

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

**I BSC I SEMESTER**

**ZOOLOGY**

**Max. Marks: 100**

**PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES**

Z1502(3)

**Objectives:** To enable the students to

1. Describe general taxonomic rules on animal classification
2. Categorise & classify the invertebrate fauna using taxonomic keys.
3. Recall the general characteristics of animals belonging to protozoa to Hemichordata.
4. Summarise the social behavior and cooperation among insect species.
5. Appraise the significance and economic importance of vermiculture.

**COURSE OUTCOMES:** By the end of the course, students will be able to

CO1: Recall the basic concepts of systematics underlying the organization of invertebrates.

CO2: Classify protozoa to Hemichordata with taxonomic keys, explain the structural organization.

CO3: Summarize vermiculture and importance of vermicomposting.

CO4: Illustrate the process of pearl formation and importance of pearl culture.

CO5: Discuss the helminth diseases, pathogenicity and the prevention.

**COURSE:**

**UNIT I**

- 1.1 Principles of Taxonomy – Binomial nomenclature – Rules of nomenclature
- 1.2 Whittaker's five kingdom concept and classification of Animal Kingdom.

## **Phylum Protozoa**

- 1.3 General Characters and classification of protozoa up to classes with suitable examples
- 1.4 Locomotion, nutrition and reproduction in Protozoans
- 1.5 Elphidium– Structure & Life history, Importance of Alternation of Generations.

## UNIT –II

### **Phylum Porifera**

- 2.1 General characters and classification up to classes with suitable examples
- 2.2 Skelton in Sponges
- 2.3 Canal system in sponges

### **Phylum Coelenterata**

- 2.4 General characters and classification up to classes with suitable examples
- 2.5 Metagenesis in Obelia
- 2.6 Polymorphism in coelenterates
- 2.7 Corals and coral reefs

### **Phylum Ctenophora :**

- 2.8 General Characters and Evolutionary significance (affinities)

## Unit – III

### **Phylum Platyhelminthes**

- 3.1 General characters and classification up to classes with suitable examples

3.2 Life cycle and pathogenicity of *Fasciola hepatica*

3.3 Parasitic Adaptations in helminthes.

### **Phylum Nematelminthes**

3.4 General characters and classification up to classes with suitable examples

3.5. Life cycle and pathogenicity of *Ascarislumbricoides*

Unit – IV

### **Phylum Annelida**

4.1 General characters and classification up to classes with suitable examples

4.2 Evolution of Coelom and Coelomoducts

4.3 Vermiculture - Scope, significance, earthworm species, processing, Vermicompost, economic importance of vermicompost

### **Phylum Arthropoda**

4.4 General characters and classification up to classes with suitable examples

4.5 Vision and respiration in Arthropoda

4.6 Metamorphosis in Insects

4.7 Peripatus - Structure and affinities

4.8 Social Life in Bees and Termites

Unit – V

### **Phylum Mollusca**

5.1 General characters and classification up to classes with suitable examples

5.2 Pearl formation in Pelecypoda

5.3 Sense organs in Mollusca

### **Phylum Echinodermata**

- 5.4 General characters and classification up to classes with suitable examples
- 5.5 Water vascular system in star fish
- 5.6 Larval forms of Echinodermata

### **Phylum Hemichordata**

- 5.7 General characters and classification up to classes with suitable examples
- 5.8 Balanoglossus - Structure and affinities

### **REFERENCE BOOKS**

1. L.H. Hyman 'The Invertebrates' Vol I, II and V. – M.C. Graw Hill Company Ltd.
2. Kotpal, R.L. 1988 - 1992 Protozoa, Porifera, Coelenterata, Helminthes, Arthropoda, Mollusca, Echinodermata. Rastogi Publications, Meerut.
3. E.L. Jordan and P.S. Verma 'Invertebrate Zoology' S. Chand and Company.
4. R.D. Barnes 'Invertebrate Zoology' by: W.B. Saunders CO., 1986.
5. Barrington. E.J.W., 'Invertebrate structure and Function' by ELBS.
- 6 P.S. Dhami and J.K. Dhami. Invertebrate Zoology. S. Chand and Co. New Delhi.
7. Parker, T.J. and Haswell 'A text book of Zoology' by, W.A., Mac Millan Co. London.
8. Barnes, R.D. (1982). Invertebrate Zoology, V Edition".

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

**I BSC I SEMESTER**

**ZOOLOGY Pratical**

**Max. Marks: 50**

**PAPER – I: ANIMAL DIVERSITY – BIOLOGY OF NONCHORDATES**

Z1522(2)

**Objectives:** To enable the students to

1. Identify invertebrates based on special identifying characters.
2. Compare the hierarchical categories and understand their position in classification.
3. Observe the different organ systems through demonstration or virtual dissections.
4. Maintain a neat, labelled record of identified museum specimens.

**COURSE OUTCOMES:**By the end of the course, students will be able to

CO1: Describe and place the invertebrates according to their taxonomic position.

CO2: Be versatile in identification of museum specimens.

CO3: Reinforce observation and identification skills.

CO4: Develop insight about the importance of preservation of museum specimens.

**COURSE:**

1. **Study of museum slides / specimens / models (Classification of animals up to orders)**

Protozoa: Amoeba, Paramecium, Paramecium Binary fission and Conjugation, Vorticella, Entamoeba histolytica, Plasmodium vivax.

Porifera: Sycon, Spongilla, Euspongia, Sycon- T.S & L.S, Spicules, Gemmule.

Coelenterata: Obelia – Colony & Medusa, Aurelia, Physalia, Velella, Corallium, Gorgonia, Pennatula.

Platyhelminthes: Planaria, Fasciola hepatica, Fasciolalarval forms – Miracidium, Redia, Cercaria, Echinococcusgranulosus, Taeniasolium, Schistosomahaematobium.

Nemathelminthes: Ascaris(Male & Female), Drancunculus, Ancylostoma, Wuchereria.

Annelida: Nereis, Aphrodite, Chaetopteurs, Hirudinaria, Trochophore larva .

Arthropoda: Cancer, Palaemon, Scorpion, Scolopendra, Sacculina, Limulus, Peripatus, Larvae - Nauplius, Mysis, Zoea, Mouth parts of male &female Anopheles and Culex, Mouthparts of Housefly and Butterfly.

Mollusca: Chiton, Pila, Unio, Pteredo, Murex, Sepia, Loligo, Octopus, Nautilus, Glochidium larva.

Echinodermata: Asterias, Ophiothrix, Echinus, Clypeaster, Cucumaria, Antedon, Bipinnaria larva

Hemichordata: Balanoglossus, Tornaria larva.

## **2. Dissections:**

1. Prawn: Appendages, Digestive system, Nervous system, Mounting of Statocyst.

2. Insect Mouth Parts

3. Laboratory Record work shall be submitted at the time of practical Examination.

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

5. Computer - aided techniques should be adopted or show virtual dissections

#### REFERENCE MANUALS:

1. Practical Zoology- Invertebrates S.S. Lal
2. Practical Zoology - Invertebrates P.S. Verma
3. Practical Zoology - Invertebrates K.P. Kurl
4. Ruppert and Barnes (2006) Invertebrate Zoology, 8th Edition, Holt Saunders International Edition.
5. Departmental Repository of flash cards.

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

**ZOOLOGY –SEMESTER II**

**PAPER – II: ANIMAL DIVERSITY – BIOLOGY OF CHORDATES    Max. Marks:100**

**Z 2503(3)**

**OBJECTIVES:**To enable the students to

1. Describe the structural and functional aspects of vertebrate systems.
2. **Identify the** morphological and anatomical features of different classes of vertebrates.
3. Summarise the general characters of animals and structural adaptations.
4. Recall the origin and evolutionary relationship among chordates.
5. Discuss the importance of adaptive radiation in mammals.

**COURSE OUTCOMES:**By the end of the course, students will be able to

CO1: Illustrate the **unique** characters of cephalochordates, Urochordates and fishes.

CO2:Taxonomically identify and specify key features on preserved vertebrate specimens;

CO3: List the unique features of chordates and use key features to differentiate between vertebrate groups and relate the ecological role of different groups of vertebrates.

CO4:Define the term migration, discuss migration in fishes and birds.

CO5: Summarise dentition in mammals and its evolutionary significance

**COURSE:**



## **Unit - I**

- 1.1 General characters and classification of Chordata upto classes
- 1.2 Protochordata- Salient features of Cephalochordata , Affinities of Cephalochordata.
- 1.3 Salient features of Urochordata
- 1.4 Structure and life history of Herdmania
- 1.5 Retrogressive metamorphosis –Process and Significance

## **Unit - II**

- 2.1 Cyclostomata, General characters, Comparison of Petromyzon and Myxine
- 2.2 Pisces : General characters of Fishes
- 2.3 Scoliodon: External features, Digestive system, Respiratory system, Structure and function of Heart, Structure and functions of the Brain.
- 2.4 Migration in Fishes
- 2.5 Types of Scales
- 2.6 Dipnoi

## **Unit - III**

- 3.1 General characters of Amphibia
- 3.2 Classification of Amphibia up to orders with examples.
- 3.3 Rana hexadactyla: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and functions of the Brain

3.4 Reptilia: General characters of Reptilia, Classification of Reptilia upto orders with examples

3.5 Calotes: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain

3.6 Identification of Poisonous snakes and Skull in reptiles

#### **Unit - IV**

4.1 Aves General characters of Aves

4.2 Columba livia: External features, Digestive system, Respiratory system, Structure and function of Heart, structure and function of Brain

4.3 Migration in Birds

4.4 Flight adaptation in birds

#### **Unit - V**

5.1 General characters of Mammalia

5.2 Classification of Mammalia upto sub - classes with examples, comparison of Prototherians, Metatherians and Eutherians .

5.3 Adaptive radiation in Mammals.

5.4 Dentition in mammals.

#### **REFERENCE BOOKS**

- J.Z. Young, 2006. The life of vertebrates. (The Oxford University Press, New Delhi). 646 pages. Reprinted

- Arumugam, N. Chordate Zoology, Vol. 2. SarasPublication.278 pages.200 figs.
- A.J. Marshall, 1995. Textbook of zoology, Vertebrates. (The McMillan Press Ltd., UK). 852 pages.(Revised edition of Parker &Haswell, 1961).
- M. EkambaranathaAyyar, 1973. A manual of zoology. Part II. (S. ViswanathanPvt. Ltd., Madras).
- P.S. Dhami& J.K. Dhami, 1981. Chordate zoology. (R. Chand & Co.). 550 pages.
- Gurdarshan Singh & H. Bhaskar, 2002.Advanced Chordate Zoology. Campus Books, 6 Vols., 1573 pp., tables, figs.
- A.K. Sinha, S. Adhikari& B.B. Ganguly, 1978.Biology of animals. Vol. II. Chordates.(New Central Book Agency, Calcutta).560 pages.
- R.L.Kotpal, 2000. Modern textbook of zoology, Vertebrates. (Rastogi Publ., Meerut). 632 pages.
- E.L. Jordan & P.S. Verma, 1998. Chordate zoology. (S. Chand & Co.). 1092 pages.
- G.S. Sandhu, 2005. Objective Chordate Zoology.Campus Books, vii, 169 pp.
- Sandhu, G.S. & H. Bhaskar, H. 2004. Textbook of Chordate Zoology. Campus Books, 2 vols., xx, 964 p., figs.
- Veena, 2008. Lower Chordata.(Sonali Publ.), 374 p., tables, 117 figs.

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

**SEMESTER II**

**ZOOLOGY - PAPER - II**

**Max. Marks: 50**

**ANIMAL DIVERSITY - BIOLOGY OF CHORDATES**

**Z 2553(2)**

**Learning Outcomes:** To enable the students to

1. To understand the taxidermic and other methods of preservation of chordates.
2. Identify chordates based on special identifying characters.
3. Understand internal anatomy of animals through demo or virtual dissections, thus directing the student for “empathy towards the fellow living beings”.
4. Maintain a neat, labeled record of identified museum specimens.

**COURSE OUTCOMES:**By the end of the course, students will be able to

**CO1:** Describe and place the vertebrates according to their taxonomic position

.

**CO2:** Be versatile in identification of museum specimens.

**CO3:** Reinforce observation and identification skills.

**CO4:** Develop insight about the importance of preservation of museum specimens.

**CO5:** Identify and discuss the structure and functional complexity of vertebrates in relation to their ecological habitats and behavioural patterns.

**COURSE:**

**OBSERVATION OF THE FOLLOWING SLIDES / SPOTTERS / MODELS**

1. Protochordata :Herdmania, Amphioxus, Amphioxus T.S through pharynx.

2. Cyclostomata :Petromyzon and Myxine.
3. Pisces :Pristis, Torpedo, Hippocoampus ,Exocoetus, Echeneis, Labeo, Catla, Clarius,Channa, Anguilla.
4. Amphibia :Ichthyophis, Amblystoma, Axolotl larva, Hyla,Ranahexadactyla.
5. Reptilia: Draco, Chamaeleon, Uromastix,Mabuya,Testudo, Trionyx, Russels viper, Naja,Krait, Hydrophis, Crocodile.
6. Aves :Psittacula, Eudynamis, Bubo, Alcedo, coraciusbengalensis, struthiocamelus.
7. Mammalia: Ornithorhynchus, Pteropus, Funambulus, Macropus(Kangaroo), Echidna, Loris, Dugong .

#### Dissections-

1. Scoliodon -IX and X, Cranial nerves
2. Scoliodon -Brain
3. Mounting of fish scales

#### Note:

1. Dissections are to be demonstrated only by the faculty or virtual.
2. Laboratory Record work shall be submitted at the time of practical examination.

#### References:

1. A Text Book of Practical Zoology Vertebrates, P.S.Verma, S.Chand publications,
2. A Text Book of Practical Zoology Vertebrates, S.S.Lal, Rastogi publications.
3. Department repository of flash cards.



**SKILL DEVELOPMENT COURSES**

Semester II

**ZOOLOGY**

DT 2001(2)

**DAIRY TECHNOLOGY**

**Objectives: To enable the students to**

1. Acquire knowledge about the care and management of cattle
2. Develop an overview on establishing or develop a Dairy Industry.
3. Relate and apply the knowledge in designing animal barns with optimal conditions.
4. Classify and explain the systems of Inbreeding and crossbreeding.

**Learning Outcomes:**

After successful completion of the course, students will be able to;

1. Understand the pre-requisites for starting a Dairy farm
2. Recognize different breeds of Cows & buffaloes following safety precautions.
3. Prepare and give recommended feed and water for livestock
4. Maintain health of livestock along with productivity
5. Vaccination of cattle, nutrients requirements
6. Entrepreneurship i.e., Effectively market dairy products
7. Ensure safe and clean dairy farm and Standard safety measures to be taken in establishing an industry
8. Efficiently start and manage to establish or develop a Dairy Industry

**SYLLABUS:**

**Section I (Introduction and Establishment of a Dairy Farm):**

**0**

**5 Hrs**

- 1.1 Dairy development in India – Dairy Cooperatives (NDRI, NDDB, TCMPF) (1hr)
- 1.2 Constraints of Present Dairy Farming and Future Scope of Dairy Farmer. (1hr)
- 1.3 Selection of site for dairy farm; Systems of housing – Loose housing system, Conventional Dairy Farm; Records to be maintained in a dairy farm. (2hrs)

**Section II (Livestock Identification and Management): 13 Hrs**

- 2.1 Breeds of Dairy Cattle and Buffaloes – Identification of Indian cattle and buffalo breeds and Exotic breeds; Methods of selection of Dairy animals. (5hrs)
- 2.2 Systems of inbreeding and crossbreeding. (2hrs)
- 2.3 Weaning of calf, Castration, Dehorning, Deworming and Vaccination programme (3hrs)
- 2.4 Care and management of calf, heifer, milk animal, dry and pregnant animal, bulls and bullocks. (3hrs)

**Section III (Feed Management, Dairy Management, Cleaning and Sanitation): 8 Hrs**

- 3.1 Basic Principles of Feed, Important Feed Ingredients, Feed formulation

- and Feed Mixing(2hrs)
- 3.2 Operation Flood –Definition of Milk and Nutritive value of milk and ICMR recommendation of nutrients –Per Capita Milk production and availability in India and Andhra Pradesh -Methods of Collection and Storage of Milk– Labelling and Storage of milk products (4hrs)
- 3.3 Cleaning and sanitation of dairy farm – Safety precautions to prevent accidents in an industry. (2hrs)

**Co-curricular Activities Suggested: (4 hrs)**

1. Group discussion&SWOTanalysis
2. Visit to a DairyFarm
3. Visit to Milk CooperativeSocieties
4. Visit to Feed MillingPlants
5. Market Study and Identification of Government Schemes, Insurance and Bank Loans in relation to dairyfarming

**Reference books:**

1. Dairy Science: Petersen (W.E.) Publisher – Lippincott &Company
2. Principles and practices of Dairy Farm –JagdishPrasad
3. Text book of Animal Husbandry - G C Benarjee
4. Hand book of Animal Husbandry - ICAREdition
5. Outlines of Dairy Technology – Sukumar (De) – Oxford Universitypress
6. Indian Dairy Products – Rangappa (K.S.) & Acharya (KT) – Asia PublishingHouse.
7. The technology of milk Processing – Ananthkrishnan, C.P., Khan, A.Q. and Padmanabhan, P.N. – Shri Lakshmi Publications.
8. Dairy India 2007, Sixth edition
9. Economics of Milk Production – Bharati Pratima AcharyaPublishers.

<http://www.asci-india.com/BooksPDF/Dairy%20Farmer%20or%20Entrepreneur.pdf>

<https://labour.gov.in/industrial-safety-health>



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

III SEMESTER

**ZOOLOGY**

TIME: 4HRS/WEEK

Z 3502(3) **CYTOLOGY, GENETICS & EVOLUTION**

Max.MARKS:100

19 – 20 ADMITTED BATH("19AG")**SYLLABUS**

**Learning Objectives: To enable the students to**

1. Explain the structure and fundamentals of Prokaryotic & Eukaryotic cells.
2. Describe about various cell organelles structure and their importance in functioning of body.
3. Describe the fundamentals of heredity process through Mendel's work.
4. Impart knowledge of genetic variations.
5. Explain various processes related to Origin and continuity of life on earth.

**Course outcomes: By the end of the course, students will be able to**

CO1. Understand and differentiate basic structure and components of Prokaryotic and Eukaryotic cells.

CO2. Correlate the structure of animal cell organelles to their functions in eukaryotic cells.

CO3. Explain fundamental concepts of genetic Inheritance.

CO4. Explain the fundamental principles and laws of genetics.

CO5. Describe origin and continuity of life through diverse evolutionary changes.

**COURSE:**

**Unit - I**

**1. Cytology**

1. Definition & history of cell. Differences between prokaryotic and eukaryotic animal cells.
2. Ultra structure of prokaryotic and eukaryotic animal cell.

3. Plasma membrane –Structure, Different membrane models of plasma membrane & functions.

## **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 –Synthesis of ATP.
6. Structure and functions of Nucleus
7. Chromatin - Structure and significance, Chromosomes - Structure, functions, giant chromosomes (polytene, lampbrush)

## **Unit –III**

### **Genetics**

1. Mendel's work on transmission of traits.
2. Principles of inheritance
3. Interaction of genes. (Supplementary, complementary, duplicating, collaborative and polygenic inheritance).
4. Incomplete dominance and co dominance
5. Lethal alleles, Epistasis, Pleiotropy

## **UNIT –IV**

6. Sex determination, Chromosomal aberrations, amniocentesis.
7. Sex linked inheritance
8. Linkage and crossing over
9. Cytoplasmic inheritance
10. Human karyotyping, Barr bodies, Lyon hypothesis .

## **UNIT –V**

### **Evolution**

1. Origin of life. (Earth primitive atmosphere, theory of biogenesis, biochemical and chemical origin, experimental evidences in support of biochemical origin of life).
2. Lamarckism, Darwinism, Neo – Darwinism, Hardy-Weinberg Equilibrium.
3. Variations (morphological evidences), 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)

**TEXT BOOKS:**

1. Genetics by Veer BalaRastogi. KedarNath 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. Evolutionary Biology by VeerbalaRastogi

**References:**

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.Guptae: books:
4. "Cell Biology, Genetics, Molecular Biology, Evolution & ecology" by P.S.Verma&A.K.Agarwal – S.Chand& company L.t.d, New Delhi.

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

III SEMESTER

ZOOLOGY

TIME: 3HRS/WEEK

Z 3552(2)

CYTOLOGY, GENETICS & EVOLUTION

Max. MARKS: 50

19 – 20 ADMITTED BATH ("19AG") PRACTICAL SYLLABUS- II A

**Learning Objectives: To enable the students to**

1. Gain insight on structure of various cell organelles.
2. Acquire skill in preparation of temporary slides of mitosis.
3. Develop problem solving ability.
4. Explain different chromosomal abnormalities and genetic syndromes.
5. Learn fossil evidences through diagrams.

**Course outcomes: By the end of the course, students will be able to**

CO1. Examine and differentiate various types of cells and their structure.

CO2. Observe various histological slides by using microscopy technique.

CO3. Solve various genetic problems related to sex-linked inheritance and blood grouping.

CO4. Identify and summarise chromosomal abnormalities

CO5. Compare and contrast homologous and analogous organs with reference to their evolutionary origin.

COURSE:

**CYTOLOGY:**

1. Ultra structure of cell – model.
2. Observation of chromosomes during stages of mitosis.
3. Observations of Polytene chromosomes in the Salivary glands of insects.
4. Preparation of temporary slides of Mitotic divisions with onion root tips.

## **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).
4. Determination of Blood groups and Rh factor.

## **EVOLUTION:**

Study of fossil evidences

1. Phylogeny of horse with pictures.
2. Darwin's finches (pictures).

## **REFERENCE BOOKS:**

1. A Text Book of Practical Zoology Invertebrates, S.S.Lal, Rastogi publications.
2. A Text Book of Practical Zoology Invertebrates, P.S.Verma, S.Chand publications.
3. A Text Book of Practical Zoology Vertebrates, S.S.Lal, Rastogi publications.
4. Departmental Repository of flash cards.

**Learning Objectives:** To enable the students to

1. Gain comprehensive knowledge on the concepts of vertebrate embryonic development.
2. Illustrate the basic physiological processes and their importance.
3. Elucidate the co-ordination and integration of Endocrine system.
4. Explain various factors of community interactions and population dynamics.
5. . Identify Zoogeographical regions with their climatic and faunal peculiarities.

**Course outcomes:** By the end of the course, students will be able to

- CO1. Be familiar with the early developmental stages of vertebrates.
- CO2. Understand the general physiology of higher Vertebrates.
- CO3. Gain insight into functioning of various physiological systems including digestive, respiratory, excretory, nervous systems.
- CO4. Compare different ecological interactions and functions.
- CO5. Correlate Zoogeographical regions with their climatic and faunal peculiarities

Course:

## **Unit – I**

### **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.

## **UNIT-II**

### **Physiology**

1. **Definition of digestion**, types of digestion-{Extracellular, intracellular & cellulose digestion}.  
    , physiology of digestion in different regions, Absorption of digested products, Gastrointestinal Hormones.
2. **Respiration** – Types of respiration –{external and internal}. Process of respiration{ Pulmonary ventilation, transport of gases(oxygen and carbon dioxide)}. Properties and functions of Respiratory pigments.
3. **Circulation** - Structure and functioning of heart, Cardiac cycle. Types of heart, coagulation of blood, tachycardia, bradycardia.
4. **Muscle contraction** - Ultra structure of muscle fibre, molecular and chemical basis of muscle contraction (Sliding filament mechanism of muscle contraction .Role of calcium, ATP utilization and its replenishment).

## **UNIT- III**

**Nerve impulse transmission:** Structure of neuron, properties of neuron. Nerve impulse transmission –

Resting membrane potential, origin and propagation of action potentials along myelinated and non-myelinated nerve fibres. Synapse, Synaptic transmission.

**Excretion** - Structure of kidney & 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, gonads.

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

## **UNIT –IV**

### **ECOLOGY**

1. Meaning and scope of Ecology
2. Important abiotic factors of Ecosystem - Temperature, light, water, oxygen and CO<sub>2</sub>.
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. Ecological succession.

## **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. 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 ReenaMathur, 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.
6. Fundamentals of Microbiology and Immunology By A.K.Banerjee and N.Banerjee. Central book Agency. India.



7. Animal Physiology and Biochemistry by Dr. V.S.Tyagi. KedarNath Ram Nath. Meerut.

8. Chordate embryology by P.S.Verma, V.K.Agarwal&B.S.Tyagi, S.Chanda& Company ltd Delhi, edition – 1994.

9. A text book of ecology by P.D.Sharma

10. Animal ecology and distribution of animals by Veer balarastogi and M.S.Jayaraj.

11. A text book of Palaeontology and zoogeography by veer balarastogi

### **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. Development Biology by Dr.K.V.Satry& Dr. VineetaShukal.Rastogi publications.Meerut – 250002, Edition .2004.

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM  
IV SEMESTER **ZOOLOGY** TIME: 3HRS/WEEK  
Z 4552(2) **DEVELOPMENTAL BIOLOGY, PHYSIOLOGY, ECOLOGY, ZOOGEOGRAPHY**  
19 – 20 ADMITTED BATH ("19AG") **PRACTICALS SYLLABUS** Max. MARKS: 50

**Learning Objectives: To enable the students to**

1. Illustrate the early embryonic developmental stages in Frog and Chick.
2. Develop basic laboratory skills in the field of Physiology.
3. Demonstrate experiments on determination of pH, temperature and dissolved oxygen.
4. Develop collaborative working skills.
5. Observe and locate distribution of fauna at various geographical regions.

**Course outcomes:** By the end of the course, students will be able to

CO1. Summarise the different developmental stages in frog.

CO2. Perform physiology experiments following standard protocol.

CO3. Recognise principal fauna of Rocky, Sandy and Muddy shores.

CO4. Identify and place the fauna according to the zoogeographical regions.

CO5.

Map various zoogeographical regions of the world and indicate the faunal peculiarities.

**COURSE:**

**DEVELOPMENTAL BIOLOGY:**

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

Hen's egg, Primitive streak (18hrs), 24 hrs, 48 hrs chick embryo.

**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. 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. Estimation of Blood pressure by Auscultatory method
6. Estimation of haemoglobin by sahli's method.

### **ECOLOGY:**

1. Determination of PH and Temperature of given sample.
  2. Estimation of dissolved Oxygen in a given sample.
  3. Estimation of salinity (chloride) of water in the given samples.
1. Identification of intertidal fauna-
    - a. Rocky shore fauna-Sycon, Zoanthus, adamsia,sabella, Balanus,lepas, Matutachiton, cellana, , Turbo, nerita, haliotis, littorina,Cypraea, ostrea, mytilus, Palmipes, Stomopneustus,antedon .
    - b. Sandy shore fauna-Edwardsia, Nereis, Arenicola, emerita,Ocypoda, clibanarius without shell, albunea, Oliva, conus, Murex.
    - c. Muddy shore fauna-Virgularia, Pteroides, Solen, Lingula, Molpadia.

BIOSTATISTICS: Methods of sampling.

**ZOOGEOGRAPHY:**

Map pointing of Nearctic region ,Neotropical region, Ethiopian, Palaearctic ,oriental & Australian regions –Study of physical & faunal peculiarities.

Oriental & Australian regions.

**REFERENCE BOOKS:**

1. A Text Book of Practical Zoology Invertebrates, S.S.Lal, Rastogi publications.
2. A Text Book of Practical Zoology Invertebrates, P.S.Verma, S.Chand publications.
3. A Text Book of Practical Zoology Vertebrates, P.S.Verma, S.Chand publications
4. A Text Book of Practical Zoology Vertebrates, S.S.Lal, Rastogi publications.
5. Departmental Repository of flash cards.



**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, Dobzhanhansky . 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. Cell Biology, Genetics & Molecular Biology by N. Arumugam.



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.

#### Reference Books:

1) Standardised protocols .

2) Practical book of Zoology, B.Sc Third year, Semester V,

DR.K.Kondaiah,A.V.N.Gupta,K.V.Maheswari,TechnicalPublishers,Guntur.



**Learning Objectives: To enable the students to**

1. Acquire knowledge about the care and management of poultry.
2. Discuss the feeding, breeding, hatching and rearing of fowls.
3. Relate and apply the knowledge in designing animal barns with optimal conditions.
4. Classify and explain the systems of Inbreeding and crossbreeding.
5. Develop an overview on the rearing techniques of commercially important species.

**COURSE OUTCOMES By the end of the course, students will be able to**

CO1: Gain insight on the various aspects of care and management of animals.

CO2: Explain the nutritional aspects, methods of feeding, formulating poultry feed, the causes and symptoms of poultry diseases.

CO3: Relate the knowledge and apply the suitable techniques involved in design and maintenance of animal barns optimized to specific needs.

CO4: Classify and explain the systems of Inbreeding and crossbreeding.

CO5: Describe the economic importance of the commercially important poultry and dairy breeds.

**COURSE:**

**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 ,SanjanaRawat.
4. Basic operations of Animal husbandry by SandeepTomar.

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

V SEMESTER

ZOOLOGY

TIME:2Hrs/Week

Z 5552 (2)

ANIMAL HUSBANDRY

Max MARKS: 50

w.e.f. 2015 – 2018 ("15AC")

PRACTICAL SYLLABUS – III B

**Learning Objectives: To enable the students to**

1. Identify the different poultry breeds
2. Examine and remember the anatomy of poultry bird.
3. Identify cattle breeds and discuss their importance.
4. Identify the causes and effects of poultry and dairy diseases.

**Course Outcomes: By the end of the course, students will be able to**

CO1: Able to identify different indigenous and exotic poultry breeds.

CO2: Describe the anatomy of poultry bird.

CO3: Classify and identify different cattle breeds.

CO4: Identify poultry and dairy diseases and their prevention.

**COURSE:**

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.

**REFERENCE BOOKS:**

1. Practical book of Zoology, B.Sc Third year, Semester V,  
DR.K.Kondaiah,A.V.N.Gupta,K.V.Maheswari,TechnicalPublishers,Guntur.
2. Text Book of Poultry Science by NilotpalGhosh
3. Animal Husbandry by Banerjee.

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM  
VI SEMESTER      **ZOOLOGY**      TIME: 3 Hrs/Week  
Z-E1-6501 (3)      **WILD LIFE: DIVERSITY, CONSERVATION & MANAGEMENT**  
Max. Marks: 100  
w.e.f 2016 -2019 ('16AD' batch) **SYLLABUS**

**Objectives:** To enable the students to

1. Summarise importance of protecting and conserving wild life to maintain ecological balance.
2. Discuss the threats, causes of depletion of wildlife and relate to the in-situ and ex-situ conservation.
3. To gain information about Wild life as a source of education, tourism & occupation.
4. Analyse wildlife offences, management of wildlife crime and poaching and steps taken to preserve our wildlife.
5. Define sanctuary, protected area, etc and discuss methods of monitoring wildlife populations.

**COURSE OUTCOMES:** By the end of the course, students will be able to

- 1) Develop an overview of the principles of wildlife conservation, management and the different conservation schemes.
- 2) Summarise illegal wildlife trade, laws of legislation, organisations promoting wildlife policies.
- 3) Discuss different conservation schemes of wildlife.
- 4) Review the trends of ecotourism and design the layout of a modern zoo.
- 5) List the national parks and bird sanctuaries of Andhra Pradesh and cite the list of endangered species.
- 6) Develop empathy towards animals.

**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.

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM  
VI SEMESTER **ZOOLOGY** TIME: 3Hrs/Week  
Z-E1-6551 (2) **WILD LIFE: DIVERSITY, CONSERVATION & MANAGEMENT**  
Max. Marks: 50  
w.e.f 2016 -2019 ('16AD' batch) **PRACTICAL SYLLABUS – IV**

**OBJECTIVES:** To enable the students to

1. Acquire skill in identifying and mapping the ecozones of India, National parks and Bird areas.
2. Acquire skill\familiarise the students to identify horns ,antlers ,pugmarks etc.
3. Gain knowledge about conservation of endangered animals and suggest methods of conservation.
4. Understand the criticality of conservation, sustainable use, or control of wildlife and its habitats, in order to safeguard sustainable relationships between wildlife and other human interests.

**COURSE OUTCOMES:** By the end of the course, students will be able to

CO1: Develop tactile skills in observation of animals and their behaviour .

CO2: Able to identify horns, antlers, pugmarks.

CO3: Identify the major biomes and outline their characteristics.

CO4: Suggest measures for protecting endangered species and their role in maintaining the ecological balance.

CO5: Develop empathy towards animals.

**COURSE:**

1. Identification of poisonous and non-poisonous snakes: Tropidonotus, Dryophis, Ptyas, Typhlops, Cobra, Krait, Echiscarinata, 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.

Reference Books:

1. Modern Textbook of Zoology Vertebrates by R.L.Kotpal. Rastogi publications, Meerut
2. Flash cards

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

ZOOLOGY SYLLABUS FOR VI SEMESTER

ZOOLOGY –ELECTIVE PAPER:VII-(A)

IMMUNOLOGY & CLINICAL APPLICATIONS

Z E2 6501(3)

**Learning Objectives:**To enable the students to

1. To be able to describe the basic concepts of immunology.
2. To explain the working of the immune system.
3. To understand the various types of hypersensitivities.
4. To apprehend the types and importance of vaccines and monoclonal antibodies.
5. To get acquainted with various immunological tests.
6. To classify and explain the various immune diseases.

**COURSE OUTCOMES:**By the end of the course, students will be able to

CO1: Describe about the types of cells and organs of immune system, structure and functions of antigens and antibodies.

CO2: Explain the working of immune system with respect to antibody/B-cell mediated, T-cell mediated, Antigen presentation & Processing and properties and functions of cytokines.

CO3: Apprehend the concept of hypersensitivity reactions and analyze the causes for different types of allergy.

CO4: Be acquainted with the recent trends in immunological techniques and different types of vaccines and monoclonal antibodies.

CO5: Illustrate various immunological tests for the diagnosis of immunity related disorders.

CO6: Classify and explain about auto-immune diseases, immune-deficiency diseases and immunology of organ transplantation.



## **COURSE:**

**Max. Marks:100**

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### **Unit - I**

#### **Overview of Immune system**

- .1. Introduction to basic concepts in Immunology
- .2. Innate and adaptive immunity

#### **Cells and organs of Immune system**

- 1.Organs of immune system
- 2.Cells of immune system

### **Unit - II**

#### **Antigens**

1. Basic properties of antigens
2. B and T cell epitopes, haptens and adjuvants
- 3 .Factors influencing immunogenicity

#### **Antibodies**

1. Structure of antibodies.
2. Classes and functions of antibodies
- 3.Monoclonal antibodies.

### **UNIT-III**

#### **Working of Immune system**

1. Humoral immune response (antibody/ B-cell mediated)
- 2.Primary and Secondary responses.
3. Antigen presentation & processing.
4. Cellular immune response (T-Cell mediated)
5. Basic properties and functions of cytokines.

### **Unit -I V**

#### **Immune Response in health and disease**

1. Classification and brief description of various types of hyper sensitivities
2. Introduction to concepts of autoimmunity and immunodeficiency..

#### **Vaccines**

1. General introduction to vaccines
- 2 .Types of vaccines.

### **UNIT-V**

#### **CLINICAL APPLICATIONS:**

1. Immunological Techniques (diagnostic tests): Agglutination, Precipitation, immunoelectrophoresis, complement fixation, Neutralisation, ELISA, RIA-(radio immunoassay) and HLA typing (human leucocyte antigen system).

2. Auto immune Diseases & Immuno deficiency Diseases.

3. Immunology of organ transplantation.

**TEXT BOOKS:**

1. Text book of Microbiology by K. Ananthanarayanan & C.K. Jayaram Paniker.

2. Essentials of Medical Microbiology by Rajesh Bhatia & Rattan Lal Ichhpujani

3. Review of Medical Microbiology by Ernest Jawetz bld.

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

**ZOOLOGY SYLLABUS FOR VI SEMESTER**

**ZOOLOGY –ELECTIVE PAPER:VII-(A)**

**IMMUNOLOGY & CLINICAL APPLICATIONS**

**Z E2 6551(2)**

**Learning Objectives:** To enable the students to

1. To identify different lymphoid organs.
2. To describe histology of lymph organs.
3. To acquire skills in determination of different immunological tests.
4. To illustrate different techniques of ELISA and Immuno electrophoresis.

**COURSE OUTCOMES :** By the end of the course, students will be able to

CO1: Identify and demonstrate in understanding different lymphoid organs.

CO2: Describe the histology of different lymphoid organs.

CO3: Acquire skills in determination of different immunological test like blood group, Rh typing, Blood cell counting, blood sugar, serum proteins, urine analysis etc.

CO4: Illustrate the principle of ELISA and immuno electrophoresis.

**COURSE:**

1. Demonstration of lymphoid organs (as per UGC guidelines)
2. Histological study of spleen, thymus and lymph nodes (through prepared slides)
3. Blood group determination&Rh typing.
4. Demonstration of
  - a. ELISA
  - b. Immuno Electrophoresis.
5. Blood cell counting-RBC, WBC, DIFFERENTIAL COUNTING.
6. Estimation of blood sugar and serum proteins.
7. Urine analysis and estimation of urine sugar.

REFERENCE BOOKS:

1. Practical book of Zoology, B.Sc Third year, Semester V, DR.K.Kondaiah,A.V.N.Gupta,K.V.Maheswari,Technical Publishers,Guntur.
2. Departmental flash cards.

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM VI  
SEMESTER **ZOOLOGY** TIME: 3Hrs  
Z-A1-6501(3) **PRINCIPLES OF AQUACULTURE** Max. Marks: 100  
w.e.f. 2015 – 2018 ("15AC") **SYLLABUS**

**Objectives: To enable the students to**

- 1) Analyse the underlying principles of aquaculture practices, their importance and strategies to improve production of aquatic organisms.
- 2) Develop insight about Aquaculture and Fisheries.
- 3) Recognise the factors for successful management of carp culture ponds.
- 4) Summarise the culture of Shrimps, oysters and maintenance of an aquarium.

**Course Outcomes: By the end of the course, students will be able to**

CO1: Appraise about the culture practices, systems and selection of species for aquaculture.

CO2: Review and plan the layout, design and construction of a pond using theoretical knowledge.

CO3: Summarise the nutritional requirements at different developmental stages and the importance of supplementary feed.

CO4: Develop insight into the prestocking, stocking and post stocking management of carp culture ponds.

CO5: Relate the knowledge of ornamental fish keeping, in maintaining aquaria.

COURSE:

**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 – Central 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) Konemannverlagsgesellschaft – mbH. Bonner strasse 126 D – 5096 B cologne.

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ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM.  
VI SEMESTER **ZOOLOGY** Time: 2Hrs  
Z-A1-6551(2) **PRINCIPLES OF AQUACULTURE**  
Max. Marks: 50 **PRACTICAL SYLLABUS – IV A1**

**OBJECTIVES:**

1. Acquire skill in identifying edible fishes, crustaceans and aquarium fishes.
2. Acquire skill in recording biometric data of a given fish.
3. Gain insight about the steps in the setting up of fish and shrimp ponds.
4. Gain knowledge about the fish culture practices.

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, Cynodossus, Trichiurus, Stormateus, Cybium, Caranx, Arius.



**OBJECTIVES: To enable the students to**

1. Recognise the importance of fish biometric studies.
2. Recognise the importance of determining water quality for maintaining culture ponds.
3. Identify zooplankton, shrimp and fish diseases.
4. Recognise the commercially important aquatic species.

**COURSE OUTCOMES: By the end of the course, students will be able to**

CO1: Record the fish biometrics.

CO2: Identify the Zooplankton, commercially important species based on their external morphology.

CO3: Summarise about the symptoms associated with fish and shrimp diseases and suggest measures for prevention.

CO4: Acquire skill in determining the PH, dissolved oxygen, salinity etc of pond water samples.

**COURSE:**

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 molluses): 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

### Reference Books:

1. “Fishery Science & Indian Fisheries” by C.B.L.Srivastava – KitabMahal, Allahabad – Edition: 1988.
2. Departmental repository of flash cards.
3. Manual of Vertebrate Zoology ,S.S.Lal.

Z-A2-6501(3) **AQUACULTURE MANAGEMENT** Max.Marks:100  
w.e.f. 2015-2018 ("15AC") **SYLLABUS**

**Objectives: To enable the students to**

- 1) Outline the technique of induced breeding for propagation of species and contributes significantly to the overall aquaculture production.
- 2) Realise the importance of maintaining soil & water quality parameters in the management of culture ponds.
- 3) Appraise the role of live feeds in shrimp larval nutrition, feed formulation and feeding strategies.
- 4) Gain overview on the importance of genetic improvement methods for better fish stocks.

**COURSE OUTCOMES:** By the end of the course, students will be able to

CO1: Summarise the technique of induced breeding, management of water quality, feed quality and disease prevention in carp culture ponds.

CO2: Recall the various kinds of fish hatcheries and their utility.

CO3: Relate the types of feeds, feed formulation and feeding strategies according to the developmental stages of the fish.

CO4: Gain insight on the reasons and preventive measures of the diseases of fish and shrimp.

CO5: Conduct cost benefit analysis, analyze the fish marketing strategies and to identify the most suitable one.

CO6: Validate the recent advances in aquaculture thru application of biotechnology.

**COURSE:**

**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 CircularNo. 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

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**Objectives:** To enable the students to

- 1) Recognise the importance of live feeds in larval nutrition.
- 2) Assess the nutritional requirements and formulate the diet using standard methods.
- 3) Assess the suitability of ponds suitable for aquaculture.

**COURSE OUTCOMES:** By the end of the course, students will be able to

- CO1: Identify the live feed organisms.  
CO2: Formulate the diet according to the age using suitable feed ingredients.  
CO3: Relate the feeding habit according to the type of alimentary canal.  
CO4: Demonstrate skill in assessing the suitability for various parameters in culture ponds.

**COURSE:**

### **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.

Reference Books:

1. "Fishery Science & Indian Fisheries" by C.B.L.Srivastava – KitabMahal, Allahabad – Edition: 1988.
2. Departmental repository of flash cards.
3. Manual of Vertebrate Zoology ,S.S.Lal.

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OBJECTIVES:To enable the students to

1. Acquire skill in preparation of value added products of fish and fishery products.
2. Gain hands on experience in fish preservation techniques like salting, drying etc.
3. Follow safety and hygienic measures in sea food processing plants.

COURSE OUTCOMES:By the end of the course, students will be able to

CO1: Indicate proper ways of handling fish with minimal stress and methods of identifying a fresh fish.

CO2: Apply the techniques of fish preservation and be able to follow suitable procedures.

CO3: Demonstrate skill in preparation of value added products form fishes.

CO4: Evaluate the situation for following safety and hygienic procedures according to National and International standards.

COURSE:

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.**

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.

**(or)**

Life cycle of *Penaeusmonodon*.

Reference Books:

1. "Fishery Science & Indian Fisheries" by C.B.L.Srivastava – KitabMahal, Allahabad – Edition: 1988.
2. Departmental repository of flash cards
3. NIFPHATT Training manual .

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

VI SEMESTER

**ZOOLOGY**

TIME:3Hrs

Z-A3-6501 (3) **POSTHARVEST TECHNOLOGY** Max.Marks:100

w.e.f. 2015 – 2018 (“15AC”)

**SYLLABUS**

Objectives:To enable the students to

- 1) Compare and contrast the traditional and advanced methods of fish preservation.
- 2) Explain the Rigor mortis changes in fish.
- 3) Recognise the quality control and sanitation standards in maintaining the quality of sea food products.
- 4) Identify hazards and suggest suitable Good manufacturing practices in preventing hazards.
- 5) Discuss the principles of HACCP

COURSE OUTCOMES:By the end of the course, students will be able to

CO1: Summarize the handling and principles of fish preservation.

CO2: Gain insight about the processing and preparation of commercially important products and byproducts of fish.

CO3: Discuss the use of seaweeds in disease treatment and preparation of therapeutic drugs.

CO4: Establish Good laboratory practices, corrective procedures for sanitation in processing plants.

CO5: Recall the principles of HACCP and suggest corrective measures.

COURSE:

### **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 lowradiation 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).

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**GENERAL SERICULTURE, MULBERRY CULTIVATION AND MANAGEMENT**

w.e.f. 2019 – 2020

**SYLLABUS**

**OBJECTIVES:** To enable the students to

1. Develop an overview on the importance of sericulture.
2. Summarize the cultivation, maintenance of farm, silkworm rearing and silk reeling.
3. Identify the diseases and pests of mulberry.
4. Enhance skills for self-employment in the mulberry rearing and silk rearing.

Course outcomes: By the end of the course, students will be able to

1. Appraise the prospects of sericulture and realize its employment potential.
2. Acquire skill in selection of mulberry plant, the optimal condition for its cultivation and management.
3. Identify the diseases and pests of the mulberry plant.
4. Discuss the types of silkworms and basic techniques of cocoon construction and silk production.

**COURSE:**

**UNIT - I : INTRODUCTION**

1. Definition, history and present status of Sericulture
2. Types of silk worms and their food plants
3. Prospects of Sericulture in India - Sericulture industry in different states, employment, potential in mulberry and non mulberry Sericulture.

**UNIT - II : MORPHOLOGY OF MULBERRY PLANT**

1. Common varieties of mulberry used in India
2. Characters of root, stem and leaf
3. Anatomy of root, stem and leaf
4. Male and female reproductive organs, pollination, fertilization, development of seed.

**UNIT - III : REQUIREMENTS FOR MULBERRY CULTIVATION**

1. Physical and chemical properties of soil and its nature
2. Soil moisture and water requirements
3. Climatic conditions - Temperature, photoperiod, humidity and rain fall

**UNIT - IV : MULBERRY MANAGEMENT**

1. Land preparation - leveling and ploughing
2. Irrigation - drip, sprinkler or flood irrigation, weeding
3. Manuring - organic, inorganic and biofertilizers
4. Harvesting - leaf picking, shoot-leaf harvesting, branch cutting, leaf storage

**UNIT - V : DISEASES AND PESTS OF MULBERRY**

1. Fungal and bacterial diseases - Powdery mildew, red rust and leaf spot caused by fungi

Mulberry wilt caused by bacteria

Symptoms; mechanical and chemical control

- 2 .Nematode and mycoplasm diseases - Mulberry root-knot and mulberry root rot (nematode diseases),Mycoplasm and viral mulberry disease, Symptoms; mechanical and chemical control
3. Caterpillars - Bihar hairy caterpillar, semilooper  
Bugs - Leaf hoppers and scale insects  
Beetles - Girdle beetle, powder pest beetle

## REFERENCES

1. Principles of sericulture – Hisao Aruga, Mohan Pramlani for Oxford and IBH publishing co., Pvt., Ltd., New Delhi
2. Manual on sericulture – Food and Agriculture Organisation, Rome – 1976
3. Handbook of practical sericulture : S.R. Ullal and M.N. Narasimhanna CSB, Bangalore – 1987
4. A guide for bivoltine sericulture – K. Sengupta, Director, CSR & TI, Mysore – 1989
5. Economics of sericulture under irrigated conditions : M.S. Jolly, CSR & TI, Mysore – 1982
6. China sericulture, 1972, FAO, Rome
7. Mulberry cultivation (Vol. I) written by Zheng Ting – Xing, Tan Yun – Fang, Huang Guang – Xian and Ma ben. Published by Oxford and IBH publishing Co. Pvt. Ltd., New Delhi, Bombay, Calcutta
8. Text book of tropical sericulture. Publ., Japan Overseas Corporation volunteers – 1975

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**OBJECTIVES:** To enable the students to

1. Outline **and map** the extension of sericulture globally.
2. Gain insight into the soil analysis and its importance.
3. Identify the common diseases of mulberry plant.

Course outcomes: By the end of the course, students will be able to

1. Prepare and map the extension of sericulture.
2. Estimate the moisture and pH content of soil for mulberry cultivation.
3. Discuss and identify the mulberry diseases and effective treatment for better productivity and quality.

**COURSE:**

### **1. MAPS AND RECORDS**

- a. Preparation of a map showing extension of sericulture in the world
- b. Preparation of a map showing extension of sericulture in the India
- c. Graphical representation of cocoon and silk production by various silk worms in India

### **2. MORICULTURE**

- a. Soil sampling and analysis of soil pH and moisture
- b. Preparation and study of sections of root, stem, and leaf of mulberry plant
- c. study of inflorescence, male and female reproductive parts

### **3. MULBERRY DISEASES**

- a. Collection, study and preservation of mulberry disease samples
- b. Microscopic preparation of mulberry fungi, virus, bacteria causing diseases.

### **REFERENCES**

1. The natures and property of soils (9<sup>th</sup> edition) N.C. Brady (Mac Millan Pub. Co. Inc., New York)
2. Manual on sericulture-Food and Agriculture Organisation, Rome-1976
3. Handbook of practical sericulture: S.R. Ullal and M,N. Narasimhanna CSB, Bangalore-1987
4. A guide for bivoltine sericulture-K. Sengupta, Director, CSR & TI, Mysore-1989
5. Silk production processing and marketing-MM Nanavaty, VS Johari, Wiley Estern ltd., Ansari Road, New Delhi.

6. Principles of sericulture-Hisao Aruga, Mohan Primalani for Oxford and IBH publishing co., Pvt., Ltd., New Delhi.

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**OBJECTIVES:** To enable the students to

1. Describe the morphology of different stages of silkworm.
2. Explain the anatomy and physiology of Mulberry silkworm.
3. Apply the knowledge in planning, designing, constructing silkworm rearing houses.
4. Identify various diseases of silkworm, their prevention, control and management.
5. Analyse suitable technology for rearing silkworm larvae and using disinfection methods to get healthy cocoons.

**COURSE OUTCOMES:** By the end of the course, students will be able to

1. Gain insight into the external and internal morphology of different stages of silkworm.
2. Discuss and explain the anatomy and physiology of Mulberry silkworm.
3. Relate the knowledge in planning, designing and constructing silkworm rearing houses.
4. Identify various diseases of silkworms, their prevention, control and management.
5. Recognize the disinfection, feeding appliances and methods to get healthy cocoons.

**COURSE:**

#### **UNIT - I : MORPHOLOGY OF SILK WORM**

1. Egg - External and internal morphology and colour changes
2. Larva - Mouth parts, legs, prolegs, spiracles, eyes, claspers, integumentary hair and sexual markings
3. Pupa – Male and female morphology and sexual dimorphism
4. Adult – Mouth parts, antennae, wings and external genitalia

#### **UNIT - II : ANATOMY AND PHYSIOLOGY OF MULBERRY SILK WORM**

1. Digestive system of larva - Structure and physiology of digestion
2. Silk glands of larva – Structure, development and mechanism of silk synthesis
3. Circulatory system of larva – Blood vessel, haemolymph and cells
4. Reproductive system of adult – Mechanism of egg development
5. Endocrine glands in larva and pupa, their secretions and hormonal control on development
6. Role of pheromone in mating

#### **UNIT - III : SILK WORM REARING HOUSE AND APPLIANCES**

1. Construction of ideal rearing house (CSB model)
2. Early age rearing appliances
3. Late age rearing appliances – Trays, ant wells, stands and racks, paraffin wax, papers, rubber foam pads, nets, chopsticks and feathers
- 4 .Mountages – Bamboo, plastic, nylon, balances (digital)

#### **UNIT - IV : DISINFECTION AND FEEDING APPLIANCES AND SILK WORM TECHNOLOGY**

1. Disinfection of ants, appliances
2. Disinfectant appliances – Sprayers and dusters
3. Feeding appliances – Leaf chamber, chopping knife, chopping board
4. Humidity and temperature measuring devices
5. Commercial races – Multivoltine, bivoltine, monovolatine and hybrid races
6. Seed collection, cards, loose eggs, incubation, hatching, brushing, rearing of early instars, rearing of late instars.
- 7.. Mounting and cocoon production
8. Harvesting and storage of cocoons

#### **UNIT - V : DISEASES OF SILK WORMS AND THEIR MANAGEMENT**

1. Viral diseases – Nuclear polyhydrosis disease, infectious flacherie viral disease (symptoms, prevention, control and management)
2. Protozoan disease – Pebrine disease (symptoms, prevention, control and management)
3. Bacterial diseases – Septicemia, Toxicosis (symptoms, prevention, control and management)
4. Fungal diseases – Muscardine disease, aspergillosis (symptoms, prevention, control and management)
5. Pests – Tachinid fly, dermistid beetle (damage, control measures)

#### **REFERENCES**

1. Silkworm rearing techniques in the tropics, Dr. S. Omura, Japan International Cooperation Agency – 1980
2. The natures and property of soils (9<sup>th</sup> edition) N.C. Brady (Mac Millan Pub. Co. Inc., New York)
3. Studies on soils of India, S.V. GovindRajan and H.G. GopalaRao (1970), Vikas Pub. House Pvt. Ltd., New Delhi
4. Silk egg production (Vol. III) written by Wang Sang – Ming published by Oxford and IBH publishing Co. Pvt. Ltd., New Delhi, Bombay, Calcutta
5. Economics of silk industry, RC Rawlley, PS king and Sons Ltd., London



**PRACTICAL SYLLABUS – IV B2**

**LEARNING OBJECTIVES:** To enable the students to

1. Summarize morphology of different stages of silkworm.
2. Examine and observe the different types and systems of larva, pupae of insects and adult.
3. Identify various diseases of silkworm.
4. Describe metamorphosis in different insects.

**COURSE OUTCOMES:** By the end of the course, students will be able to

1. Explain and discuss the morphology of different stages of silkworm.
2. Recognize and observe different types and systems of larva, pupae and adult.
3. Identify and discuss different diseases of silkworm.
4. Illustrate metamorphosis in different insects.

**COURSE:**

1. Morphology of egg, last instar larva, pupa, adult, sexual dimorphism, mouth parts, antennae, legs, prolegs and wings
2. Dissection of digestive system of larva, silk gland of larva and reproductive system of adult
3. Study of various appliances
4. Microscopic preparation of pebrine causative agents in larva and adult by Giemsa stain
  1. Study of one each of viral, bacterial, protozoan diseases and pests
6. Metamorphosis in insects lepidoptera, Blatta (cockroach), Dragon fly, Damselfly-Butterfly & Silkworm.

Types of larvae & pupae of insects.

**References**

1. The nature and property of soils (9<sup>th</sup> edition) N.C. Brady (Mac Millan Pub. Co. Inc., New York)
2. Manual on sericulture-Food and Agriculture Organisation, Rome-1976
3. Handbook of practical sericulture: S.R. Ullal and M.N. Narasimhanna CSB, Bangalore-1987
4. A guide for bivoltine sericulture-K. Sengupta, Director, CSR & TI, Mysore-1989
5. Silk production processing and marketing-MM Nanavaty, VS Johari, Wiley Eastern Ltd., Ansari Road, New Delhi.

6. Principles of sericulture-Hisao Aruga, Mohan Primalani for Oxford and IBH publishing co., Pvt., Ltd., New Delhi.

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**Learning Objectives:** To enable the students to

1. Gain insight on the various aspects of Cocoon sorting, preservation and cooking.
2. Summarise throwing, weaving and chemical processing of silk.
3. Be familiar with the management strategies of sericulture industry.
4. Appraise the challenges in cocoon and yarn marketing.

**Course Outcomes:** By the end of the course, students will be able to

CO1: Effectively manage small scale sericulture unit.

CO2: Develop skill in raw silk testing and grading.

CO3: Gain insight on role of co-operative and financing agencies in sericulture management.

CO4: Observe the merits and demerits of traditional and regulated markets.

CO5: Discuss feedback system and challenges in silk export.

## **COURSE:**

### **UNIT - I : COCOONS**

1. Quality of cocoon, cocoon shell ratio, silk filament length, cocoon reelability and factors effecting reelability
2. Physical and chemical properties of fibre
3. Cocoon drying – Conventional and modern techniques
4. Cocoon sorting and preservation
5. Cocoon cooking

### **UNIT - II : REELING, SILK THROWING AND WEAVING**

1. Reeling appliances – Conventional and modern
- .2. Reeling operations
3. Rereeling
4. Raw silk testing and grading
5. Silk throwing and twisting
- .6. Silk weaving
7. Chemical processing of silk yarn and fabrics

### **UNIT - III : SERICULTURE AND MANAGEMENT**

- .1 Sericulture organisation at state and national levels – Development, research, training and policies
- .2. Role of national silk worm seed organisation in grainage
3. Sericulture services network – Basic seed facility, seed areas, grainages, nurseries, central research centers (CRCs), filature, silk exchanges and cocoon certification centers
- .4..Project formulation and role of credit co-operative and financing agencies in sericulture –  
NAARD, IDBI, Banks, IRDP etc.

#### **UNIT - IV: MARKETING ORGANIZATIONS, COCOON AND YARN MARKETING**

- 1 Sericulture marketing organisation for seed cocoon, raw silk and silk fabric
- 2 Traditional and regulated markets, their merits and limitations
- 3 Government intervention – Legislation and implication in marketing
- 4 Marketing institutions – Marketing boards, co-operatives and stabilization of price

#### **UNIT - V : COCOON AND YARN MARKETING**

- 1 .Cocoon marketing – Gradation of seed and reeling cocoons, marketing of multivoltine, bivoltine and hybrid cocoons
- .2. Yarn marketing – Gradation of yarn, twisted and untwisted yarn
3. Feedback system – Surveys and types, merits and limitations
4. Silk export – Challenges and growth prospects

#### **REFERENCES**

1. The natures and property of soils (9<sup>th</sup> edition) N.C. Brady (Mac Millan Pub. Co. Inc., New York)
2. Studies on soils of India, S.V. GovindRajan and H.G. GopalaRao (1970), Vikas Pub. House Pvt. Ltd., New Delhi
3. Economics of sericulture under irrigated conditions : M.S. Jolly, CSR & TI, Mysore – 1982
4. Silk egg production (Vol. III) written by Wang Sang – Ming published by Oxford and IBH publishing Co. Pvt. Ltd., New Delhi, Bombay, Calcutta
5. Economics of silk industry, RC Rawlley, PS king and Sons Ltd., London
6. Silk production processing and marketing – MM Nanavaty, VS Johari, Wiley Estern Ltd., Ansari Road, New Delhi



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

VI SEMESTER

ZOOLOGY

Time: 2 Hrs

Z-B3-6551

**SILK TECHNOLOGY, SILK MARKETING AND EXTENSION**

**PRACTICAL SYLLABUS – IV B3**

Max.Marks: 50

**OBJECTIVES:**To enable the students to

1. Identify the various types of cocoons.
2. Examine types of silk fabrics.
3. Adopt advanced techniques for better income and productivity.

**Course Outcomes:** By the end of the course, students will be able to

CO1: Identify high quality cocoons.

CO2:Apply improved technologies in silkworm rearing

CO3: Setup and effectively manage cocoon production and rearing.

### **Course**

1. Study of cocoons.
2. Types of Silk.
3. PROJECT WORK.

### References

1. The natures and property of soils (9<sup>th</sup> edition) N.C. Brady (Mac Millan Pub. Co. Inc., New York)
2. Manual on sericulture-Food and Agriculture Organisation, Rome-1976
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