradation of Xenobiotics.

Reference Books:

1. Dr.R.C.Dubey .Dr.D.K.Maheswari, (2010), A Text book of Microbiology, S.Chand& CO Ramnager, New Delhi.
2. Ronald ,M.Atlas, (1988), Microbiology Macmillan publishing company Newyork.
3. J.Pelczar, D,Reid. (1984), TATA McGraw Hill publishing company Ltd. Newyork.
4. Samuel Baron , Medical Microbiology, II Ed., Wesley publishing company, California

SEMESTER -I

PAPER – IV PRACTICAL – I

BIOCHEMISTRY, CELL &MOLECULAR BIOLOGY AND MICROBIOLOGY

SUBJECT CODE : **CONTACT HOURS: 6 / week**

CONTACT HOURS : 72 / sem

Biochemistry

Effect of temperature on salivary amylase activity - Determination of Q_{10}.

Effect of pH on salivary amylase activity.

Effect of Enzyme Concentration on Salivary amylase activity

Influence of substrate concentration on Salivary amylase activity

Paper Chromatography – Ascending and Circular chromatography

Column Chromatography – Separation of pigments from varied leaves or flowers

Gel Electrophoresis – (Demonstration only)

Quantitative estimation - Estimation of Carbohydrates, Proteins and Lipids from fresh tissues - Standard graphs.

Cell & Molecular Biology

Microscopy: Optical and Phase Contrast Microscope

Micrometry - Measurement of cells using Ocular and Stage micrometers - Length and Width

Counting of blood cells in Human blood - R.B.C and W.B.C

Identification of mitotic stages in Onion root tip.

Identification of meiotic stages in Tradescantia

Observation of Giant chromosome in Chironomous larva. (Visual Aid / Virtual Dissection)

Observation of osmosis in Onion epidermal cells (Demonstration only)

Models – Watson and Crick Model of DNA, Protein Synthesis, Replication in DNA – Semi-conservative

Microbiology

Sterilization of glassware and media

Preparation of Culture media

Aseptic transfer of Bacteria

Pure culture of Bacteria

Serial dilution Technique

Preservation and maintenance of Bacterial culture

Cultural characteristics of bacteria

Wet mount preparation and Hanging Drop technique

Microscopic measurement of microbes using Haemocytometer

Spotters:

* Hot air oven

* Autoclave

* Pressure cooker

* Agar Plate

* Inoculation needle

* Structure of Bacteria

* Structure of Virus

SEMESTER -I

ELECTIVE I

SERICULTURE

SUBJECT CODE : **CONTACT HOURS: 06 / week**

CONTACT HOURS : 72 / sem

Unit I **15hrs**

Moriculture: Scope of Sericulture, Classification of Mulberry, Popular varieties in India, Draught Resistant varieties. Methods of Cultivation, Methods of Propogation, Irrigation, Manuring and Pruning. Harvesting and Storage, Pests and diseases – Fungal, Bacterial & Viral diseases.

Unit II **10hrs**

Silkworm biology : Taxonomy, Anatomy, Embryology, Life cycle, Role of Hormones in Metamorphorosis.

Unit III **10hrs**

Grainage Technology: General account on grainages, Breeding stations (P4, P3, P2 & P1).

Grainages : Procedures in a grainages – Rearing of Parental Seed cocoon, Seed Cocoon Preservation, Separation of Sexes, Moth Emergences, Pairing and Ovipositions, Methods of Industrial Egg Production, Mother Moth Examinations. Voltininsm, Diapausing and Non – diapausing egg, Artificial hatching of Diapause : Hot Acid Treatment, Cold Acid Treatment, Acid treatment after Chilling. Incubation.

Unit IV **12 hrs**

Silkworm Rearing : Rearing House and Appliances, Rearing operations: brushing, care during rearing and cleaning, feeding, optimum environmental conditions, and selection of ripe worms, spinning, mounting, harvest, storage and transport of cocoons. Rearing methods :Chawki worms Rearing: Paraffin paper rearing, box rearing, net method, cooperative rearing. Rearing of late age worms: Shelf rearing, Floor Rearing, Shoot rearing, Diseases of silkworm – Viral, Bacterial, Fungal and Protozoan diseases – pathogens; mode of infection, prevention and control measures, Pests of silkworm, Non-mulberry silkworm.

Unit V **13hrs**

Silk Reeling: Steps to be followed before Reeling: Stifling, Drying and Storing, Cooking & Boiling, Deflossing& Ridding, Reeling appliances. Method of reeling - Charka, Cottage basin & filatures

Genetics – breeding, heterosis and sex determination.

Economics of sericulture, Physical Characteristics of Cocoon & Cocoon marketing.

Unit VI **12hrs**

Sericulture farm management: Training for farmers – subsidy and loan for farm development. Silkworm as a model animal for biotechnological studies – transgenic studies and gene expression studies.

Reference Books:

1. G.Ganga., (2003) Comprehensive Sericulture, Volume-1 & Volume-2, Oxford & IBH Pub., Co., Pvt., Ltd.,
2. S.Krishnaswamy et al., (1972), Sericulture manual -1 (Mulberry cultivation), manual -2 (Silkworm rearing) & Manual -2 (Silk reeling), Food and Agriculture Organization of the United Nations, Rome.
3. Hiroo, Sibuya Ku., (1975) Text book of Tropical Sericulture, Japan Overseas Corporation , Volunteers 4-2, 24, Tokyo, Japan.
4. VenkataNarasaiah (2003), Sericulture in India, Ashish Publishing House, New Delhi.
5. Silk Production, (2004), Dr.N.G.Ojha, Dr.P.N.Panday APH Publishing Corporation, New Delhi.

SEMESTER -II

PAPER - V

DEVELOPMENTAL BIOLOGY

SUBJECT CODE : **CONTACT HOURS : 06/week**

CONTACT HOURS : 72 / Sem

Unit: 1

Theories of Embryology & Gametogenesis: **12hrs**

Theories of Embryology : Pre formation theories, Epigenetic theory, Von Baer's Law, Germplasm theory, Mosaic theory, Regulative theory, Concept of potency and toti potency, Gradient theory. Gametogenesis : Origin of primordial germ cells, Spermatogenesis- formation of spermatid, spermioteliosis, morphology of spermatozoan, Oogenesis – proliferatiave phase, growth phase – pre-vitellogenesis, vitellogenesis, types of eggs, maturation of egg.

Unit: 2

Fertilization: **15hrs**

Fertilization : Mechanism of fertilization - encounter of spermatozoa and ova, Activation of Ovum - Change in ionic permeability & Potential of egg's plasma membrane, Transient intracellular rise in calcium ions, Transient intracellular increase in pH, Cortical reaction, monospermic&polyspermic fertilization, Metabolic activation, theories of Fertilization, migration of pronuclei and amphimixis, Ooplasmic segregation; Significance of fertilization.

Unit: 3

Cleavage & Gastrulation: **15hrs**

Cleavage - Peculiarities of Cell divisions in Cleavage, Patterns of Cleavage. The Nuclei of Cleavage cells, Distribution of cytoplasmic substances in the egg during cleavage, Role of egg cortex, The Morphogenetic gradients in the egg cytoplasm, Effect of yolk on Cleavage, Cleavage in Amphioxus, Frog, Chick and Mammals. Gastrulation - The fate map, morphogenetic movement, metabolism during gastrulation, activity of gene during gastrulation, gastrulation in Amphioxus, Frog, Chick and Mammals.

Unit: 4

Organogenesis: **10hrs**

Formation of primary organ rudiments - Development of eye, brain, ear & heart

in Frog, Developmental defects or abnormalities (Teratogenesis).

Unit: 5

Metamorphosis: 10hrs

Metamorphosis in Amphibia, Hormonal regulation of Amphibian metamorphosis, Tissue reactivity in Amphibian Metamorphosis. Metamorphosis in insects.Regeneration in Planarian and Amphibian.

Unit: 6

Experimental & Applied Embryology 10hrs

Embryonic induction, Organizer concept, Theories - Neural induction, Nucleocytoplasmic Interaction, Birth control, Artificial insemination, Test tube baby, Role of genes in development.

Reference Books:

1. B.I. Balinsky (1981), An Introduction to Embryology, V Ed., Saunders College Publishing, Newyork.
2. Dr.R.C. Delela and R.Verma., (1986-87), A Text book of Chordate Embryology, V Ed., Jai Prakashnathan& co, Meerut city, India.
3. P.S.Verma and V.K. Agarwal (1975) Chordate Embryology X Ed., S.Chand& Co Pvt Ltd, Ramnager, New Delhi.
4. Bradley M.Pattern., (1957), Early Embryology of the Chick IV Ed., McGraw- Hill Book company, Newyork.
5. Bradley M.Pattern., (1948), Embryology of the pig III Ed., McGraw- Hill Book Company Newyork.

SEMESTER -II

PAPER - VI

ENVIRONMENTAL BIOLOGY & BIO DIVERSITY

SUBJECT CODE : **CONTACT HOURS : 06/ week**

CONTACT HOURS: 72 / sem

Unit: 1

Environment and Ecosystem: **12hrs**

(I) Environment : segments of environment, Atmosphere - structure, Air as an ecological factor. Hydrosphere:Hydrological cycle, Physico- chemical aspects, river and sea . Lithosphere- process of soil formation, Soil profile, Soil texture & major soil types of India.

II) Dynamics of Ecosystem: Primary & Secondary productivity, Energy flow and Ecological energetics.

Unit: 2

Bioresource Ecology: **15hrs**

Renewable resources - Solar energy, Biogas, Wind energy, Ocean energy and geothermal energy. Petroplants for future fuel and Bioenergy from waste.

Non-Renewable resources - Fossil fuels, Nuclear fuels, Petroleum and Natural gas

Unit: 3

Environmental Pollution: **15hrs**

Pesticides :Heavy metals, Radioactive pollutants, Carbon monoxide, Plastic pollution & Oil pollution. Acid rain, Greenhouse effect & Global warming. Novel methods for Pollution control- Vermitechnology, Phytoremediation &Biotreatment of wastes by Genetically Engineered Microbes. Hospital Waste Management. Biological indicators & their role in environmental monitoring & Environmental Impact Assessment.

Unit: 4

Environmental management: **10hrs**

Environmental Policy : National & International - Enforcement of Anti-Pollution Laws. Environmental awareness - Environmental education. Bio products for environmental health - Biopesticides, Biofertilizers, Biodegradable and ecofriendly products.

Unit: 5

Biodiversity: 10hrs

Characterisation : Definition, Biodiversity indices, levels and loss. Megadiversity countries & diversity hotspots, Taxonomic distribution of faunal diversity in India. Prioritization of taxa for conservation - Endemicity and Keystones; IUCN Categories of Threat; Remote sensing and GIS in Biodiversity . Biodiversity & Sustainable development.

Unit: 6

Conservation strategies: 10hrs

In-situ conservation – National Parks & Sanctuaries, Sacred groves. Ex-situ conservation - Gene banks& Cryopreservation. Earth summit & Post-Rio scenarios. Endangered Fauna of India. Wild life management in India.

References:

1. Asthana, D.K. &MeeraAsthana, (1999). Environment – Problems & Solutions, S.Chand& Company Ltd.
2. Sharma, P.D., (1999). Ecology & Environment, Rastogi Publications, Meerut.
3. Agarwal, K.C., (1996). Biodiversity, Agro Botanical Publishers.
4. Gupta, P.K., (1999). Elements of Biotechnology, Rastogi Publications, Meerut.
5. Kumar, H.D.(2003), Biodiversity and Sustainable Conservation, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

SEMESTER -II

PAPER - VII

BIO INFORMATICS

SUBJECT CODE : **CONTACT HOURS : 06** /week

CONTACT HOURS : 72 /Sem

Unit I :

Computers – Architecture – Milestone and early developments (Generations I - V) Computers as a source of Bioinformatics – Browsers used in Biology – Internet, email, Number system – Binary, Decimal and Octal number system.

Unit II :

Introduction to Bioinformatics, Objectives and Scope- Fields related to Bioinformatics, Applications of Bioinformatics in various fields.

Unit III:

Genomics: Gene – genome databases – DNA sequence databases – EMBL, Gen Bank – Gen bank submission format, DDBJ, NCBI & TIGR, Human Genome Project – Companies involved in HGP – Potential benefits of HGP – Genes located in different chromosomes. Gene expression analysis – Microarray.

Unit IV:

Proteomics: Protein sequence Databases – SWISS PROT, TrEMBL, PIR. Protein structures – Primary, Secondary & Tertiary – Protein Structure Predictions: a). Ab – intio modeling b) Identification of conserved and variable regions. Protein structure prediction software available in the web.

Unit V:

Sequence Alignment: Homology and similarity searching tool (BLAST, FASTA and CLUSTAL W)– Molecular visualization tools – Rasmol, chime, Dis – MOL, Web lab viewer, Sequencing methods – Pairwise sequence alignment - (Dot matrix, Dynamic Programming & word or K tuple method). Multiple Sequence Alignment.

Unit VI :

In silico approach or Molecular Dogging. Drug designing – objectives, rational drug design – examples of designed drugs – drug development – Pharmacogenomics – uses of Pharmacogenomics

Reference Books:

1. S.Ignacimuthu ., (2005), Basic Bioinformatics, III Ed., Narosa Publishing House Pvt. Ltd.
2. Prakash S Lohar., (2009), Bioinformatics, I Ed., MJP Publishers.
3. BG Curran., (2010), Bioinformatics , I Ed., CBS Publishers & Distributers.
4. M.Rajadurai (2010) – Bioinformatics A Practical Manual – I Ed., PBS Book Enterprises.
5. T K Attwood & D J Parry Smith., (2008), Introduction to Bioinformatics, I Ed., Himalaya Publishing House.

SEMESTER -II

ELECTIVE - II

BIOINSTRUMENTATION & BIOSTATISTICS

SUBJECT CODE : **CONTACT HOURS : 06** /week

CONTACT HOURS : 72 /Sem

Unit – I

Principles and Application:

HPLC, GCMS (Gas Chromatography), UV visible spectrophotometer, Atomic absorption spectrometer – Centrifuges, low, high and Ultracentrifuge- PCR – PH meter – ELISA.

Unit – II

Separation and Analytical Techniques:

Chromatography: High performance liquid chromatography and Gas Chromatography; Thin layer Chromatography – Electrophoresis: Paper and Disc gel Immunoelectrophoresis. Tracer Technique: Geiger Muller counter, Scintillation Counter and Autoradiography.

Unit III

Histological and Histochemical Methods:

Histochemical Techniques: Protein, Carbohydrates, Lipids and DNA. Histological preparations of Tissues for light and Electron Microscopy, Immunochemical Localization.

Unit IV

Probability – theorems of probability (Addition& Multiplication) – Probability distribution – binomial, Poison & Normal. Testing of Hypothesis, student "t" test, Chi – square distribution & their properties and uses.

Unit – V

Correlation – definition, types & methods of studying Correlation , Regression Analysis – methods, Estimation of unknown value from known value – one way ANOVA.

Unit VI

Research Methods and Thesis writing:

Identification, selection and scope of research problems – methods of literature collection and review – Planning and execution of investigation – Thesis writing – preparation and presentation of research paper for Journals, Conferences – Preparation of short communications and review articles.

Reference Books:

1. Jayaraman, J- (1972) Laborarotary manual in biochemistry New age International Pvt., Ltd., Publisher, New Delhi.

2. Oser, B.L.., Hawk's physiological chemistry 14th ed., McGrow – Hill book co., New Delhi.
3. Plummer, T.D., (1971). An Introduction to Biochemistry 3rd ed., Hill book co., New Delhi.
4. Sadasivam, S, &Manickam A, biochemical methods – Wiley Eastern ltd, New Delhi.
5. Daniel, W.W, (1978 – Biostastics. A foundation for Analysis in the Health Sciences. (Wiley Series in Probability and Statistics) 9th Ed., New York.
6. Willard, HH (1986) Instrumental methods of Analysis, 6th Ed., CBS Publication, New Delhi.

SEMESTER -II

PAPER – VIII PRACTICAL- II

DEVELOPMENTAL BIOLOGY, ENVIRONMENT & BIODIVERSITY, BIOINFORMATICS

SUBJECT CODE : **CONTACT HOURS : 06** /week

CONTACT HOURS : 72 /Sem

Developmental Biology:

Early Embryonic development of Frog – Observation of 2 cell, 4 cell, 8 cell, 16 cell, Blastula, gastrula & Yolk plug stages.

Temporary Mounting of Chick Blastoderm

Early Hours of Chick development – Observation of various stages 24,48,72 and 96 hrs of chick blastoderm.

Induced Ovulation in Frog. (Demonstration only)

Effect of Thyroxine Hormone on Amphibian Metamorphosis (Demonstration only)

Types of eggs & sperms.

Spotter : Development of Brain, eye, heart and ear in Frog.

Environment Biology& Biodiversity:

Estimation of primary productivity of aquatic plants by Light and Dark bottle Method.

Estimation of secondary productivity - Long term study on biomass production in fish.

Analysis of water samples - Salinity, Carbon dioxide, Carbonate and Bicarbonate.

Determination of Soil moisture, Soil Texture, Humus, Chloride.

Biodiversity measurement - Indices.

Pollution bioindicators– Pila, Chironomus larvae, Tilapia, Leech, Mosquitoe larva

Bioinformatics:

1. Nucleic acid Databases
   NCBI
   EMBL
   Gen Bank
2. Protein Sequence Data bases
   SWISS – PROT
   Tr- EMBL
3. Browsing of Internet
4. E-mail
5. Downloading the biological websites
6. Genome fragment Identification – DNA Microarray
7. Sequence Alignment
   Pairwise Alignment – FASTA , BLAST
   Multiple Sequence Alignment – CLUSTAL W

SEMESTER -III

PAPER – IX

GENETICS

SUBJECT CODE : **CONTACT HOURS : 06 / week**

CONTACT HOURS : 72 / sem

Unit I **15hrs**

Basics of Genetics : Gene interactions - Allelic - Complete Dominance, Incomplete dominance, Co-dominance, Lethal genes, Pleiotropism. Non-allelic - Complementary factors, Supplementary factors, Epistasis, Dominant, Recessive, Duplicate Recessive Epitasis, Duplicating factors.

Polygenic Inheritance : Skin colour in Man

Multiple Alleles : A, B, O, MN and Rh blood group inheritance.

Unit 2: **15hrs**

Role of genes in Metabolism : Metabolic disorders (Disorders of Phenyl alanine metabolism only).

Prenatal diagnosis : Ultrasound Scanning, Amniocentesis, CVS & AFP test

Sex Linked Inheritance in Man – Colour blindness and Haemophilia

Sex limited and Sex influenced genes in Man

Unit 3: **12hrs**

Molecular mechanism of Mutation

Mutagens : Radiation & Chemical

Mutation Detection :ClB technique

Chromosomal Mutation : changes in structure, Ploidy – Euploidy, Anuploidy and Syndrome.

Extra Nuclear Inheritance.

Unit 4: **10hrs**

Eugenics : Positive Eugenics, Negative Eugenics

Euthenics : Cure for Inherited diseases – Missing enzyme intake, Gene therapy

Studies on twins: mono and dizygotic twins.

Unit 5: **10hrs**

The Hardy - Weinberg Law.

Algeberic proof for Hardy - Weinberg Equilibrium.

Factors affecting Hardy - Weinberg Equilibrium.

a. Meiotic drive b. Genetic drift

c. Migration d. Selection

e. Mutation f. Non – random mating

Applications of Hardy - Weinberg Law

Unit 6: **10hrs**

Pedigree Chart.

Mendelian Traits in Man.

Human Karyotype Analysis.

Sex determination - Sex Determination in Man, Drosophila, Fowl, Butterfly, Grasshopper and Honey bee.

Transposable genetic elements or Mobile gene

Reference Books:

1. Eldon John Gardner et al ., (1991) Principles of Genetics, VIII Edition Johnwiley and son's .Inc, Newyork.
2. W. Strickberger, (1976), Genetics, III Edition, Macmillan Publishing Co., Newyork.
3. William D. Stansfield, (1969), Theory and problems of Genetics, Mc Craw- Hill Book Company, Newyork.
4. Mckusick, V.A., (1968) Human Genetics, Prentice- Hall of India Private Limited, New Delhi.
5. Lewin.B., (1999) 'Genes' , VI Ed., Oxford University Press, Oxfold.

SEMESTER -III

PAPER - X

BIOTECHNOLOGY

SUBJECT CODE : **CONTACT HOURS : 06 / week**

CONTACT HOURS :72 /Sem

Unit: 1 **12hrs**

Introduction and Scope of Biotechnology :

Genetic Engineering :

Cloning vectors - Plasmids, Phages, Cosmids, Ti plasmids, Animal , Viral Vectors and Shuttle Vectors. Gene cloning – Human, Shot Gun Cloning, Restriction enzymes and their uses. Construction and Screening of DNA Libraries (Genomic and cDNA Library)

Unit: 2 **10hrs**

Microbial systems: Role of Microbes in Biotechnology, Bioweapons, Environmental application, Ore leaching, Impacts and issues related to rDNA technology

Unit: 3 **12hrs**

Animal Systems: Invitro fertilization (IVF) in Humans, Embryo Transfer (ET) in human. Transgeneic techniques-Transfection, microinjection, Electroporation and Retroviral Method. Transgenic animal-fish, Mice, Sheep and Cow.

Unit: 4 **13hrs**

Animal Tissue Culture: Culture techniques, Primary culture, secondary Culture. Cell lines – evolution & maintenance of cell lines. Large scale culture of cell lines. Stem cell biology-Embryonic stem cell and Adult stem cell. Organ culture- Method of organ culture, Artificial Skin and Cartilage.

Unit: 5 **15hrs**

Medical Biotechnology:

Biotechnology and Human health care: rDNA in Medicine – Interferon, Interleukin, Tissue Plasmid and activator, Blood clotting factor VII and Insulin. Gene therapy - Somatic cell Line therapy, germ line therapy, different tissues involved in gene therapy. Hybridoma technology, Human Genome Project and Microarray.

Unit: 6 **10hrs**

Applied Biotechnology:

DNA finger printing: Use of DNA finger printing in forensic science. Intellectual property rights, patent, Nanotechnology - Nanomaterial Synthesis, Charcterization& Applications.

Reference Books:

1. R.C. Dubey, (1993), A Text book of Biotechnology. III Ed., S.Chand& company Ltd.
2. H.K.Das, (2004), Text book of biotechnology III Ed., Wiley India (P) Ltd.
3. V.Kumaresan, (1994), Biotechnology VI Ed., - Himalaya Publishing house.
4. S.C.Rastogi ., (2007), Biotechnology - Principles and Applications- I Ed., Narosa Publishing house.
5. Mohan P. Arora., (2003), Biotechnology, I Ed., Himalaya Publishing house.

SEMESTER -IV

PAPER - XI

ANIMAL PHYSIOLOGY

SUBJECT CODE : **CONTACT HOURS : 06/ week**

CONTACT HOURS : 72 / sem

Unit: 1 **12hrs**

Homeostasis: Biological control systems – Neural, Chemical and Endocrine.

Ionic basis of cellular excitability.

Properties of Cell Membrane - transport across cell membrane.

Food - Digestion, Absorption and Co-ordination of digestive activities.

Unit:2 **10hrs**

Respiration & Circulation

Respiratory organs and their ventilation, Respiratory pigments - Transport of Respiratory Gases , O_2 as a limiting factor in the environment.

Body Fluids - Blood and Blood constituents, Mechanism of Blood coagulation, Hemodynamics

Heart - Structure, Origin and Conduction of Heart beat

Unit: 3 **15hrs**

Excretion, Osmotic and ionic regulations and Thermo regulation:

Organs of excretion, nitrogenous wastes. Structure of Nephron - Juxtraglomerulus apparatus of Nephron.

Physiology of Urine Formation & Counter Current mechanism, Renal regulation of acid - base balance.

Osmoregulation - Hormones and regulation of water and Electrolytes.

Thermoregulation - Temperature and rate of biological activities, Temperature compensation in Poikilotherms and Homeotherms.

Unit: 4 **15hrs**

Nervous Integration:

Transmission of nerve impulse: Excitation, Conduction Interneuronal transmission - Ephatic and synaptic transmission - Chemical synapses and Neuro muscular junction.

Unit: 5 **10hrs**

Muscle and receptors

Muscular movement : Mechanisms of Muscle contraction –Excitation, Contraction &Coulpling (ECC) , Energetics of muscular contraction.

Receptors: Photoreceptor, Chemoreceptor, Mechanoreceptor and Thermoreceptor.

Unit: 6 **10hrs**

Endocrine regulation on reproduction

Vertebrate controls: Hypothalamic hormones – Gonadotrophins. Gonadal steroids – Estrogen&Progestron. Regulation of Breeding cycle – Oestrous & Menstrual cycles. Placental Hormones ,Relaxin and the hormones associated with Parturition.

Reference Books:

1. William S. Hoar, General and Comparative Physiology Prentice - Hall of India (private) Ltd, New Delhi.
2. C.Ladd. Prosser, Frank A. Brown, Comparative Animal Physiology , II Ed., W.B. Saunders company, London.
3. Kuntsachmidt- Nielsen, (2013), Animal physiology: Adaptation and Environment- III Ed., Press syndicate of the University of Cambridge, London.
4. Elaine ,N. Marieb,(2006), Human Anatomy & physiology, VI Ed., Dorling Kindersley (India) Pvt.Ltd.,
5. Christopher D. Moyes& Patricia M.Schulte., (2007), Principles of Animal Physiology, Dorling Kindersley (India) Pvt.Ltd.,

SEMESTER -IV

PAPER - XII

IMMUNOLOGY

SUBJECT CODE: **CONTACT HOURS : 06/week**

CONTACT HOURS : 72//Sem

Unit: 1 Basics of Immunology **10hrs**

Introduction, History of Immunology, Types of Immunity: Innate & Acquired Immunity, Humoral and Cell mediated Immunity.

Unit: 2 Cells and Tissues of the immune system **10hrs**

. Histology of Lymphoid organs - Concepts of Primary and Secondary lymphoid organs. T and B lymphocytes - T cell regulation - T- cell and B-cell receptors, T cell & B cell

maturation.

Unit: 3 Immune responses of Antigen and Antibody **12hrs**

Antigen : Characteristics of Antigen, types of Antigen and factors influencing antigen. Antibody: Structure of Immunoglobulin, types and characteristics of Immunoglobulins. Synthesis of Immunoglobulin and Genetic basis of Class Switch, Disorders of Immunoglobulin synthesis. Immunodiagnostics

Unit: 4 Antigen and Antibody Reactions **10hrs**

Antigen and Antibody reactions : Agglutination, Precipitation - Complement System and Complement Fixation Test, Role of Complements in Immune Response – Immunoflouresence, Hypersensitivity Reactions.

Unit: 5 Vaccines and Health **15hrs**

Major Histocompatibility -MHC restriction, Haematopoiesis and differentiation: Gene regulation of Haematopoiesis. Vaccines: Active and Passive immunization, Principles and types of vaccines: Viral and bacterial vaccines used in human, DNA Vaccine, Subunit Vaccine, Auto immunodiesases.

Unit: 6 Immunity to Infectious diseases **15hrs**

Transplantation Immunology , Tumour immunology, AIDS and other Immuno deficiencies. ELISA , Western Blotting , Hybridoma Technology - Monoclonal antibodies.

Reference Books:

1. Kuby ., (1992), Immunology, IV Ed., - W.H. Freeman and company.
2. Evan M.Roitt., (1988), Essentials Immunology- VI Ed., ELBS imprint.
3. Shailendra Kumar Sinha., (2009), Immunology and Medical Zoology- I Ed., - Oxford Book Company.
4. David male., (2008), Immunology VII Ed., Elsevier Health sciences.
5. I.Kannan., (2007), Immunology I Ed., - MJP Publisher .

SEMESTER - IV

Elective -III

Ornamental Fish Culture

SUBJECT CODE : **CONTACT HOURS : 06 / week**

CONTACT HOURS : 72 / Sem

Unit I : **15hrs**

Construction of Home Aquarium: Design and Construction of Aquarium tank, Accessories used in Aquarium, (aerators, filters, types of filters and hand nets), setting up of Aquarium tank (gravel / pepples, plants, ornamental objects and fishes, selection of species). Aquarium plants and its importance.

Unit II : **15hrs**

Taxonomy and Biology of popular Ornamental fishes : Live -bearers (ovo -viviparous) - Red swordtail, Platy, Guppy and Molly. Egg layers (oviparous) - Gold fish, Siamese fighting fish, Gourami, Angel fish, Oscar, Koi carp, Discus and Red Tail shark, Breeding and Spawning of Live bearers and Egg layers. Induced breeding and production of Mono sex fish.

Unit III : **10hrs**

Nutritional requirements of Ornamental fishes - different kinds of feeds - Artificial and Live food. Culture of live food organisms -Infusorians, Rotifers, Cladocerans, Brine shrimp, Chironomus and Tubifex. Artificial feed - feed formulation, Balanced diets for Aquarium fishes.

Unit IV : **10hrs**

Cleaning the aquarium, maintenance of water quality – Temperature, Water change, Ammonia, $0_2/CO_2$, Water hardness and Control of Snail and control Algal growth in Aquarium tanks.

Unit V : **10hrs**

Common diseases of aquarium fishes- Protozoan, Fungal, Bacterial and Nutrional diseases. Their diagnosis and treatment, Problems of over feeding.

Unit VI : **12hrs**

Commercially important Marine Ornamental fishes. Purchase and Transport of Ornamental fishes. Use of Sedatives. Other Ornamental organisms - Anemones, Lobsters, Shrimps. Entrepreneurship development in Ornamental fish culture.

Reference Books :

1. J.D. Jameson and R.Santhanam, (1996) , Manual of Ornamental fishes and Farming Technologies - Fisheries Colleges & Research Institute TANVASU, Tuticorin -628 008.
2. R. Santhakumar et al. (2007). Manual on Freshwater Ornamental Fish Culture, Dept. of Fisheries extension, Fisheries College and Research Institute, TANVASU, Tuticorin - 628 008.
3. V.K. Venkatataramani et al., (2004). Biodiversity and stock Assessment of Marine Ornamental fishes. Dept. of Fisheries Biology & Capture Fisheries, Fisheries College & Research Institute, TANVASU, Tuticorin -628 008.

SEMESTER - IV

PAPER – XIV PRACTICAL - III

ANIMAL PHYSIOLOGY, IMMUNOLOGY AND EVOLUTION

SUBJECT CODE : **CONTACT HOURS : 06 / week**

CONTACT HOURS : 72 / Sem

Animal Physiology:

Effect of Temperature on Oxygen consumption of fish & calculation Q10

Effect of Temperature on Opercular movements of fish & calculation Q10

Effect Temperature on Heart Beat of Fresh Water Mussel & calculation of Q10 (Demonstration only)

Effect of salinity on Oxygen consumption of fish

Effect of salinity on Opercular movement of fish

Effect of salinity on Heart Beat of Fresh Water Mussel (Demonstration only)

Estimation of Salt loss in a fish

Estimation of Salt gain in a fish

Mounting of haemin crystals.

Blood pressure recording

Estimation of Blood sugar.

Immunology:

Histology of Lymphoid organs.

Isolation of Lymphocytes and enumeration.

Bleeding and preparation of complement and antisera

Haemagglutination and Haemolysis titration

Ammonium Sulphate Precipitation - Method of Antibody Production

Ouchterlonytechnique -Immunodiffusion (Demonstration only).

Immuno Electrophoresis of Human Serum and Anti-Human Serum (Demonstration only).

ABO Blood Grouping and Rh typing

Serum Separation

Qualitative Detection of Antibodies to HIV – 1 & HIV – 2 in Human serum / Plasma (Visit to Immunology Lab)

Evolution:

Variation – Finger print

Experiment with beads to illustrate the gene pool concept and production to genotypes

Use of Models to study selection in large and small population and principles of genetic drift

Homologous &Analogus organs

Vestigial organs

Fossils

Embryos of various Vertebrates

Examples of evolutionary importance PeriPatus, Limulus

Animals with adaptive colouration (Leaf insect, Stick insect, Chameleon)