

**OBJECTIVES:**

1. To develop awareness of Biosystematics.
2. To study the diverse forms of invertebrate
3. To acquire knowledge about the causes, symptoms, and prevention of some human protozoan & helminth diseases.
4. To understand the interaction of man with other animals.

**UNIT – I: PROTOZOA**

- 1 .General characters
- 2 .Classification of Protozoa upto classes with examples.
- 3 .*Elphidium*(type study)

**PORIFERA**

- 1 General characters
- 2 Classification of Porifera upto classes with examples.
- 3 *Sycon*– External Characters, Types of cells.
- 4 Skeleton in Sponges.
- 5 Canal system in sponges.

**UNIT – II: COELENTERATA**

- 1 General characters
- 2 Classification of Coelenterata upto classes with examples
- 3 *Obelia* - External Characters, Structure of Polyp and Medusa
- 4 Polymorphism in coelenterates
- 5 Corals and coral reefs formation

**PLATYHELMINTHES**

- 1 General characters & classification upto classes with examples.
2. *Fasciola hepatica* - External Characters, Excretory system, Reproductive System, Life History and pathogenicity.
3. Parasitic adaptations of flat worms

**UNIT – III: NEMATHELMINTHES**

- 1 .General characters
2. Classification of Nematelminthes upto classes with examples
3. Brief account of some common nematode parasites (*Ancylostoma*, *Enterobius*, *Trichinella*, *Dracunculus*).

**ANNELIDA**

- 1 .General characters
- 2 .Classification of Annelida upto classes with examples
- 3 .*Hirudinaria granulosa* - External Characters, Digestive System, Excretory System Nervous system and Reproductive System.
- 4 . Coelom and Coelomoducts
- 5 .Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

**UNIT – IV: ARTHROPODA**

1. General characters
2. Classification of Arthropoda upto classes with examples.
3. Prawn - External Characters, Appendages, Respiratory system, Circulatory System, Nervous system and Sense organs (Statocyst and Eye).
4. *Peripatus* - Structure and affinities.
5. Larval forms of Crustacea (*Nauplius*, *Zoea*, *Mysis*, *Megalopa*, *Alima*).

**MOLLUSCA**

1. General characters
2. Classification of Mollusca upto classes with examples
3. Pilaglobosa- Structure of radula, Respiratory system.
4. Pearl formation in Pelecypoda
5. Torsion in gastropods

**UNIT – V: ECHINODERMATA**

1. General characters&
2. Classification of Echinodermata upto classes with examples.
3. Water vascular system in star fish.

**HEMICHORDATA**

1. General characters
2. Classification of Hemichordata upto classes with examples.
3. *Balanoglossus* - Structure, organization and affinities.

**NON – CHORDATE LARVAL FORMS**

1. Amphiblastula (porifera)
2. Ephyra (Aurelia)
3. Trochophore (nereis)
4. Glochidium (unio)
5. Bipinnaria (echino)
6. Ophiopluteus (echino)
7. Echinopluteus (echino)
8. Tornaria (hemichordata).

**TEXT BOOKS:**

1. "Modern Text Book of Zoology" Invertebrates by R.L.Kotpal; S.K. Agarwal, R.P.Khetrapal-Rastogi Publications, Meerut -25002, Edition: 1996.
2. "A Manual of Zoology" Vol.I by Prof. M.Ekambaranathlyer & S. Viswanthan – Printers & Publishers – V.Subramanian, Madras, Edition 1982 .
3. "Unified Course in Zoology" by DR. Ramesh chand – Jain prakashNath publications, Meerut, Edition : 1991.
4. Zoology - Dr. BillaMadanmohan ; Telugu Akademi, Himayatnagar, Hyderabad.

**REFERENCES:**

1. "Text Book of Zoology" by T.Jeferey Parker & William A. Haswell. Edited by C.B.S publishers, BholaNath Nagar, New Delhi – 110032, Edition:1992.
2. "Invertebrate Zoology" by T.C.Majuria – pradeep publications, Jalandhar Edition :1985.
3. "Invertebrate Zoology" by R.L.Kotpal – Rastogi publications, Meerut – 35002 Edition:199

**Major Dissections: (Demonstration only)**

**Leech:** 1. Reproductive system **Prawn:** Nervous system  
2. Nervous system **PILA :** Digestive system

:

**Minor dissections / Mounting: (Demonstration only)**

**Sponge:** Spicules.

**Leech:** 1. Jaw mounting  
2. Nephridium

**Nereis:** 1. Parapodium

**PRAWN:** Appendages, statocyst. **PILA :** Radula.

**Spotters:** Study of prepared slides & specimens pertaining to theory .

**Protozoa:** Paramecium (W.M); Paramecium. Binary fission, Paramecium – conjugation,  
Polystomella, Radiolaria, Vorticella .

**Porifera :** Scypha, Cliona, Euplectella, Hyalonema, Euspongia, Gemmule,

**Coelenterata :** Obelia colony, Medusa, , Physalia, Velella, scyphistoma larva, Ephyra Larva,  
Adamsia, Meandrina, Corallium, Gorgonia, Pennatula.

**Helminths :** Planaria, Fasciola, Redia, Cercaria, Dracunculus, Taenia solium, Cysticercus,  
Ascaris, Trichurus.

**Annelida :** Nereis, Hetero nereis, Aphrodite, leech, Tubifex , Hirudo , Trochophore.

**Arthropoda :** Peripatus, Sacculina, Clibanarius, Albunea, Ocypoda, Squilla , Lepisma,  
Poecilocera, Dragon fly, Mantis, Dytiscus, Limulus, Scorpion, Julus,  
Scutigera..

**Larval forms:** Nauplius, Zoea, Megalopa, Alima.

**Mollusca:** Cypraea, Aplysia, Chiton, Glochidium larva, Lamellidens, Pinctada vulgaris,  
Dentalium, sepia, Octopus, Nautilus , Loligo.

**Echinodermata:** Palmipes, Ophiothrix, Stomopneustes, Clypeaster, Molpadia ,  
Antedon, Cucumaria.

**Larval forms :** Bipinnaria, Ophiopluteus, Echinopluteus.

**Hemichordata:** Balanoglossus , tornaria larva.

**OBJECTIVES:**

1. To gain knowledge about the cell organelle and their role in life processes.
2. To acquire knowledge about the basic physiological processes.
3. To understand the basic laboratory techniques in physiology.

**UNIT – I**

**1. CYTOLOGY:**

1. Definition, history, prokaryotic and eukaryotic cells, virus, viroids, mycoplasma
2. Electron microscopic structure of eukaryotic cell.
3. Plasma membrane – Different models of plasma membrane.

**UNIT – II**

**2. CELL ORGANELLE:**

1. Structure and functions of Endoplasmic Reticulum
2. Structure and functions of Golgi apparatus
3. Structure and functions of Lysosomes
4. Structure and functions of Ribosomes
5. Structure and functions of Mitochondria
6. Nucleus
7. Chromatin - Structure and significance, Chromosomes - Structure, types, functions

**UNIT – III**

**PHYSIOLOGY:**

1. Definition of digestion & Types of digestion - Extracellular, intracellular & cellulose digestion. Organs of digestion, physiology of digestion in different regions, Absorption of digested products, Gastro Intestinal Hormones.
2. Respiration – Pulmonary ventilation, transport of oxygen and carbon dioxide. Types of respiration – external and internal. Properties and functions of Respiratory pigments. Mechanism of respiration in mammals. Chloride shift, Bohr Effect, and oxygen dissociation curve.
3. Circulation - Structure and functioning of heart, Cardiac cycle. Types of heart, coagulation of blood.

**UNIT – IV:**

Muscle contraction - Ultra structure of muscle fiber, molecular and chemical basis of muscle contraction (Sliding filament mechanism of muscle contraction .Role of calcium, ATP utilization and its replenishment).

Structure of neuron, Functional properties of neuron. Nerve impulse transmission – Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibers. Synapse, Synaptic transmission.

**UNIT – V:**

Excretion - Structure of nephron, urine formation, counter current mechanism.

Endocrine glands - Structure, secretions and the functions (of hormones) of pituitary, thyroid, parathyroid, adrenal glands, pancreas, thymus, pineal body, male and female sex hormones.

Hormonal control of reproduction in a mammal: Estrous and menstrual cycle.

**TEXT BOOKS:**

1. A text Book of Animal Physiology with related Biochemistry by A.K.Berry, Dr. As.Kapoor, Dr.R.Nagabhushanam. Emkay Publications, Delhi
2. A Text Book of Animal Physiology and Ecology by P.S.Verma, B.S.Tyagi, V.K.Agarwal, S.Chand and Company Ltd. New Delhi.
3. Animal Behaviour by ReemaMathur, Rastogi and Company, Meerut.
4. A text book of Animal Behaviour by Harjindra Singh, Anmol Publications Pvt. Ltd., New Delhi.
5. Essentials of Animal Physiology by Rastogi.

**REFERENCE: BOOKS:**

1. Living Body – a text book in Human Physiology by Charles Herbert Best, Norman Burke Taylor, Asia Publishing House, New Delhi.
2. Animal Physiology by GoelandSastry, Rastogi Publications, Meerut.
3. Animal Behaviour by ManjuYadav, Ram NathKedarNath, Meerut.
4. Human Physiology by Chatterjee. “Cell Biology, Genetics, Molecular Biology, Evolution &Ecology” by P.S.Verma&A.K.Agarwal – S.Chand& company L.t.d, New Delhi.
5. “Cell Biology, Genetics, Molecular Biology, Evolution & ecology” by P.S.Verma&A.K.Agarwal – S.Chand& company L.t.d, New Delhi.

### **CYTOLOGY:**

Ultra structure of cell – model

Observation of chromosomes during stages of mitosis.

Observations of Polytene chromosomes in the Salivary glands of insects.

Preparation of temporary slides of Mitotic divisions with onion root tips.

### **PHYSIOLOGY**

1. Identification and study of L.S. of heart of a mammal, T.S. of ileum of frog, T.S. of Pancreas, T.S. of liver, T.S. of artery, T.S. of vein, Blood of frog and man, Human excretory system. L.S. and T.S. of Mammalian kidney, and V.S. of Mammalian ovary and mammalian testis.
2. Mammalian Viscera – Rat.
3. Experiment to demonstrate action of Salivary amylase on starch.
4. Identification of proteins, carbohydrates and fats (qualitative tests for carbohydrates, proteins & fats).
5. Zonation of gut in relation to PH of enzymes.
6. Determination of Blood groups and Rh factor.
7. Estimation of Blood pressure by Auscultatory method
8. Estimation of Hb% by Sahli's method.

\*\*      \*\*      \*\*

### **UNIT – I: Handling and Principles of fish Preservation**

1. Handling of fresh fish, storage and transport of fresh fish, post mortem changes (rigor mortis and spoilage), spoilage in marine fish and freshwater fish.
2. Principles of preservation – cleaning, lowering of temperature, rising of temperature, denudation, use of salt, use of fish preservatives, exposure to low radiation of gamma rays.

### **UNIT – II: Methods of fish Preservation**

1. Traditional methods - sun drying, salt curing, pickling and smoking.
2. Advanced methods – chilling or icing, refrigerated sea water, freezing, canning, Irradiation and Accelerated Freeze drying (AFD).

### **UNIT – III: Processing and preservation of fish and fish by-products**

1. Fish products – fish minced meat, fish meal, fish oil, fish liquid (ensilage), fish protein concentrate, fish chowder, fish cake, fish sauce, fish salads, fish powder, pet food from trash fish, fish manure.
2. Fish by-products – fish glue, ising glass, chitosan, pearl essence, shark fins, fish leather and fish maws.

#### **Seaweed Products**

1. Preparation of agar, algin and carrageen. Use of seaweeds as food for human consumption, in disease treatment and preparation of therapeutic drugs.

### **UNIT – IV: Sanitation and Quality control**

1. Sanitation in processing plants - Environmental hygiene and Personal hygiene in processing plants.
2. Quality Control of fish and fishery products – pre-processing control, control during processing and control after processing.

#### **Regulatory affairs in industries**

### **UNIT – V: Quality Assurance, Management and Certification**

1. Seafood Quality Assurance and Systems: Good Manufacturing Practices (GMPs); Good Laboratory Practices (GLPs); Standard Operating Procedures (SOPs); Concept of Hazard Analysis and Critical Control Points (HACCP) in seafood safety.  
5.1.2 National and International standards – ISO 9000: 2000 Series of Quality Assurance System, Codex Alimentarius.

### **REFERENCE BOOKS:**

1. Balachandran KK. 2001. Post-harvest Technology of Fish and Fish Products. Daya Publ.
2. Bond, et al. 1971. Fish Inspection and Quality Control. Fishing News Books, England.
3. Clucas IJ. 1981. Fish Handling, Preservation and Processing in the Tropics. Parts I, II. FAO.
4. Gopakumar K. (Ed.). 2002. Text Book of Fish Processing Technology. ICAR.
5. Govindan, TK. 1985. Fish Processing Technology, Oxford-IBH.
6. Hall GM. (Ed). 1992. Fish Processing Technology. Blackie.
7. Huss HH, Jakobsen M & Liston J. 1991. Quality Assurance in the Fish Industry. Elsevier.
8. John DEV. 1985. Food Safety and Toxicity. CRC Press.
9. Krenzer R. 1971. Fish Inspection and Quality Control. Fishing News.
10. Larousse J & Brown BE. 1997. Food Canning Technology. Wiley VCH.
11. Nambudiri DD. 2006. Technology of Fishery Products. Fishing Chimes.
12. Regenssein JM & Regenssein CE. 1991. Introduction to Fish Technology. VanNostrand Reinhold.
13. Rudolf K. 1969. Freezing and Irradiation of Fish. Fishing News (Books).

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM  
VI SEMESTER **ZOOLOGY** TIME: 3 Hrs  
Z-A3-6551(2) **POSTHARVEST TECHNOLOGY** Max. Marks: 50  
w.e.f. 2015 – 2018 ("15AC") **PRACTICAL SYLLABUS – IV A3**

1. Observation of common types of crafts nets and gears based on models provided in the Department and on visit to fishing villages for on the spot study **Project Work.**

2. Visit to a fish breeding centre / fish farms and submit a project report

**(or)**

Visit to a feed manufacturing unit and submit a project report

**(or)**

Visit to a shrimp hatchery / shrimp farms and submit a project report

**(or)**

Visit to a shrimp processing unit and submit a project report.

3. Life cycle of *Penaeus monodon*.

\*\*            \*\*            \*\*

## **OBJECTIVES:**

1. To understand the importance of biotechnology in the utilization of microorganisms, cellular components and transgenic animals for beneficial use.
2. To study the techniques of recombinant DNA technology.
3. Application of biotechnology in industries, agriculture, & medicine.
4. To inculcate interest in research.

## **COURSE**

### **UNIT – I: Tools of Recombinant DNA technology - Enzymes and Vectors**

**Restriction modification systems:** Types I, II and III. Mode of action, nomenclature, applications of Type II restriction enzymes in genetic engineering.

**DNA modifying enzymes and their applications:** DNA polymerases. Terminal de - oxynucleotidyl transferase, kinases and phosphatases, and DNA ligases

**Cloning Vectors:** Plasmid vectors: pBR and pUC series, Bacteriophage lambda and M13 based vectors, Cosmids, BACs, YACs,

### **UNIT – II: Techniques of Recombinant DNA technology**

**Cloning:** Use of linkers and adaptors

**Gene delivery:** Microinjection, electroporation, biolistic method (gene gun), liposome and viral-mediated delivery

**PCR:** Basics of PCR.

**DNA Sequencing:** Sanger's method of DNA sequencing- traditional and automated sequencing

**Hybridization techniques:** Southern, Northern and Western blotting,

**Genomic and cDNA libraries:** Preparation and uses

### **UNIT – III: Animal Cell Technology**

**Cell culture media:** Natural and Synthetic

**Cell cultures:** primary culture, secondary culture, continuous cell lines; Protocols for Primary Cell Culture; Established Cell lines (common example HeLa); Organ culture; Cryopreservation of cultures.

**Hybridoma Technology:** Cell fusion, Production of Monoclonal antibodies (mAb), Applications of mAb

**Stem cells:** Types of stem cells, applications

**UNIT – IV: Reproductive Technologies & Transgenic Animals**

**Manipulation of reproduction in animals:** Artificial Insemination, *In vitro* fertilization, microfertilization, super ovulation, GIFT (gamete intrafallopian transfer), Embryo transfer, Embryo cloning

**Transgenic Animals:** Strategies of Gene transfer; Transgenic - sheep, - fish; applications.

**UNIT – V: Applied Biotechnology**

**Industry:** Fermentation: Different types of Fermentation:- briefly (Submerged & Solid state; batch, Fed batch & Continuous; Stirred tank, Air Lift, Fixed Bed and Fluidized)  
Downstream processing - Filtration, centrifugation, extraction, chromatography, spray drying and lyophilization.

**Agriculture:** fisheries – monoculture in fishes, polyploidy in fishes; DNA fingerprinting

**TEXT BOOKS:**

1. Genetic Engineering by Mohan P.Arora. Himalaya Publishers.
2. Genetics by Sinott, Dunn, Dobzanhansky . T.M.H Edition
3. Genomics and Biotechnology by P.K.Gupta .
4. A Text book of Biotechnology by U.Satyanarayana.
5. Biotechnology by B.D.Singh.
6. Text book of Biotechnology by R.C.Dubey.
7. Genetics and Evolution by P.L.Kochhar.
8. CellBiology, Genetics & Molecular Biology by N.Arumugam.

\*\*        \*\*        \*\*

**ANY SIX OF THE FOLLOWING:**

1. Isolation of Plasmid DNA from *E. coli*
2. Preparation of genomic DNA from *E. coli*/animals/ human.
3. Restriction digestion of lambda ( $\lambda$ ) DNA using EcoR1 and Hind III.
4. Preparation for insertion and vector for ligation.
5. Performance of ligation reaction using T4 DNA ligase.
6. Preparation of competent cells
7. Transformation of *E. coli* with plasmid DNA using CaCl<sub>2</sub>,
8. Selection of transformants on X-gal and IPTG
9. Techniques: Western Blot, Southern Hybridization, DNA Fingerprinting(with pcr demo only).
10. Amplification of DNA by PCR (Demo).
11. Packing and sterilization of glass and plastic wares for cell culture.
12. Preparation of culture media.

\*\*      \*\*      \*\*

**OBJECTIVES:**

1. To gain knowledge about the concepts of Bio-Systematics.
2. To Learn about Developmental biology
3. To understand the morphology and anatomy of chordates.

**UNIT – I: GENERAL CHARACTERS OF CHORDATA**

**PROCHORDATA**

1. Salient features of Cephalochordata
2. Structure of *Branchiostoma* ( *AMPHIOXUS*), larva of *amphioxus*.
3. Affinities of Cephalochordata
4. Salient features of Urochordata
5. Structure and life history of *Herdmania*
6. Significance of Retrogressive metamorphosis

**UNIT – II:**

**CYCLOSTOMATA**

1. General characters of Cyclostomes
2. Comparison of the *Petromyzon* and *Myxine*

**PISCES**

1. General characters of Fishes
2. Classification of fishes up to subclasses with examples
3. *Scoliodon* - External features, Digestive system, Respiratory system, Heart, Brain
4. Migration in Fishes
5. Types of Scales
6. Dipnoi

**UNIT – III:**

**AMPHIBIA**

1. General characters of Amphibia.
2. Classification of Amphibia upto orders with examples.
3. *Rana hexadactyla* - External features, Digestive system, Respiratory system, Heart, Brain.
4. Parental care in Amphibia.

**REPTILIA**

1. General characters of Reptilia
2. Classification of Reptilia upto orders with examples
3. *Calotes* - External features, Digestive system, Respiratory system, Heart, Brain
4. Identification of Poisonous snakes.
5. Poison apparatus and biting mechanism in poisonous snakes.
6. Skull in Reptiles.

**UNIT – IV:****AVES**

1. General characters of Aves
2. Classification of Aves upto subclasses with examples.
3. *Columba livia* - External features, Digestive system, Respiratory system, Heart, Brain
4. Migration of Birds
5. Flight adaptation of birds.

**MAMMALIA**

1. General characters of Mammalia
2. Classification of Mammalia upto sub classes with examples
3. Comparison of Prototherians, Metatherians and Eutherians
4. Dentition in mammals
5. Aquatic mammals and their adaptations.

**UNIT- V****DEVELOPMENTAL BIOLOGY**

1. Gametogenesis ( spermatogenesis, oogenesis )
2. Fertilization
3. Parthenogenesis (Haploid and Diploid).
4. Types of eggs.
5. Types of cleavages.
6. Development of Frog upto formation of primary germ layers.
7. Formation and functions of Foetal membrane in chick embryo
8. Development, types and functions of Placenta in mammals.

**TEXT BOOKS:**

1. Modern Text book of Zoology – vertebrates by R.L.Kotal – Rastogi Publications, Meerut – 25002, Edition 2004 -2005.
2. Manual of Zoology – Vol II by Ekambaranatham – Madras – V Edition (1985)
3. A Text Book of zoology – vol II by P.S.Dhami&J.K.DhamiPradeep publications, Delhi; Edition 1992.
4. Introduction to chordates by MajpuriaTrilok Chandra – S.Nagin& Co – Jallundhar 1974.
5. Chordate embryology by P.S.Verma, V.K.Agarwal&B.S.Tyagi, S.Chanda& Company ltd Delhi, edition – 1994.

**REFERENCE BOOKS:**

1. A Text Book of Zoology – vol II by T.Jefferyparkar and William Haswell – CBS publishers & Distributors – Delhi 7<sup>th</sup> edition.
2. The Cambridge Natural History – vol VI & VII by SS.F.Harmer&A.E.Shipley – wheldon& Wesley ltd. England – 1968.
3. A Text Book of chordate embryology by Dr. R. C. Dalela& Dr. S. R. Verma- Jai prakash& co. Meerut city. v.p. Edition 1983
4. Modern Zoology by Dr. Ramesh Gupta – Prakash publications, Muzaffarnagar -v.p. Edition 1993 – 1994
5. A Text Book of chordate zoology by R.C.Dalela – Jai PrakashNath publications. Meerut. Edition 1998.
6. Development Biology by Dr.K.V.Satry& Dr. VineetaShukal. Rastogi publications. Meerut – 250002, Edition .2004.

**MAJOR DISSECTIONS (Demonstration only)**

**SHARK** : 1. Arterial System, 2. 5<sup>th</sup> & 7<sup>th</sup> Cranial Nerves.

**MINOR DISSECTIONS / MOUNTINGS:** ( Demonstration only)

**SHARK** : 1. Brain 2. Placoid Scales. 3. Primitive streak 4. 24 hrs chick embryo.

**SPOTTERS:**

**PROCHORDATA:** Amphioxus (Entire), T.S. of Amphioxus through Pharynx, Tail; larva of Amphioxus; Ascidia, Ascidian Tadpole.

**PISCES** : Petromyzon, Ammocoetus Larva, Myxine, Zygaena, Trygon or Torpedo, Narcine, Pristis, Echeneis, Cynoglossus, Rastrelliger, Tetradon, Hippocampus ( Male & Female ), Exocoetus, Anguilla or Muraena, Labeo, Catla, Clarius. - placoid scale, cycloid scale, ctenoid scale.

**AMPHIBIA:** Bufo, Hyla, Alytes, Necturus, Triton (newt), Salamandra (amphystoma), Axolotyl Larva, Ichthyophis with eggs.

**REPTILIA:** Draco, Chameleons, Varanus, Mabuya, Phrynosoma, Dryophis, Russell's Viper, Hydrophis or Enhydrina, Bungarus (krait), Cobra, Testudo, Trionyx, Lissemys.

**AVES:** Athena brama, Anas, Alcedo, Passer domesticus, Corvus splendens, Acridothera tristis, Psittacula, Columba livia, Merops (bee eater), Upupa epops, Pycnonotus (bulbul) .

**MAMMALIA:** Funambulus, Macaca, Pteropus (bat), Crocidura (shrew), Rattus, Hystrix (Porcupine), Manis, Herpestes (mongoose), Echidna or (spiny anteater), Ornithorhynchus (duckbilled platypus), Loris (monkey).

**OSTEOLOGY:** Lower Jaw and Girdles of Frog, Vertebrae and limbs of Frog.

Skulls of Calotes, Pigeon and Rabbit. Vertebrae of Pigeon and Rabbit.

Limbs and Girdles of Calotes, Pigeon and Rabbit.

**EMBRYOLOGY :** Blastula & gastrula of frog, Yolk plug of frog.

Hen's egg, Primitive streak, 24 hrs, 48 hrs chick embryo.



**OBJECTIVES:**

1. To acquire knowledge of the phenomenon of heredity.
2. To create understanding of the importance of genetic variation in species.
3. To Learn about the dynamic nature of the interrelationships between organisms and their environment.
4. To understand the role of evolution in the formation of new species.
5. To gain knowledge of the geographical distribution of animals.

**COURSE:**

**UNIT – I: GENETICS**

1. Mendel's work on transmission of traits.
2. Principles of inheritance
3. Interaction of genes.
4. Incomplete dominance and co dominance
5. Lethal alleles, Epistasis, Pleiotropy.

**UNIT – II:**

6. Sexdetermination, Genetic abnormalities.
7. Sex linked inheritance
8. Linkage and crossing over
9. Extra chromosomal inheritance
10. Human karyotyping, Barr bodies, Lyon hypothesis & amniocentesis.

**UNIT – III: ECOLOGY**

1. Meaning and scope of Ecology
2. Important abiotic factors of Ecosystem - Temperature, light, water, oxygen .
3. Nutrient cycles - Nitrogen, carbon and phosphorus.
4. Habitat and ecological niche, Community interactions - Mutualism, commensalism, parasitism, competition, predation.
5. Population Ecology -characteristics & factors determining population growth.
6. Biostatistics: scope and applications of statistics in ecology-methods of sampling-advantages and disadvantages of sampling.

**UNIT – IV: EVOLUTION**

1. Origin of life.
2. Lamarckism, Darwinism, Neo – Darwinism, Hardy-Weinberg Equilibrium.
3. Variations, isolating mechanisms, natural selection
4. Types of natural selection (directional, stabilizing, disruptive)
5. Artificial selection and forces of evolution
6. Speciation (Allopatric and Sympatric)
7. Macro evolutionary principles (Example: Darwin's finches)

**UNIT – V: ZOOGEOGRAPHY**

1. Zoogeographical regions
2. Study of physical and faunal peculiarities of Oriental, Australian and Ethiopian Regions.
3. Patterns of Animal distribution. Factors affecting distribution
4. Means of dispersal and barriers to dispersal.
5. Continental drift , Wallace line.

**TEXT BOOKS:**

1. Genetics by Veer Bala Rastogi. Kedar Nath Ram Nath. Delhi.
2. Genetics by P.K.Gupta. Rastogi Publications. Meerut
3. Cell Biology, Genetics, Evolution and Ecology by P.S. Verma and V.K. Agarwal. S.Chand Company. New Delhi.
4. Elements of Biotechnology by P.K.Gupta
5. Fundamentals of Microbiology and Immunology By A.K. Banerjee and N. Banerjee. Central book Agency. India.
6. Animal Physiology and Biochemistry by Dr. V.S. Tyagi. Kedar Nath Ram Nath. Meerut.

**REFERENCE BOOKS:**

1. Immunology. I. Kannan
2. Principles of Immunology by N.V. Shastri. Himalaya Publishing House Pvt. Ltd.
3. Genetic Engineering by Mohan P. Arora. Himalaya Publishers.
4. Genetics by Sinott, Dunn, Dobzansky . T.M.H Edition
5. Genomics and Biotechnology by P.K.Gupta .

**GENETICS:**

1. Problems in Genetics-Gene interaction, Inheritance of blood groups and Sex Linked Inheritance
2. Karyotyping of genetic syndromes given on flash cards.
3. Karyotyping of human chromosomes (Human Karyotype figure on paper should be cut into different sets of chromosomes and students are asked to arrange them in order and comment on the ideogram).

**ECOLOGY:** Determination of PH and Temperature of given sample.

1. Estimation of dissolved Oxygen in a given sample.
2. Estimation of salinity (chloride) of water in the given samples.
3. Identification of intertidal fauna-
  - a. Rocky shore fauna-Sycon, Zoanthus, Balanus, Matuta, Turbo, Cypraea, Palmipes, Stomopneustus.
  - b. Sandy shore fauna-Edwardsia, Nereis, Ocypoda, Oliva, Murex.
  - c. Muddy shore fauna-Virgularia, Pteroides, Solen, Lingula, Molpadia.
4. Identification of Zooplankton in water sample: Tomopteris, Eucalanus, Nauplius larva of prawn, Zoea larva of crab, Lucifer, Pteropod, Ophiopluteus Larva of Brittle star, Sagitta, Doliolum, Oikopleura.

**EVOLUTION:** Study of fossil evidences

1. Phylogeny of horse with pictures.
2. Darwin's finches (pictures).
3. Visit to a natural history museum & submission of report

**ZOOGEOGRAPHY : Map pointing of Nearctic region , Neotropical region, Ethiopian, Palaeartic ,oriental & Australian regions –Study of physical & faunal peculiarities. Oriental & Australian regions.**

**OBJECTIVES:** To enable students to

- Study the food resources of aquatic environment.
- Develop awareness about the technique of aquaculture and job potential of fisheries.
- Acquire knowledge about the maintenance of Aquarium.

**UNIT – I: INTRODUCTION / BASICS OF AQUACULTURE**

1. Definition, Significance and History of Aquaculture
2. Present status of Aquaculture – Global and National scenario
3. Major cultivable species for aquaculture: freshwater, brackish water and marine.
4. Criteria for the selection of species for culture

**UNIT – II: Types of Aquaculture**

1. Freshwater, Brackishwater and Marine water.
2. Concept of Monoculture, Polyculture, Composite culture, Monosex culture and Integrated fish farming

**Culture systems**

Ponds, Raceways, Cages, Pens, Rafts and water recirculating systems

**Culture practices**

Traditional, extensive, modified extensive, semi-intensive and intensive cultures of fish and shrimp.

**UNIT – III: Design and construction of aquafarms**

1. Criteria for the selection of freshwater and brackish water pond farms
2. Design and construction of fish and shrimp farms

**Seed resources**

Natural seed resources and Procurement of seed for stocking: Carp and shrimp

**Nutrition and feeds**

1. Nutritional requirements of a cultivable fish and shellfish
2. Natural food and Artificial feeds and their importance in fish and shrimp culture

**UNIT – IV: Management of carp culture ponds**

Culture of Indian major carps: Pre-stocking management – Dewatering, drying, Ploughing / desilting; Predators, weeds and algal blooms and their control, Liming and fertilization; Stocking management – Stocking density and stocking; Post-stocking management – Feeding, water quality, growth and health care; and Harvesting of ponds

**Culture of giant freshwater prawn, *Macrobrachium rosenbergii***

**UNIT – V: Culture of shrimp** (*Penaeus monodon* or *Litopenaeus vannamei*)**Culture of pearl oysters**

**Culture of ornamental fishes** – Setting up and maintenance of aquarium; and breeding.

**REFERENCES BOOKS:**

1. Bardach, JE et al. 1972. Aquaculture – The farming and husbandry of freshwater and marine organisms, John Wiley & Sons, New York.
2. Bose AN et al. 1991. Coastal aquaculture Engineering. Oxford & IBH Publ.Co.Pvt.Ltd.
3. Chakraborty C & Sadhu AK. 2000. Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn. Daya Publ. House.
4. FAO. 2007. Manual on Freshwater Prawn Farming.
5. Huet J. 1986. A text Book of Fish Culture. Fishing News Books Ltd.
6. ICAR. 2006. Hand Book of Fisheries and Aquaculture. ICAR.
7. Ivar LO. 2007. Aquaculture Engineering. Daya Publ. House.
8. Jhingran V.G. 2007. Fish and Fisheries of India. Hindustan Publ. Corporation, India.
9. Landau M. 1992. Introduction to Aquaculture. John Wiley & Sons.
10. Lovell RT. 1998. Nutrition and Feeding of fishes. Chapman & Hall.
11. Mcvey JP. 1983. Handbook of Mariculture. CRC Press.
12. MPEDA: Handbooks on culture of carp, shrimp, etc.
13. New MB. 2000. Freshwater Prawn Farming. CRC Publ.
14. Pillay TVR. 1990. Aquaculture- Principles and Practices, Fishing News Books Ltd., London.
15. Pillay TVR & Kutty MN. 2005. Aquaculture- Principles and Practices. 2<sup>nd</sup> Ed. Blackwell
16. Rath RK. 2000. Freshwater Aquaculture. Scientific Publ.
14. Stickney RR. 1979. Principles of Warmwater Fish Culture, John Wiley & Sons
15. Wheaton FW. 1977. Aquacultural Engineering. John Wiley & Sons.

**REFERENCES:**

1. “Aquarium fishes” (A Colourful Profile) by Harishankar J.Alappat, A.Biju Kumar – B.R.Publications. Delhi – 110052 – Edition: 1987.
2. “Fish and Fisheries of India” by V.G.Jhingran – Hindustan Publishing Corporation – Edition: 1985.
3. “Fishery Science & Indian Fisheries” by C.B.L.Srivastava – Kitab Mahal, Allahabad – Edition: 1988.
4. “An Introduction to Fishes” by S.S.Khanna – Central Book Depot, Allahabad – Edition: 1996.
5. “Ichthyology” by Karl F.Lagler; John E.Bardach, Robert R.Miller. Dora R.May Passino – John Wiley & Sons, New York.
6. “Prawn & Prawn Fisheries of India” by C.V.Kurrian & V O Sebastian – Hindustan Publishing Corporation, Delhi – Edition: 1986.
7. “A Text book of Fish Biology & Indian Fisheries” by Parihar – Cenrral Publishing House, Allahabad.
8. “Hand Book of Fish Biology and Indian Fisheries by Parihar-Central Publishing House, Allahabad. (2003)
9. The complete Aquarium guide. (Fish, plants and accessories for your aquarium) Konemann verriogs gesellschaft – mbH. Bonner stases 126 D – 5096 B cologne.

1. Identification of fishes based on colour, pigmentation, biometric and recording biometric data of a given fish.
2. Examination of morphometric and meristic characteristics of fish. Examination and study of types and arrangement of scales, gill rakers and the gut and its contents to determine the feeding habit of fish.
3. Observation of Fisheries of Visakhapatnam coast. (with reference to food and commercial importance )
  - a. Zygaena, Rhynchobatus, Chiloscylidium, Trygon, Mugil, Sardinella, Rastrelliger, Hilsa, Harpodon, Catla, Therapon, Megalaspis, Channa, Cynoglossus, Trichiurus, Stormateus, Cybium, Caranx, Arius, Anchoviella, Gadus, Leiognathus, Muraena, Notopterus – Wallago.
  - b. Crustacean Fishery: Palaemon, Peneaus indicus, Peneaus monodon, Palinurus. Ocypoda, Albunea.
  - c. Molluscan Fishery (edible and commercial molluscs): Turbo, Haliotis, Pteroceros, Strombus, Mytilus, Placuna, Ostrea, Pinctada, Sepia, Loligo, Octopus.

#### **DISEASES:**

1. Identification and study of fish and shrimp diseases - Using specimens / pictures
2. External examination of the diseased fish – diagnostic features and procedure.
3. Determination of dosages of chemicals and drugs for treating common diseases.

#### **Pond Management**

1. Water Quality -Determination of temperature, pH, salinity in the pond water sample;  
Estimation of dissolved oxygen, free carbon dioxide, total alkalinity, total salinity.  
Hardness, phosphates and nitrites.
2. Identification and study of common zooplankton, aquatic insects and aquatic weeds – Each

**OBJECTIVES:** To enable students to

1. Understand the importance of protecting and conserving wild life to maintain ecological balance.
2. Acquire knowledge of the endangered animal species, the threats they face and their conservation.
3. To gain information about Wild life as a source of education, tourism & occupation.

**COURSE:**

**UNIT-I:** Importance of wild life – Ecological, Commercial, Game, Scientific, Aesthetic and ethical values. Ecological balance, gene bank, plant propagation, scientific importance, soil erosion etc) Importance of forests (timber, fuel wood etc.) Natural resources & their conservation. Wild life values(+,-).Animals in Indian mythology. Ecozones of India and faunal diversity of India.

**UNIT-II: Management of Wild life:**

Threats to wild life and causes of depletion.

Conservation strategies: (Habitat management, Establishment of parks and sanctuaries, breeding in captivity, reintroduction, mass education, promulgation of laws.) Wild life trade & legislation: Assessment, Documentation, Trade, Wild life laws and ethics.

Illegal wild life trade & pet trade in India – Major trade centre's, routes and related issues. Indian and International organizations, Conventions and Societies.

**UNIT-III: Conservation Schemes:** Project Tiger (names of tiger reserves), Crocodile breeding project(reserves), Project Gir lion,(reserves), Sea turtle project.(reserves). Monitoring of wild life populations (visual count, pellet, Biotelemetry, other tracking devices & methods). Wild life offences – relating to animals. Poaching: prevention & management. Management of wild life crime.

**UNIT-IV: Zoo Management and Ecotourism:**

Basic considerations for designing a modern zoo. Functions of a modern zoo. Zoo layout and exhibits of animals. Zoo services, Zoo sanitation. Care of wild life – injured and sick, disease monitoring and control. Viral, bacterial and protozoan diseases of wildlife. Prospects and trends of Ecotourism – conventional, nature based, sustainable tourism and Ecotourism in India. Definitions of sanctuary, protected area(PA),etc.

**UNIT-V:**National Parks and Important Bird Sanctuaries of Andhra Pradesh. Endangered animals of South India. Economic importance of Wild life. Management of wild animals (translocation to new sites, Management of excess populations, rouge animals, etc.) Man Animal conflicts & management of conflicts.

**TEXT BOOKS AND REFERENCES:**

1. Wildlife of India by Agarwal K.C.
2. Management of Wildlife by Dwivedi.
3. A text book of Wildlife Management by Singh S.K.
4. Threatened Animals of India by Tikkader.
5. Animal Behaviour by ReenaMathur. Rastogi publications, Meerut.
6. National Parks of India by R.S.Bisht. Publications Division, Delhi.
7. Modern Textbook of Zoology Vertebrates by R.L.Kotpal. Rastogi publications, Meerut.
8. Wildlife in India by V.B.Saharia. Natraj, Dehradun, New Delhi.

1. Identification of poisonous and non-poisonous snakes: Tropicodonotus, Dryophis, Ptyas, Typhlops, Cobra, Krait, Echis carinata, Hydrophis.
2. Identification of beaks and claws in birds: Fowl, Duck, Crow, Woodpecker, Hoopoe, Parrot, Myna and Kingfisher.
3. Identification of types of feathers: Remex, Rectrix, Contour, Filoplume and Down.
4. Identification of types of nests in birds.
5. Identification of claws, nails and hoofs.
6. Identification of horns and antlers.
7. Identification of pug marks, teeth and dental formula of mammals.
8. Identification of spotters: Asiatic lion, Black buck, Ganges River Dolphin, Indian elephant, Slender loris, otter, Sloth bear, Tiger, Gharial, Olive Ridley Turtle, Python, Monitor lizard, Vulture, Great Indian Bustard, Great Indian Horn bill, Jerdon's Courser, Fish eating Eagle and Indian rhino from flash cards.
9. Map pointing: Ecozones of India, Important National parks and bird sanctuaries of South India.
10. Map pointing of the distribution of endangered animals of India.
11. Identification of extinct animals.

\*\*                    \*\*                    \*\*

**OBJECTIVES:**

1. To develop skill in the management of poultry industry.
2. To acquire knowledge on breeding, hatching, and rearing of fowls.
3. To understand the care and management of Dairy animals.
4. To gain knowledge about the nutritive values and economically important products.

**UNIT – I:** General introduction to poultry farming. Principles of poultry housing. Poultry houses. Systems of poultry farming. Management of chicks, growers and layers. Management of Broilers.

**UNIT – II:** Poultry feed management – Principles of feeding. Nutrient requirements for different stages of layers and broilers. Methods of feeding. Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms, control and management.

**UNIT– III:** Selection, care and handling of hatching eggs. Egg testing. Methods of hatching. Brooding and rearing. Sexing of chicks.

**UNIT – IV:** Breeds of Dairy Cattle and Buffaloes – Definition of breed; Classification of Indian Cattle breeds, exotic breeds and Indian buffalo breeds. Systems of inbreeding and crossbreeding. Housing of dairy animals – Selection of site for dairy farm; systems of housing – loose, housing system. Conventional dairy barn. Cleaning and sanitation of dairy farm. Weaning of calf. Castration and dehorning. Deworming and Vaccination programme. Records to be maintained in a dairy farm.

**UNIT – V:** Care and management of dairy animals - Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks.

Rearing techniques & nutritive values of the products of – Piggery ,emu farming, Duckery.

**TEXT BOOKS:**

1. A Text book of economic zoology by P.K. Gupta.
2. A Text book of Animal husbandry by G.C.Banerjee.
3. Economic importance of Animal husbandry by Suresh k. Rao ,Sanjana Rawat.
4. Basic operations of Animal husbandry by Sandeep Tomar.

ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

V SEMESTER

**ZOOLOGY**

TIME: 2 Hrs/Week

Z 5552 (2)

**ANIMAL HUSBANDRY**

Max MARKS: 50

w.e.f. 2015 – 2018 ("15AC")

**PRACTICAL SYLLABUS – III B**

1. Study of various breeds of layers and broilers (photographs)
2. Identification of disease causing organisms in poultry birds (as per theory)
3. Study of the anatomy of a poultry bird by way of dissecting a bird. (Demonstration)
4. Study of various activities in a poultry farm (layers and broilers) and submission of a report.
5. Study of various breeds of cattle (photographs/microfilms)
6. Field trips to study of various activities carried out in a dairy farm and submission of a report.

**\*\*        \*\*        \*\***

### **UNIT – I: Breeding and Hatchery Management**

1. Bundh Breeding and Induced breeding of carp by Hypophysation; and use of synthetic hormones.
2. Types of fish hatcheries; Hatchery management of Indian major carps
3. Breeding and Hatchery management of *Penaeus monodon*/ *Litopenaeus vannamei*
4. Breeding and Hatchery management of giant freshwater prawn.

### **UNIT – II: Water quality Management**

1. Water quality and soil characteristics suitable for fish and shrimp culture
2. Oxygen depletion and control mechanisms in culture ponds
3. Aeration: Principles of aeration and Emergency aeration
4. Liming materials, Organic manures and Inorganic fertilizers commonly used and their implications in fish ponds

### **UNIT – III: Feed Management**

1. Live Foods and their role in shrimp larval nutrition.
2. Supplementary feeds: Principal foods in artificial diets; Types of feeds; Feed additives and Preservatives; role of probiotics.
3. Feed formulation and manufacturing; Feed storage
4. Feeding strategies: Feeding devices, feeding schedules and ration size; Feed evaluation- feed conversion efficiencies and ratios

### **UNIT – IV: Disease Management**

1. Principles of disease diagnosis and health management;
2. Prophylaxis, Hygiene and Therapy of fish diseases
3. Specific and non-specific defense systems in fish; Fish immunization and vaccination
4. Etiology, Symptoms, prophylaxis and therapy of common fish diseases in fish ponds
5. Etiology, Symptoms, prophylaxis and therapy of common shrimp diseases in shrimp ponds

**UNIT – V: Economics and Marketing**

1. Principles of aquaculture economics – Capital costs, variable costs, cost-benefit analysis
2. Fish marketing methods in India; Basic concepts in demand and price analysis

**Fisheries Extension**

3. Fisheries Training and Education in India; Role of extension in community development.

**Fish Genetics**

4. Genetic improvement of fish stocks – Hybridization of fish.
5. Gynogenesis, Androgenesis, Polyploidy, Transgenic fish, Cryopreservation of gametes, Production of monosex and sterile fishes and their significance in aquaculture.

**REFERENCE BOOKS:**

1. Boyd CE. 1979. Water Quality in Warm Water Fish Ponds. Auburn University
2. Boyd, CE. 1982. Water Quality Management for Pond Fish Culture. Elsevier Sci. Publ. Co.
3. Chakraborty C & Sadhu AK. 2000. Biology Hatchery and Culture Technology of Tiger Prawn and Giant Freshwater Prawn. Daya Publ. House
4. Conroy CA and Herman RL. 1968. Text book of Fish Diseases. TFH (Great Britain) Ltd, England.
5. Halver J & Hardy RW. 2002. Fish Nutrition. Academic Press.
6. Ian C. 1984. Marketing in Fisheries and Aquaculture. Fishing News Books.
7. ICAR. 2006. Handbook of Fisheries and Aquaculture. ICAR.
8. Jhingran VG. 2007. Fish and Fisheries of India. Hindustan Publishing Corporation, India.
9. Jhingran VG & Pullin RSV. 1985. Hatchery Manual for the Common, Chinese and Indian Major Carps. ICLARM, Philippines.
10. Kumar D. 1996. Aquaculture Extension Services Review: India. FAO Fisheries Circular No. 906, Rome.
11. Lavens P & Sorgeloos P. 1996. Manual on the Production and Use of Live Food for Aquaculture. FAO Fisheries Tech. Paper 361, FAO.
12. MPEDA. 1993. Handbook on Aqua Farming - Live Feed. Micro Algal Culture. MPEDA Publication
13. New MB. 1987. Feed and Feeding of Fish and Shrimp. A Manual on the Preparation and Preservation of Compound Feeds for Shrimp and Fish in Aquaculture. FAO – ADCP/REP/87/26

**NUTRITION:**

1. Identification and study of Live food organisms – Any five
2. Formulation and preparation of a balanced fish feed
3. Estimation of Proximate composition of aquaculture feeds – Proteins, carbohydrates, lipids, moisture, ash content.
4. Gut content analysis to study artificial and natural food intake.

**POST HARVEST TECHNOLOGY:**

1. Evaluation of fish/ fishery products for organoleptic, chemical and microbial quality.
2. Preparation of dried, cured and fermented fish products, examination of salt, protein, moisture in dried / cured products, examination of spoilage of dried / cured fish products, marinades, pickles, sauce.
3. Preparation of isinglass, collagen and chitosan from shrimp and crab shell.
4. Developing flow charts and exercises in identification of hazards – preparation of hazard analysis worksheet, plan form and corrective action procedures in processing of fish.