

**KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)**  
**COIMBATORE – 641 029**

**Course Name: M.Sc., Zoology**

Curriculum and scheme of Examination under CBCS

(Applicable to students Admitted from the Academic Year **2016-2017** onwards)

Semester	Part	Subject Code	Title of the Paper	Instruction hours/cycl	Exam. Marks			Duration of Exam (hours)	Credits
					CIA	ESE	TOTAL		
<b>I</b>	<b>I</b>	15PZO101	C.P.1 <b>Animal physiology</b>	6	25	75	100	3	5
		15PZO102	C.P.2 <b>Cell and Molecular biology and Biochemistry</b>	5	25	75	100	3	4
		15PZO103	C.P.3 <b>Biotechnology and Bioinformatics</b>	6	25	75	100	3	5
		15PZO104	C.P.4 <b>Aquaculture</b>	5	25	75	100	3	5
			<b>Cr.P.1</b>	4					
			<b>Cr.P.2</b>	4					
<b>II</b>	<b>I</b>	15PZO205	C.P.5 <b>Biostatistics and Biophysics</b>	6	25	75	100	3	5
		15PZO206	C.P.6 <b>Molecular Genetics</b>	6	25	75	100	3	5
		15PZO207	C.P.7 <b>Microbiology and Immunology</b>	6	25	75	100	3	4
		15PZO2CL	<b>C.Pr.1</b>	4	40	60	100	4	2
		15PZO2CM	<b>C.Pr.2</b>	4	40	60	100	4	2
		15PZO2N1	<b>Non Major Ele. I</b>	4	25	75	100	3	5
<b>III</b>	<b>I</b>	15 PZO308	C.P.8 <b>Entomology</b>	5	25	75	100	3	5
		15 PZO309	C.P.9 <b>Bioinstrumentation</b>	5	25	75	100	3	4
		<b>16 PZO310</b>	<b>C.P.10 Developmental Biology</b>	5	25	75	100	3	5
			<b>C.Pr.3</b>	4					
			<b>C.Pr.4</b>	4					
		15PZO3N2	<b>Non Major Ele. II</b>	3	25	75	100	3	5
<b>IV</b>	<b>I</b>	15 PZO3E1	<b>Major Ele. I</b>	4	25	75	100	3	5
		15 PZO411	C.P.11 <b>Biodiversity and Evolution</b>	5	25	75	100	3	5
		15 PZO412	C.P.12 <b>Applied Entomology</b>	6	25	75	100	3	5
		<b>16PZO4CN</b>	<b>C.Pr.3</b>	4	40	60	100	4	2
		15PZO4CO	<b>C.Pr.4</b>	4	40	60	100	4	2
		15PZO4E2	<b>Major Ele. II</b>	6	25	75	100	3	5

		15PZO4Z1	Project and Viva voce	5	40	160	200	-	5
			<b>Total</b>				<b>2200</b>		<b>90</b>

### MAJOR ELECTIVE PAPERS

(2 papers are to be chosen from the following 4 papers)

1. Environmental Biology
2. Wild life ecology and Management
3. Environmental Biology & Toxicology.
4. Poultry science & Management

### NON -MAJOR ELECTIVE PAPERS

(2 papers are to be chosen from the following 4 papers)

1. Nutrition and Dietetics
2. Ecotourism
3. **Nanobiotechnology**
4. Human genetics & Counselling

#### Tally Table:

Part	Subject	No. of Subjects	Total Marks	Credits
I	Core – Theory / Practical / Project	18	1800	70
	Major Elective Paper	2	200	10
	Non Major Elective Paper	2	200	10
	<b>Grand Total</b>	<b>22</b>	<b>2200</b>	<b>90</b>

#### Note:

CBCS – Choice Based Credit System  
CIA – Continuous Internal Assessment  
ESE – End of Semester Examinations

25 % CIA is applicable to all theory subjects except JOC, ALC, COP and Diploma Courses, which are considered as extra credit courses.

PZ0 1

15PZO101

I - SEMESTER

**PAPER -1 ANIMAL PHYSIOLOGY**

**Total Credits: 5**

**Total Hours: 90**

**Objectives**

1. To know the functions of the organ and organ system.
2. To study the catabolism of nutrients.
3. Physiological adaptation of organs at different environment.

**UNIT I      DIET AND NUTRITION**

**18Hrs**

Nutritional Aspects: Role of Protein, carbohydrate, lipid, mineral and dietary fibers in nutrition.

Energy Metabolism:-Introduction, Caloric value of foods, BMR, factors influencing BMR, physiological variations of BMR, respiratory quotient, (RQ), Factors affecting respiratory quotient.

**UNIT II      RESPIRATION**

**18Hrs**

Process of gaseous exchange, Transport of oxygen and CO<sub>2</sub>, Factors affecting O<sub>2</sub>, and CO<sub>2</sub> transport, Effects of Hypoxia, Oxygen therapy, Control of respiration, Regulation of respiration during exercise, Physiological adaptations at high altitude and deep sea.

**UNIT III      CIRCULATION**

**18Hrs**

Composition of blood, Plasma proteins, types, characteristics, functions and clinical importance. Haematological abnormalities (anaemia, leucopenia, leucocytosis, Thrombocytopenia) Blood pressure, cardiac cycle and ECG.

**MUSCLE PHYSIOLOGY**

Ultra structure of muscle fibre, muscle proteins, Mechanism of muscle contractions, Neuro muscular junction-structure and mechanism of impulse transmission.

**UNIT IV      EXCRETION**

**18Hrs**

Patterns of Nitrogen elimination, Mechanism of urine formation, Composition of urine, Concurrent mechanisms, Regulation of excretion, Fluid system of the body and

Constituents of extra cellular and intra cellular fluids, Edema, Regulation of body fluids by Kidney.

## PZ0 2

### UNIT V      ENDOCRINE GLANDS AND REPRODUCTION

18Hrs

Pituitary, Thyroid, Parathyroid, Adrenal and Pancreatic glands, Gastro intestinal hormones. Role of Hormones in Reproduction. Cibernating system of Homeostasis and Hormonal control.

#### Text Books:-

1. Essentials of Animal physiology-S.C. Rastogi, New Age International (P) Ltd., Publishers, (2003).
2. Text books of human physiology-Saradhasubramaniam K and P.Madhavankutty, S. Chand Company Ltd., (2007).

#### Reference Books:-

1. Text books of medical physiology-C.Guyton, M.D. John E. Hall. Ph.D, W.B. Saunders Company, (2006).
2. Text book of medical physiology-M.M. Chatterjee, RanaShinde, Jupee Brothers, Medical Publishers, Pvt. Ltd., (1992).
3. Text books of animal physiology-(1990) R.Nagabushanam-Emkay Publication.
4. General and Comparative Physiology-(1984) William S. Hoar, Prentice Hall of India. New Delhi.
5. Animal physiology and Biochemistry –Singh H.R and Neeraj Kumar (2007) Vishal publications, Jalandhar.
6. Text book of Physiology. (2010) R.Chandramouli Jaypee Brothers Publications.
7. Animal Physiology – K.A.Goyal and K.V.Sastry 2012.

**I – SEMESTER**

**PAPER-2 CELL AND MOLECULAR BIOLOGY AND BIOCHEMISTRY**

**Total Credits: 4**

**Total Hours: 75**

**Objective**

1. To aware about cell membrane and cyto skeletons structure and functions.
2. To know about nucleus, DNA, protein synthesis, cancer and ageing.
3. To inculcate the knowledge on structure and functions of carbohydrate, protein, lipid, free radicals and anti-oxidants.

**UNIT I**

**15Hrs**

**Cell Membrane:** Fine Structure, Chemical composition, Transport – Diffusion, Active Transport and Pumps, Uniports, Symports and antiports, Cell to cell adhesion – Gapjunctions, connections

**Cytoskeleton and their structure and function:**

Endoplasmic reticulum, Microfilaments, Microtubules

**UNIT II**

**15Hrs**

**Nucleus:** Chromosomes, Giant Chromosomes, Cell cycle and cell signaling, Interphase nucleus, Chromosomal movement during cell division.

**DNA:** Structure and Chemistry, Nuclear DNA amounts and C value, Satellite DNA and its functions, Mobile DNA (Transposable elements)

**UNIT III**

**15Hrs**

**Protein Synthesis:** DNA template, RNA types- their structure and functions, Transcription, Translation, Post translational modifications.

**Special Changes and Acceptance:** Biogenesis of Mitochondria, Mitochondrial genome and its function, Biology of Cancer, Biology of Aging.

**UNIT IV**

**15Hrs**

**Classification, Structure and Metabolism**

**Carbohydrate-** Mono, di and Polysaccharides – structure of pentose (Ribose) and Hexoses (Glucose and fructose)-Glycolysis, Krebcycle, Glyconeogenesis: HMP Pathway, Glycogenolysis.

## PZO 4

**Protein:** Amino acids, Structure and Classification, essential and non essential amino acid. Protein classification structure and function of Hemoglobin deamination, Transamination and transdeamination.

**Lipids:** Classification, saturated and unsaturated fatty acids, cholesterol structure, Metabolism of lipids, Enzymes-Classification-Mechanism of action.

### UNIT V

**15Hrs**

#### **Free Radicals & Anti oxidants**

Free radicals, Reactive Oxygen species conservation, Impact, Free radicals, Scavenger system, Inflammation, Respiratory diseases, Retro lentil fibroplasias, Reperfusion injury, Arteriosclerosis, Peptic ulcer, skin diseases, Age related diseases, Preventive antioxidants chain breaking antioxidants.

#### **Text books**

1. Cell and Molecular Biology-P.K.Gupta-2010; Rastogi Publications.
2. Fundamentals of Biochemistry for Medical students-AmbikaShanmugam, Published by author, 10, 111-cross street, West C.I.T.Nagar, Madras-35

#### **Reference books**

1. Fundamentals of Biochemistry. Dr. A. C. Deb. New central Book Agency Pvt LTD. Kolkata. (2004).
2. The principles of Biochemistry. Lehninger. A.L., D.L. Nelson and M.M.Cox., CBS Publishers & Distributors, New Delhi, India. (1993).
3. Text book of medical physiology- C. Guyton and Jhon E. Hall. 11 Edition, Saunders- An Imprint of Elsevier., New Delhi, India. (2006).
4. Text book of Biochemistry. D.M. Vasudevan & SreeKumari. S, Jaypee brothers, Medical publishers (P) Ltd. New Delhi (2007).
5. The text book of medical bio chemistry M.N Chatterjee and RanaShinde, Jaypee brothers medical publishers (P) Ltd, New Delhi-(2007).

**I - SEMESTER**

**CORE PAPER - 3 - BIOTECHNOLOGY AND BIOINFORMATICS**

**Total Credits: 5**

**Total Hours: 90**

**Objectives**

1. To learn more advanced and application oriented subjects.
2. It helps to learn the various techniques by the combination of both biology and Information technology.
3. To understand the importance of Human genome project and the necessities of drug designing

**UNIT I      RECOMBINANT DNA TECHNIQUES      18Hrs**

Cloning vectors for recombinant DNA. (Bacterial, Viral, Fungal sources -any one example) - Cloning in bacteria and Eukaryotic organisms - transfer of recombinant DNA in the bacterial cell - selection of recombinants - cloning strategy used for synthesis of insulin.

**UNIT II      GENE ANALYSIS AND IMMUNOLOGY      18Hrs**

PCR, RFLP, RAPD – Application and significance, cDNA, Gene sequencing, Monoclonal antibodies

**UNIT III      ANIMAL CELL, TISSUE AND ORGAN CULTURE      18Hrs**

Requirements for animal cell and tissue culture, isolation of animal material, primary cell culture - Evolution of cell lines - products obtained through cell culture system. Transgenic animals and their use.

**UNIT IV      INTRODUCTION TO BIOINFORMATICS      18Hrs**

Historical perspectives of Bioinformatics. Application of Internet principles in Bioinformatics - Data Banks -Softwares used and its applications in Biology.

**UNIT V      18Hrs**

Protein structure predictions - Gene structure predictions - Phylogenetic tree clustering methods and its applications. Drug designing through Bioinformatics.



## PZO 6

### **Text Books**

1. A Text Book of Biotechnology - R.C.Dubey, S.Chand&Co.Publications (2012)
2. Bioinformatics - D.R.Westhead, J.H. Parish and R.M.Twyman Viva Books Private Limited, New Delhi.(2002)
3. Basic Bioinformatics - S.Ignacimuthu, S.J.Narosa Publishing House, New Delhi.(2005)
4. Bioinformatics for Beginners, Dr.K.Mani, N.Vijayaraj, Dr.D.Padmanabhan, Kalaikathir Achchagam, Coimbatore.(2002)

### **Reference Books**

1. Advances in Bio technology - S.N.Jogdand. Fifth revised edition 2005. Published by Himalaya publishing house.
2. Gene cloning and DNA analysis - T.A.Brown, fourth edition, Blackwell Publishing 2001.
3. Introduction to Bioinformatics. Arthur M.Lesk, Second Edition, the Pennsylvania State University, Published by Oxford University Press 2005.
4. Bioinformatics. The Machine learning approach. Second Edition Pierre Baldi&SorenBrunak. The MIT press Cambridge USA First East West Press, Edition 2003.

# PZO 7

**15PZO104**

## **I - SEMESTER**

### **PAPER 4 – AQUACULTURE**

**Total Credits: 5**

**Total Hours: 75**

#### **Objectives**

1. To explore the aquatic resources of the edible and economically important organisms.
2. To provide self employment opportunities and knowledge for students undergoing Zoology.
3. To make use of the inland waters and marine potential to substitute the protein requirements by the human population.

#### **UNIT I**

**14Hrs**

The need for aquaculture, fish as a protein source, construction and maintenance of fish farm.

#### **UNIT II**

**15Hrs**

Qualities of culturable species of fishes, Types of culture - Monoculture, Polyculture, sewage fish culture, Paddy fish culture. Culture of Indian major carp and air breathing fish. Ornamental fish culture.

#### **UNIT III**

**15Hrs**

Types of Species cultured on brackish water, coastal water, off shore and deep sea water. Oyster culture and prawn culture.

#### **UNIT IV**

**16Hrs**

Fish breeding - Bund breeding, induced breeding by Hypophysation; Breeding techniques, factors influencing induced breeding. Culture and Nutritional value of Rotifers, Artemia, copepods and Daphnia.

#### **UNIT V**

**15Hrs**

Economic importance of fishes, Methods of fish Preservation. Cryopreservation. Applied genetics of cultivable fishes for live food, Common diseases of fishes and control measures.

## PZO 8

### **Text book**

1. Kamaheshwar Pandey and J.P. Shukla, 2005.Fish and fisheries. Rastogi Publications, Meerut, India.
2. B.Ahilan and N.Felix, 2008.Text book of Aquaculture. Daya Publishing House New Delhi, India.

### **Reference books**

1. V.G. Jhingran, 1991.Fish and fisheries of India. Hindustan Publish Corporation, Delhi.
2. Rath. R.K, 2000. Fresh Water aquaculture. Scientific (India) Jodhpur.
3. Santhanam. R, 2008.Fisheries Science.Daya Publishing House, New Delhi.
4. S.C. Agarwal, 1990.Fishery Management. Ashish Publishing house, New Delhi.
5. Dr.V.B.Sakhave, 2009.Aquatic biology and Aquaculture.Mahalingam publications.
6. C.B.L. Srivatsava, 2002.A text book of Fishery Science and Indian Fisheries.KitabMahal. Allahabad.

**II - SEMESTER****CORE PAPER-5- BIOSTATISTICS AND BIOPHYSICS****Total Credits: 5****Total Hours: 90****Objectives**

1. To create awareness on collection, analysis of data and interpretation of results.
2. To know the level of significance after analysis of data and also applied in research work.
3. To know the bioelectric potentials of cell membranes and neurons.

**UNIT I****18Hrs**

**Biological Data:** Sources, Collection, Classification and Tabulation. Diagrammatic representation and Graphical representation -Frequency curves, Frequency polygon and Ogive.

Measures of central value- Arithmetic mean, median and mode. Measures of dispersion - Standard deviation and Standard Error.

**UNIT II****18Hrs**

Correlation - Introduction, Types of correlation, merits and demerits.

Regression - Definition, method of studying regression and uses. Differences between correlation and regression. Probability - Definition, types, addition and multiplication theorems.

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**UNIT III****18Hrs****Test of Samples**

Sampling and sampling errors- Test of significance for small and large samples. Student's 't' tests. ANOVA [F-test) for one way classification only, Chi-square test.

**UNIT IV****18Hrs****Bioenergetics**

Bioenergetics, Enzyme kinetics, Laws of Thermodynamics- Redox Potentials- Biological Oxidation- High energy compounds- Enthalpy.

**UNIT V****18Hrs****Bioelectricity**

Membrane potential- ionic distribution of membrane Potential- Origin of membrane potential- Resting and Action Potentials of nerves. Mechanism of Action potential. Nerve impulse propagation and conduction of nerve impulse- Measurement of Action potential.

**Text book**

**Biostatistics**

1. Biostatistics for biology - Palanichamy, S. Manoharan, Paramount Publications, Palani (1992).
2. Statistics, Pillai, R.S.N. and Bhagavathi, V.S. Chand and Co. New Delhi -5. (2001).

**Biophysics.**

1. Biophysics – VasanthaPattabhi, N.Gautham. Narosa publishing house, New Delhi, Chennai, Mumbai & Calcutta (2002).
2. A text book of Biophysis. Dr.R.N.Roy New Central book agencies (P) Ltd. Chintamoni Das Lane, Calcutta (1996).

**Reference Books**

1. Statistical methods-S.P.Gupta Sultan Chand & Sons publications, New Delhi(2001).
2. An introduction to Biostatistics - P.S.S. SundarRao and J. Richard, Prentice, Hall of India Pvt. Ltd., New Delhi (2003).
3. Fundamentals of biostatistics, Irfan Ali khan and AtiyaKhanumUkaaz publications, Andrapradesh, India (2004).
4. Text book of Medical physiology- C.Guyton and John E. Hall. 11<sup>th</sup> edition Sounders – An Imprint of Elsevier, New Delhi, India (2006).
5. Text book of Medical Biophysics Dr. R.N .Roy. Books and Allied (P) Ltd. Chintamoni Das Lane, Calcutta (2001).
6. Text book of Medical physiology- C.Guyton and John E. Hall. Essentials of Animal Physiology- S.C. Rastogi. New age International (P) Ltd. Publications, New Delhi (2001)

**Total Hours : 90**

1. To make the students understand the components of genetic material.
2. To make the students appreciate the way by which the biological information is transmitted.
3. To make the students know about the relation between diseases and genes.

Structure and Functions of genetic material: Chemical composition, Physical structure; Isolation, sequencing and synthesis. Evidences that RNA is genetic material.

DNA Replication: Enzymes of replication; DNA damage and repair mechanism;  
Molecular basis of Mutations – Spontaneous and induced mutations.

Genetic Code: Triplet nature of Code, Breaking of or deciphering the code, Wobble hypothesis. Operon Model. DNA transcription, RNA translation, Peptide synthesis. Regulation of gene activity in Eukaryotes. Antibody diversity.

Recombination in Virus; Genetic Recombination in Bacteria : Conjugation (Hfr x F and F x F) and sexduction; Transduction (generalized, specialized abortive); Transformation. Gene conversion.

Viral oncogenes – activation of proto oncogenes – tumour suppressor genes – regulation of gene expression by oncoproteins – signal transduction by oncoproteins.

## PZO 12

### **Text Books**

1. Gupta PK. (2005) Genetics. III Edn. Rastogi Publication, India.
3. Stanley R, John E, Cronon Jr. David Freifled. (1994). Microbial Genetics. II Edn. Jones and BrttLett Publishers. Inc.
4. Kannan.I. (2010). Immunology. MJP Publishers. India.

### **Reference books**

1. Weaver and Hedrick. (1997). Genetics. III Edn. WMC Brown Publishers. McGraw Hill Companies. Inc.
2. Robert H. Lewin. (2002). Principles of Genetics.VII Edn. Tata Mc Graw Hill Publishing Company Ltd. New Delhi.
3. Benjamin Lewin. (1997). Genes. Tokyo University Press, Oxford New York, Tokyo.
4. Strickberger. MW.(2010). Genetics. II edn. Macmillon Publication. New York.

**II - SEMESTER**

**PAPER-7 MICROBIOLOGY AND IMMUNOLOGY**

**Total Credits: 4**

**Total Hours:90**

**Objectives**

1. To aware the knowledge of microorganisms of different media like water, soil, sewage and human body and sterilization techniques.
2. To know the importance of microorganisms involved in agriculture, food processing and medicine.
3. To aware the basic knowledge of immunology and disorders of human beings.

**UNIT I      WATER, SOIL AND SEWAGE MICROBIOLOGY      18Hrs**

Microbiology of Water, soil and sewage - Normal microbial flora of the human body - Disinfection and Sterilisation: Basic concepts - Disinfection: Physical and chemical agents - Sterilisation: Filtration, Surfactants and synthetics detergents.

**UNIT II      AGRICULTURAL, DIARY AND FOOD MICROBIOLOGY      18Hrs**

Agriculture: Biological Nitrogen Fixation - Microbial diseases of rice, cotton and sugarcane - Microbial pesticides in agriculture {Bt, NPV} -Dairy and Food Microbiology: Pasteurization-milk - Food preservation-physico-chemical methods - Food spoilage and poisoning.

**UNIT III      INDUSTRIAL AND MEDICAL MICROBIOLOGY      18Hrs**

**Industrial Microbiology**

Fermentation products- Microbes in industry - Enzymes - Antibiotics -Alcohols.

**Medical Microbiology**

Diseases Causing organisms-Basic structure, toxicity, symptoms and their preventive measures - Diseases of gastroenteric system- Cholera, Viral hepatitis • Respiratory system- Pneumonia and Tuberculosis Nervous system-Leprosy, Tetanus, - Rabies • Genital system- Gonorrhea, Syphilis



## PZO 14

### UNIT IV IMMUNITY AND IMMUNE SYSTEM

18Hrs

Immunity: innate, acquired, passive and active - Immune system: Lymphoid organs- primary and secondary; structure and functions; cells of the immune system-Lymphocytes, T-Lymphocytes-subsets, Third population of Lymphocytes-Polymorphonuclear cells and Macrophages; Lymphokines.

### UNIT-V IMMUNOLOGICAL DISORDERS, TECHNIQUES

18Hrs

Hypersensitivity: type I, II, III and IV; auto immune disorders; Immunodeficiency diseases; tumour immunity-major histo-compatibility complex; transplantation immunity. Immuno-diffusion,RIA and ELISA.

#### Text books

1. A textbook of Microbiology. P.Chakraborty, New central book Agency P.L Calcutta, 700 009, India (1995)
2. General Microbiology - Vol I & II - Powar.C.B. Dagainawala. H.F. Himalaya publishing House, Mumbai- 400 004.( 2001 )
3. Micro biology General and Applied A. Mani, A.M.Selvaraj, L.M.Narayanan and N.Arumugam 2013, Saras Publication.

#### Reference

1. Microbiology. L.Pelizar Jr. M. J.Chan, E.C.S.TataMcGraw Hill company (1993).
2. Cellular and Molecular Immunology Sixth Edition A.K.Abbas and A.Lichtman Elsevier/Saunders(2007)
3. Essential of immunology-Hidemann,W.H. Elsevier science publishing.co.inc (1980)
4. Plant pathology, R.S.Mehrotra, Tata McGraw Hill Publishing company limited, New Delhi.( 1990)
5. Textbook of Microbiology- sixth Edition. R. Ananthanarayanan & C. K.Jayaram Paniker. Orient Longman Private Ltd., Chennai. (2000)

**II - SEMESTER**

**CORE PRACTICAL - I [1,2,5,6]**

**Total Credits: 2**

**ANIMAL PHYSIOLOGY**

1. Determination of the rate of activity of salivary amylase (human saliva) by titration in relation to temperature and calculation of  $Q_{10}$ .
2. Amylase activity in relation to pH and calculation of  $Q_{10}$ .
3. Biological response of animals to various osmotic concentrations and their effects
  - a. Change in weight of Earthworm in heterosmotic media
  - b. Active uptake of  $\text{Na}^+$  and  $\text{Cl}^-$  ions of a fish from the environmental water and change in salinity.
4. Determination of rate of ammonia excretion by a fish in different media.
5. Effect of temperature on the oxygen consumption of a fish and calculation of  $Q_{10}$

**BIOCHEMISTRY**

1. Quantitative estimation of carbohydrates in liver of an animal.
2. Quantitative estimation of proteins in muscles of an animal
3. Quantitative estimation of lipids in the given animal tissue.
4. Preparation of Heamin crystals from human blood.
5. Quantitative estimation of Hemoglobin in human blood.
6. Determination of urea in the given sample.

**BIOPHYSICS (Demonstration only)**

1. Recording of BP in man
2. Recording of ECG in Man (Demonstration only).
3. Verification of Beer Lamberts Law using spectrophotometer.
4. Separation of aminoacids by circular paper chromatography (Demonstration only).

## PZO 16

### **MOLECULAR GENETICS AND MOLECULAR BIOLOGY**

1. Study of polytene chromosome in the *Drosophila* larva.
2. Determination of RBC counting in Human blood.
3. Determination of differential count in Human blood.

### **SPOTTERS**

1. pH meter
2. Haemoglobinometer
3. Spectrophotometer
4. Centrifuge
5. Sphygmomanometer
6. ECG recorded strip

## PZO 17

### MODEL QUESTION PATTERN FOR CORE PRACTICAL I

#### CIA Practical Exam

Model Practical Exam = 25 - Marks

Observation Note = 10 - Marks

Attendance = 5 - Marks

**Total = 40 - Marks**

#### END OF SEMESTER EXAMINATION

**Time-4 Hours**

**Max Marks-60**

Q I: Major Experiment – 20 marks

Q II: Minor Experiment - 1 – 10 marks

Minor Experiment – 2 – 10 marks

Q III: Spotters 2x5 – 10 marks

Q IV: Record – 10 marks

**Total – 60 marks**

**II - SEMESTER**

**CORE PRACTICAL - II [c.p. 3, 4]**

**Total Credits: 2**

**BIOTECHNOLOGY**

1. Isolation of DNA from animal Tissue
2. Electrophoretic localization of DNA on agarose gel.
3. Purification of an enzyme on gel column. (Demonstration).
4. Primary culture of animal cell / tissue.
5. Hanging drop culture.
6. Measurement of cell number in a culture.
7. Preparation of culture media for bacteria
8. Isolation of microbes from water media
9. Bacteriological testing of milk

**Spotters**

10. Medicinal plants
11. Bio-diesel plants
12. Use of the following instruments/ techniques
  - a. Autoclave.
  - b. Carrel flask
  - c. Liquid N<sub>2</sub> chamber
  - d. Electrophoretic instruments
  - e. Northern and Southern blot.
  - f. Vermicompost

**BIOINFORMATICS**

1. Application of bioinformatics tools – Gen Bank and SCOP.
2. Creating mail merge in MS word.
3. Dendrogram (Cluster Analysis)
4. Preparation of slides in MS PowerPoint
5. Database - creation and querying in MS- Access -" Web - browsing and E-Mailing.
6. DNA Library (Demo only)

## PZO 19

### **BIOSTATISTICS**

1. Construction of frequency distribution for a given sample.
2. Construction of Histogram and frequency polygon for the frequency distribution  
Calculation of Mean, Median, Mode for the distribution.
3. Calculation of Standard deviation for the frequency distribution.
4. Calculation of correlation co-efficient for the given data.
5. Application of Student's t test in the given samples.
6. Calculation and F value for the given data.(One way method)

### **BIODIVERSITY**

1. Observation of Endangered plants - in Biospheres reserves in India-By field trip.
2. Observation of Endangered animals - in National parks and sanctuaries-By field trip
3. Systematic position and Biodiversity status of the given specimen (any ten specimen)  
A detailed tour report to be submitted during the practical examination which carries 5 marks.

## PZO 20

### MODEL QUESTION PATTERN FOR CORE PRACTICAL II

#### CIA Practical Exam

Model Practical Exam	= 25 -Marks
Observation Note	= 10 - Marks
Attendance	= 5 - Marks
<b>Total</b>	<b>= 40- Marks</b>

#### END OF SEMESTER EXAMINATION

<b>Time-3Hours</b>	<b>Max Marks-60</b>
Q I: Major Experiment	- 20 marks
Q II: Minor Experiment	- 5 marks
Q III: Spotters 3x5	- 15 marks
Q IV: Record	- 10 marks
<b>Total</b>	<b>- 60 marks</b>

PZO 21

15PZ0308

**III - SEMESTER**

**PAPER 8- ENTOMOLOGY**

**Total Credits: 5**

**Total Hours: 75**

**Objectives**

1. To know taxonomical position and collection aspects of insects.
2. Inculcating the knowledge of morphology and physiology of insects.
3. To know the knowledge about growth and metamorphosis in insects.

**UNIT I      CLASSIFICATION AND INSECT COLLECTION      15Hrs**

Classification up to order with example for each order.

Identification of Insects using keys.

**Insect Collection:** Methods, Preservation and Significance

**UNIT II      COMPARATIVE MORPHOLOGY      15Hrs**

Mouth parts, Head, Thorax, Abdomen, Genitalia and Appendages

Integument-Structure, Chemistry, Synthesis of chitin, Sclerotization and Tanning

**UNIT III      STRUCTURE AND PHYSIOLOGY      15Hrs**

Digestive system, Respiratory system and Circulatory system

**UNIT IV      15Hrs**

Excretory system, Nervous system, Sense organs and Reproductive system

**UNIT V      INSECT GROWTH      15Hrs**

Insect growth and development, Metamorphosis and its control.

**INSECT ENDOCRINOLOGY**

Endocrine Glands

Hormones and Neurohormones - their functions.



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### **Text Books**

1. Vasantharaj David .B and T.Kumarasami 2011. Elements of Economic Entomology, Popular Book depot, Madras -15
2. D.B.Tembhare (2009) Modern Entomology -Himalaya publishing house -Delhi

### **Reference Books**

1. Nayar K.K and T.N.Anathakrishnan and B.V.David. (1983) - General and Applied Entomology,Tata McGraw Hill publishing Co. Ltd., New Delhi.pp.589.
2. Imms, A.D (1972) Text Book of Entomology. Vol. I & II Ed. by Richard & Owen. ELBS.
3. P.G. Fenemore& A. Prakash (2002) Applied Entomology. New age international (P) publishers - New Delhi-2.
4. Chapman R.F(2002) The insects structure and function, fourth edition - Cambridge university press United Kingdom.
5. V.B.Wigglesworth-(1979) The principles of insect physiology, ELBS and Chapman and Hall. U.K.

**III - SEMESTER**

**CORE PAPER – 9. BIO-INSTRUMENTATION**

**Total Credits: 4**

**Total Hours: 75**

**Objective**

1. The sample preparation and applications of the biological instruments are of vital importance in post graduate studies.
2. To know the working principles of the instruments which are necessary for the projects and research studies.
3. The instruments, which are being handled in the practical classes, the students should be aware of it thoroughly.

**Principle, description, sample preparation and applications of following instruments of biological studies.**

**UNIT I 15Hrs**

Systems Biology – DNA Microarray – Radioisotopic Techniques – SEM, TEM ,Phase contrast Microscope .

**UNIT II 15Hrs**

Spectrophotometer and filtration units, Types of filters, Biosensors, Atomic Absorption Microscopy,

**UNIT III 15Hrs**

Histological techniques: Preparation of sample, serial sections, Microtome, Staining techniques. Immunological techniques – RIA & ELISA and Flow Cytometry.

**UNIT IV 15Hrs**

Chromatography (Paper and column, Gas, High performance Liquid).

**UNIT V 15Hrs**

Electrophoresis (Paper, Agarose, PAGE) and Southern blotting, Northern blotting, Western blotting

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### **Text books**

1. Bajpai, P.K., 2008. Biological Instrumentation and methodology. S. Chand & Co. Ltd. New Delhi. P. 251.
2. Asokan, P. 2002. Analytical Biochemistry (Biochemical Techniques) Chinna Publications. Melvisharam, Vellore, TN.

### **Reference books**

1. Mahinder Singh, 2005. A Text Book of Analytical Chemistry - Instrumental Techniques Dominant Publishers & Distributors. New Delhi - p. 185.
2. Douglas A. Skoog. 1985. Principle of Instrumental Analysis. Saunders College Publishing Tokyo p. 875.
3. Currell, Graham, 2008 Analytical Instrumentation- Performance Characteristics and qualities, John Wiley & Sons. New York.
4. Robyt, J.F. and White B.J. 1987 Biochemical Techniques, Brooks and Coles.
5. Wilson K and Walker J. 2000 Practical Biochemistry Principles and Techniques. Cambridge Univ. Press.
6. Veerakumari, L, 2010 Bioinstrumentation, M J P – Publishers, Chennai.

**Total hours :75**

## Objectives

- |                 |                      |               |
|-----------------|----------------------|---------------|
| <b>UNIT - I</b> | <b>GAMETOGENESIS</b> | <b>15 Hrs</b> |
|-----------------|----------------------|---------------|

Activation of egg - Mechanism of fertilization – Metabolic activities during fertilization.

<b>UNIT- II</b>	<b>DIFFERENTIATION</b>	<b>15 Hrs</b>
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**Gastrulation** : Salient features – Major events of gastrulation – Mechanism of Gastrulation in Amphibia, Birds and Mammals.

<b>UNIT- III</b>	<b>ORGANOGENESIS IN MAMMALS</b>	<b>15 Hrs</b>
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### Development of Brain, Ear, Heart and Kidney.

## EMBRYONIC NUTRITION

Types of Placenta – Physiology of Placenta – Endocrine function of placenta – Hormonal control during pregnancy and lactation.

<b>UNIT- IV</b>	<b>INDUCTION</b>	<b>15 Hrs</b>
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Primary organizer : Spemann's experiments and conclusions – Types of embryonic Induction (Primary, Secondary, chain of induction) –Experiments on Chemical nature of

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inducing substance – Mechanism of induction (surface interaction, regional specificity and theories) – Competence.

### **UNIT - V**

### **REGENERATION**

**15 Hrs**

Definition and Types of regeneration – Major events of regeneration – Regeneration in invertebrates (Hydra and Planaria) – Physiological changes during regeneration – Factors influencing regeneration.

### **TERATOGENESIS**

Definition – Chemical agents causing congenital abnormalities – Genetic teratogenesis – Environmental teratogenesis.

#### **Text Books :**

1. Chordate Embryology – P.S. Verma and V.K. Agarwal, S.Chand Publication company Ltd., New Delhi 2014.
2. Developmental Biology – Veer Bala Rastogi and M.S. Jayaraj, Keendarnath Ramnath Publication Edition -1 (2008).
3. An Introduction to Embryology – Balinsky .B.L. , W.B. Saunders Company Publication Philadelphia, (2008).
4. Elements of Developmental Biology - Jain, P.C, Vishal Publication, New Delhi 1998.

#### **Reference Books :**

1. Foundations of Embryology – Bruce .M. Carlson – McGraw Hill Publishing companies (2007).
2. Developmental Biology – Scott F. Gilbert Sinaver Amociates Sunderland. (2008)
3. An Outline of Developmental physiology, CHR. P. Raven Pergamon Press. New York. London (1959).
4. Developmental Biology – S.Banerjee Dominant Publishers and Distributers, New Delhi. (2005)
5. A Textbook of Chordate Embryology - Munish Kainth, Wisdom Press, Dominant Book publications. (2013)
6. Developmental Biology- Berril & Corp - Mc Graw Hill Book Company, mc., New York.
7. Vertebrate Embryology- McEwen, R.S.,. Oxford and IBH publishing co., New Delhi. 1969

IV - SEMESTER

**CORE PAPER -11: BIODIVERSITY AND EVOLUTION**

**Total Credits: 5**

**Total Hours: 75**

**Objectives**

4. To understand the present status of Fauna and Flora.
5. If create an awareness of conservation of Endangered Fauna and Flora.
6. If helps to understand the strategies for minimizing the Global warming.

**UNIT I**

**15Hrs**

**Biodiversity concept and definition** - Values of biodiversity - Methodologies for valuation of biodiversity. Bio geographic Zones of India.

Wild life of India (Study of Mammals, Birds, Reptiles, Amphibians and fishes - 5 examples in each family) Wild life management in India. Biodiversity Hot Spots.

**UNIT II**

**15Hrs**

Conservation of biodiversity- Loss of biodiversity - Factors causing the loss of biodiversity. Threatened species - IUCN - Red Data book. Cyropreservation and genetic markers.

**UNIT III**

**15Hrs**

Biodiversity and Biotechnology - project Tiger, project Elephant, Gene bank, Captive breeding programme. Wild life sanctuaries and National parks in India.

**UNIT IV      EVOLUTION**

**15Hrs**

**Isolation:** Definition- types of isolation- isolating mechanisms: prezygotic and postzygotic; Barriers- role of isolating mechanisms in organic evolution.

**Speciation:** Definition: species- race- deme; Species concept: Biological species- Phylogenetic species. Modes of speciation: Instantaneous speciation- gradual speciation. Sympatric and allopatric speciation.

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### UNIT V

15Hrs

**Genetics and evolution:** Selection- genetic load- mutation- genetic drift/ (meiotic drive) - migration pressure- their evolutionary significance. Role of transposons in evolution, Hardy Weinberg Equilibrium.

#### Text books

1. Evolution: P.S. Verma & V. K. Agarwal - S. Chand & Company Ltd. New Delhi. Ed.1.2008.
2. Biodiversity: Supriyochakraborty. Pointer Publishers. India. Ed.1.2007.
3. Biodiversity and sustainable development: M. L. Narasaiah. Discovery Publishing House. New Delhi- Ed.1.2005.
4. Environmental Biodiversity- P.R. Yadav and S. R. Mishra. Discovery Publishing House New Delhi. Ed.1. 2004.
5. An advanced text book of biodiversity, principles and practice Dr.K.Krishnamoorthy(2005).
6. Organic evolution by Mohan P. Arora(1998).

#### References

1. Genes and evolution: A.P. Jha. - Macmillan India Ltd. New Delhi..Ed.1.1993.
2. Biodiversity- Ramamurthi Rallapalli and Teetha Bali- APH Publishing corporation. New Delhi 2002.
7. Evolution and the Diversity of Life-Ernst Mayr.The Belknap Press Harvard Univ.Press.London,Ed.4. 1997.
8. Evolution. Monroe W Strickberger.CBS Publishers and Distributors.Delhi.Ed.1. 1994.
9. Glimpses of Biodiversity- B.B. Hosetti(2002) Daya Publishing House.
10. Biodiversity in India-T.Pullaiah 2006 Regency.
11. Organic evolution –Rastogi 1999 kedarnath Publishing House.

## IV - SEMESTER

**PAPER – 12. APPLIED ENTOMOLOGY****Total Credits: 5****Total Hours: 90****Objectives**

1. To acquire the information on sericulture and apiculture for giving job opportunities to our students.
2. To learn knowledge on disease causing insects.
3. To inculcate knowledge on pests of agriculture, stored grain pests and their control measures.

**UNIT I****18Hrs**

Sericulture - Types of silkworms - Silkworm culture- rearing techniques, Moriculture- varieties of food plants of silkworms - Silkworm diseases and control measures - Harvesting of cocoons - reeling.

**UNIT II****18Hrs**

Apiculture - Kinds of honey bees - Morphology - life cycle - Bee keeping - social behaviour - Diseases and enemies of honey bees - extraction of honey. Care and management of apiary.

**UNIT III****18Hrs**

Medical Entomology : Morphology, life cycle, disease caused by and control measures of Mosquitoes, House flies, Bed bug, Head louse and Cockroach.

**UNIT IV****18Hrs****Agricultural Entomology**

A. Crop pests : Biology, life cycle, damages and control measures of

- |                   |                    |                                |
|-------------------|--------------------|--------------------------------|
| 1. Paddy pests :  | Rice stem borer    | - <b>Scirpophagaincertulas</b> |
|                   | Brown Plant hopper | - <b>Nilaparvatalugens</b>     |
| 2. Coconut pests: | Rhinoceros beetle  | - <b>Oryctes rhinoceros</b>    |



- |                    |   |                    |                                   |
|--------------------|---|--------------------|-----------------------------------|
| 3. Red palm weevil | : | Shoot borer        | - <b>Chilo infuscatellus</b>      |
|                    |   | Top borer          | - <b>Scirphophaga excerptalis</b> |
| 4. Cotton pests    | : | Tobacco cut worm   | - <b>Spodotalitura</b>            |
|                    |   | American boll worm | - <b>Helicoverpa armigera</b>     |

**B. Stored Produce pests**

- |               |   |                            |
|---------------|---|----------------------------|
| 1. Rice       | : | <b>Sitophilus oryzae</b>   |
| 2. Flour      | : | <b>Tribolium castaneum</b> |
| 3. Green gram | : | <b>Bruchus chinensis</b>   |

**UNIT V**

**18Hrs**

Pest control methods (General) - Cultural, mechanical, physical, legal, biological & Chemical. Recent pest control – Ionizing radiation, Chemosterilants, Genetic manipulation, hormones, insect attractants (pheromones), Repellants, antifeedants, Electromagnetic energy, manipulation of animal behaviour and Integrated Pest Management (IPM). Outline classification of pesticides, mode of action of organophosphorus and pyrethroid pesticides.

**Text Books**

1. Vasantharaj David. B and T. Kumarasami (2011). Elements of Economic Entomology, Popular Book depot, Madras -15
2. D.B. Tembhare (2009) Modern Entomology -Himalaya publishing house -Delhi

**Reference Books**

1. Nayar K.K and T.N. Ananthakrishnan and B.V. David. 1983-General and Applied Entomology. Tata McGraw Hill publishing Co. Ltd., New Delhi. pp.589.
2. Imms, A.D. Text Book of Entomology (1997). Vol.I & II Ed. by Richard & Owen. ELBS.
3. P.G. Fenimore, & A. Prakash (2002) Applied Entomology- New age international (P) publishers -New Delhi. 2.
4. Chapman R.F (2002) The insects structure and function, fourth edition - Cambridge university press United Kingdom.
5. V.B. Wigglesworth - (1979) - The principles of insect physiology, ELBS and Chapman and Hall. U.K.

**IV - SEMESTER****PRACTICAL III - ENVIRONMENTAL BIOLOGY & TOXICOLOGY****Total Credits: 2****I. Analysis of water** - Pond / Pool water; / River water; Sewage/ Effluent

1. pH
2. Total dissolved solids (TDS,TSS)
3. Dissolved carbon dioxide
4. Dissolved oxygen
5. Hardness (Temporary - carbonates, bicarbonates, Permanent - calcium, magnesium, chlorides, sulphates phosphate nitrates and silicate)
6. BOD and COD (Demonstration only)

**II. Analysis of soil** - Clayey soil, Sandy soil, Garden soil and Red soil

1. Soil moisture
2. Soil texture
3. Chlorides
4. Sulphates
5. Nitrates
6. Phosphates
7. Silicates
8. Humus

**III. Biological analysis**

1. Qualitative analysis of organisms (Pollution indicators) such as diatoms / algae, flagellates, ciliates, annelids, insects mollusks and fish
2. Biological analysis of sewage water and industrial effluent.
3. Estimation of chlorophyll content in the leaves as an indicator of pollution.
4. Microbiological study in water and soil.

**IV. Toxicological Testing methods**LC<sub>50</sub>, LD<sub>50</sub>

**V. Lab and Field Study**

- 1) Detailed study of Pond/ Lake ecosystems
  - a. Physico-chemical parameters
  - b. Qualitative and quantitative analysis of plankton
- 2) Measurement of noise pollution
- 3) Estimation of Primary productivity in fresh water habitat

**VI. Field Trip**

1. Visit to - Drinking water treatment Plant; Sewage water treatment plant and District Environmental Laboratory.

**VII. Submission at the time of Practical Examination without which the students will not be permitted to take the exam.**

1. A minimum of 5 whole mounts of Plankton - 5 marks.
2. Bonafide Record - 10 Mark

**MODEL QUESTION PATTERN FOR CORE PRACTICAL III****CIA Practical Exam**

Model Practical Exam	= 25 Marks
Observation Note	= 10 Marks
Attendance	= 5 Marks
<b>Total</b>	<b>= 40 Marks</b>

**END OF SEMESTER EXAMINATION**

<b>Time-3Hours</b>	<b>Max Marks-60</b>
Q I: Estimation of water sample (Major Experiment)	– 15marks
Q II: Estimation of soil sample (Minor Experiment)	– 10 marks
Q III Estimation of Chlorophyll	– 10 marks
Q IV: Spotters (2)	– 10 marks
Q V Submission of slide	– 5 marks
Q VI: Record	– 10 marks
<b>Total</b>	<b>– 60 marks</b>

**IV - SEMESTER****PRACTICAL IV - ENTOMOLOGY (GENERAL & APPLIED)****Total Credits: 2****1. Identification of insects**

Key to insect identification (10 insects of different orders)

**2. Mounting**

Mouth parts based on their types(5 types)

Genitalia-male and female(3 pairs)

**3. Dissection**

Digestive System, Nervous System, Reproductive System of any five insects of different orders.

**4. Physiology (Cockroach)**

Analysis of Digestive enzymes

Qualitative analysis of Haemocytes, protein, carbohydrate and lipid.

**5. Sericulture (Silkworm-Bombyxmori)**

Study of egg, larva, pupa and adult-Life cycle,Pests and Diseases.

**Reeling-** Assessment of Cocoon characters,Denier, Shell ratio, Renditta.**6. Apiculture**

Bee hive, Honey comb, Types honey bees, Caste differentiation, Pests and diseases of honey bees.

**7. Medical Entomology**

Identification-Mosquitoes, Housefly, Bed bug and Head Louse.

**8. Crop pests**

Identification of pests (one in each) of coconut, cotton, sugarcane, paddy

**9. Stored grain pests**

Identification of rice pest-Sitophilus; wheat pest- Tribolium; Green gram pest-Bruchus

**10. Submission : Insect box**

i) Insects Only Photographic album

ii) Slides – Whole mounting of 10 small insects.

**Field visit**

# MODEL QUESTION PATTERN FOR CORE PRACTICAL -IV

## CIA Practical Exam

Modal Practical Exam	= 25 -Marks
Observation Note	= 10 - Marks
Attendance	= 5 - Marks
<b>Total</b>	<b>= 40- Marks</b>

## END OF SEMESTER EXAMINATION

**Time-3Hours**

**Max Marks-60**

Q I: Major Dissection	- 15 marks
Q II: Minor Dissection	- 10marks
Q III: Spotters (2 x 5)	- 10 marks
Q IV Submission of slides	- 10 marks
Q.V Submission of Insect(album) -	5 marks
Q VI: Record	- 10 marks
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<b>Total</b>	<b>- 60 marks</b>
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**NON-MAJOR ELECTIVE – 1. NUTRITION & DIETITICS****Total Credits: 5****Total Hours: 60****Objectives**

1. Protect health and saving lives by developing knowledge and expertise in the field.
2. Procedure recognized clinical, public health and management skill.
3. Qualified to work as nutritionist and dietitian in the hospital and other specialized areas such as community and public health and food industry sector.

**UNIT I STATUS OF NUTRITION****12Hrs**

Status of nutrition –Global, India and Tamilnadu levels. Nutritional value of Rice, Wheat, Millet, Milk, Fish and Egg. Food exchange list, Basic dietary calculations.

**UNIT II NUTRITIONAL NEEDS OF DIFFERENT DISEASES****12Hrs**

Nutritional deficiency and management - diabetes, obesity, underweight, cardiovascular diseases, gastrointestinal diseases and hyper tension, Nutritional requirement during pregnancy.

**UNIT III NUTRITION DURING INFANCY****12Hrs**

Growth and development - Advantages of breast feeding - Difference between human milk and Cow's milk - Factors to be considered in bottle feeding - Different milk formulae. Weaning foods ; meaning - need and uses of growth chart to monitor development - Nutritional requirement of infants (upto 1 year) Weaning foods developed by different organizations.

**UNIT IV NUTRITIONAL NEEDS OF PRE-SCHOOL CHILDREN  
(1-5 YEARS)****12Hrs**

Factors to be considered in planning meals - Eating problems of children and their management - Preparation of supplementary foods using available low foods.

**Nutrition for school children:** Nutrition requirement - Meal planning.

**UNIT V****12Hrs**

**Nutrition during adolescence** - Growth - nutritional requirements special need for girls - menarche.

**Nutritional needs of adults** (Men and women) - in relation to occupation - meal planning.

**Nutrition during old age** - Nutritional problems of aged and their management

**Text books**

1. Dietetics –Sri Lakshmi.B.2011. New age International publishers New Delhi.
2. Passmore, D.P., Break, J.P.1986. Human Nutrition and Dietetics, English Language Book society, Livingston.

**Reference Books**

1. Anita. F.P. 1986. Clinical Dietetics and Nutrition, Anita. F., Oxford paper back edition, Calcutta.
2. Emma. S.Weighley, Donna.H, Muellar, 1997. Basic nutrition, Prantice hall INC, New Jersey.
3. Anita, F.P. 1997. Clinical Dietetics and Nutrition, 4<sup>th</sup> edition, Oxford University Press, New Delhi.
4. M.Swaminathan, 1978. Hand book of food and Nutrition, published by the Printing and Publishing Co., Ltd., Bangalore.
5. Rosi, M.S. 1987 A Laboratory hand book for Dietetics, 4<sup>th</sup> Edition, McMillan Publishing Corporation, New York.



**NON-MAJOR ELECTIVE 2 – ECO TOURISM**

**Total Credits: 5**

**Total Hours: 60**

**Objectives**

- 1. To learn the importance of tourism.**
- 2. To understand the Laws& policies related to tourism.**
- 3. To understand the benefits of tourism.**
- 4. To save the environment tourism.**

**UNIT I**

**12 Hrs**

Definition of Tourism - Terminologies Related To Tourism - Elements of Tourism -Growth of Tourism - Basic Patterns of Tourism - Special Patterns of Tourism -Sectors In The Tourism Industry.

**UNIT II**

**12 Hrs**

Definition - Destination of A's Necessary For A Tourist Destination - Learning To Locate Places by Using Latitudes and Longitudes - International, National & Regional Organizations for Tourism.

**UNIT III**

**12 Hrs**

Advent of Information Technology in the Tourism Industry: Impact of Information Technology in the Tourism Industry.

**UNIT IV**

**12 Hrs**

Travel Formalities - Passport and Visa Formalities - Health Documents - Health Preventive Measures for Travelers - Travel Insurance.

**UNIT V**

**12Hrs**

Tsunami, Earthquake, Cyclone, Flood, Global warming, Land slides, Soil erosion and volcanoes

**Textbooks**

1. A text book of Environmental Studies. P. Arul, Environmental Agency, Chennai. 2004.
2. Tourism Management And Marketing -A.K.Bhattia (1997).

**Reference books**

1. Facts On Tourism - R. ShanthaKumari
2. South India Tourist Guide - VatsalaIyengar and MalathiRagavan.
3. Ecology and Environment -P.D.Sharma, Rastogi Publications, Meerut, India.

**NON MAJOR ELECTIVE 3 - NANOBIO TECHNOLOGY**

**Total Credits: 5**

**Total Hours: 60**

**Objective**

1. Understand the basic knowledge of Nanobiotechnology
2. Undersatnd the application of nanomaterials in biotechnology
3. Nanotechnological knowledge on the DNA, Proteins, Nucleic acids, drug delivery and biomedicine etc.

**UNIT I      NANOTECHNOLOGY**

**12Hrs**

Nanotechnology- Introduction, Definition, History, Scope, Importance and Applications

**UNIT II      NANOPARTICLES**

**12Hrs**

Silver and gold nanoparticles, green synthesis of nanoparticles and its characterization

**UNIT III      APPLICATIONS OF NANOPARTICLES**

**12Hrs**

Nanoparticles in medicine and agriculture

**UNIT IV      INTERACTIONS OF NANOBIO MOLECULES**

**12Hrs**

Nanobiomolecules of Proteins, Carbohydrates and Nucleic acids and their cellular interactions.

**UNIT V      NANOPARTICLES AND ECOSAFETY**

**12Hrs**

Nanoparticles in relation to human health and environmental impacts

**Textbooks**

1. RK, Rathy, “Nanotechnology” 1<sup>st</sup> edition, S. Chand Publisher 2009.
2. Sidharth Baliyan, “Basics of Nanotechnology” Anmol Publications PVT. Ltd.
3. CM, Niemeyer, C. A. “Nanotechnology: Concepts, Applications and Perspectives”, Wiley- VCH, 2004.
4. P.P. Simeonova, N. Opopol and M.I. Luster, “Nanotechnology- Toxicological Issues and Environmental Safety”, Springer 2006.

**Reference**

1. Vinod Labhasetwar and Diandra L. Leslie, “Biomedical Applications of nanotechnology”, A John Wiley & Son inc, NJ, USA, 2007.
2. Challa, S.S.R. Kumar, Josef Hormes, Carola Leushaer, “Nanofabrication Towards Biomedical Applications, Techniques, Tools, Applications and impact, Wiley-VCH, 2005.

**NON-MAJOR ELECTIVE 4 - HUMAN GENETICS AND COUNSELLING**

**Total Credits: 5**

**Total Hours: 60**

**Objectives**

4. To make the students develop knowledge on the blood types, transfusion and diseases.
5. To make the students know about applications of aminocentesis, dermatoglyphics and Population genetics.
6. To make the students learn applications of Genetic engineering and Genetic counseling.

**UNIT I**

**12Hrs**

Blood groups (major types) Blood transfusion, Erythroblastosis foetalis.  
Physiology and genetic of blood groups.

**UNIT II**

**12Hrs**

Aminocentesis, Dermatoglyphics: Terminology, methods of observation and printing, dermatoglyphic features of syndrome.

**UNIT III**

**12Hrs**

Population genetics, Hardy-Weinberg principle and its application in human population.

**UNIT IV**

**12Hrs**

Genetic engineering and its applications in human being, Cancer, AIDS.

**UNIT V**

**12Hrs**

Genetic counseling, definition, aims, procedure in genetic counseling and its limitation. Pedigree chart and its uses.

**Text Books**

1. Genetics. Veer BalaRastroggi. 2009 (reprint 2010) 3<sup>rd</sup> Ed. KadarnathRamnath publishers. Meerut. New Delhi.
2. Genetics. Alice Marcus.2009.MJP Publishers, Chennai.

**References**

8. Genetics by H. Eldon Sutton, Robert P. Wagner (1985) - Macmillan publishing company New York.
9. Basic Human Genetics. Elaine J. Mange and Arthur P. Mange (1991). 2<sup>nd</sup> Edit. Sinaver Associates Inc. publishers Sunder land.
10. Principles of Genetics. Robert H. Tamarin. 2002. 7<sup>th</sup> Ed. Tata McGraw Hill publication company Ltd. New Delhi.
11. Applied Genetics. C.Emmanuel, S. Ignachimuthu and S.Vincent. 2006. MJP Publishers, Chennai.
12. Genetics. Susan L. Elrod and William D.Stansfield. Adapted by G. Bhowmik 2009 4<sup>th</sup> Ed. McGraw-Hillpublication company Ltd. New Delhi.
13. Cell and Molecular Biology. P.J.Russel, S.L.Wolte, P.E.Hertz,C.Sterr and B.Mc Millan.2009 1<sup>st</sup> Ed. (Indianprint), Cengage learningIndia Pvt. Ltd. New Delhi.

**MAJOR ELECTIVE PAPER 1 - ENVIRONMENTAL BIOLOGY**

**Total Credits: 5**

**Total Hours: 60**

**Objectives**

1. To understand the normal functioning of the relevant part of the environment.
2. To understand how an organism fits into its environment.
3. To create awareness about the conservation of natural resources.
4. To know the importance and significance of space ecology.

**UNIT I      ATMOSPHERE      12Hrs**

Composition and Structure, Climatic factors - Air, Light, Temperature, Atmospheric Pressure, Wind, Humidity and Rainfall

**UNIT II      HYDROSPHERE      12Hrs**

Water resources, hydrological cycle, physico-chemical and biological characteristics of ponds, lakes, rivers, estuaries, mangroves and sea.

**UNIT III      LITHOSPHERE      12Hrs**

Soil formation, components of soil, physico-chemical properties of soil, structure, texture and classification of soil, Soil organisms, Soil erosion (degradation).

**UNIT IV      ENERGY AND ENVIRONMENT      12Hrs**

Concept of energy, Sources of energy, Measurements of primary production, Energy flow in ecosystem. Conservation of Natural resources - Minerals, forest, Agriculture, Afforestation, Wild life management, freshwater fish culture.

**UNIT V      12Hrs**

Radiation Ecology – Radiation environment – Remote sensing, Radio Telemetry as a tools for ecological research, Space ecology – Exobiology – Hazards of space travel – Regenerating system.

**Text Books**

1. Ecology and Environment - P.D. Sharma Rastogi Publications, India, 2012.
2. Environmental Biology – Biswarup Mukerjee, Tata McGraw Hill publishing company Ltd New Delhi, 1997.

**Reference Books**

1. Introduction to Environmental Science - Joseph M. Moran, Michael, P. Morgan, James, H. Wiesma, Published by W.H. Freeman and Company, San Francisco, 1991.
2. Environmental Biology - K.C. Agarwal, Agro Botanical Publishers (India), 1989.
3. Limnology - Charles R. Goldman, Alexander J. Horsno McGraw - Hill International book company, New Delhi, 1983.
4. Introduction to Soil Science - Dilip Kumar, DasKalyani Publishers, New Delhi, 2010.
5. Concept of Ecology-Edward John Kormondy - Prentice Hall Publishers New Delhi, 1969.
6. Fundamentals of Ecology - E.P. Odum, 3<sup>rd</sup> edition, W.B. Saunders & Co, Philadelphia, 1971.
7. Ecology Environmental Science and Conservation – J.P.Singh, S.P.Singh and S.R.Gupta – S.Chand Publishers, New Delhi 2014.



**MAJOR ELECTIVE PAPER 2**

**WILD LIFE ECOLOGY AND MANAGEMENT**

**Total Credits: 5**

**Total Hours: 60**

**Objectives**

4. To make the students understand and appreciate biodiversity and the Act to protect the wild species.
5. To make the students learn different techniques to study wild life and develop knowledge of the benefits of ecosystem.
6. To make the students analytically know about various methods to conserve biodiversity.

**UNIT I**

**12Hrs**

Ecosystem aquatic ecosystem- Pond ,terrestrial ecosystem- forest trophic relations in ecosystems, foodchain,foodweb, ecological pyramids-productivity of ecosystem-primary and secondary production.Energy flow in ecosystem.Biotic community and ecological niche.

**UNIT II**

**12Hrs**

Wild life of India – Ecological sub regions of India.Endangered flora and fauna.Wild life management in India-Indian board for wild life.Protected areas network.National parks and sanctuaries.Special projects for endangered species.

**UNIT III      BIODIVERSITY**

**12Hrs**

Biodiversity-kinds of biodiversity; Biogeography-continental shift, zoogeography, biodiversity hot spots, endemism; biodiversity assessment; Endangered species-Indian Wild life protection Act1972 and International Redlist Species Criteria, concept and assessment

**UNIT IV      FIELD SAMPLING TECHNIQUES**

**12Hrs**

Population estimation-concept, line transect, quadrat sampling; Animal Trapping Techniques. -Pitfall,funnel, Sherman traps; marking and recapture techniques; use of indirect evidences in species inventory; Basic methods in behavioral and food habit studies; Wildlife management techniques.

**UNIT V      ECOSYSTEM SERVICES****12Hrs**

Animal plant interactions-pollinators, seed dispersal, biological pest control, vector; Wildlife products-food, medicine, Germplasm, domestication; Ecological balance-prey predator relationships. herbivory and scavengers.

**Text Book:**

3. Ecology and Environment. P.D.Sharma. 2009/10<sup>th</sup> Ed. Rastogi publications. Meerut.
4. Concepts in Wild Life Management Hoselli BB (2008) Daya publishing house New Delhi 110002.

**References**

6. Ecology and evolution of communities. Cody, M.L. and J.M Diamond 1975. Harvard University Press. Cambridge. Wildlife Management Techniques. Giles.H. 1984. Natraj Publishers, Dehra Dun.
7. Fundamentals of Wildlife Management. Gopal, R. 1992. Justice Home. Allahabad. Biodiversity-Gaston, K.J. 1996.
8. A biology of numbers and difference. Blackwell Science, Oxford. Ecology. V.K. Agarwal and Usha Gupta. 2004. 1<sup>st</sup> Ed. S.Chand and Company Ltd. New Delhi.
9. Environmental Studies. D.K. Asthana and Meerut Asthana. 2006 1<sup>st</sup> Ed. (Reprint 2007). S. Chand and company Ltd. New Delhi.
10. Fundamentals of Ecology. Madhab Chandra Desh and Sathya Prakash Desh. 2009. 3<sup>rd</sup> Ed. Tata McGraw Hill Education Pvt. Ltd. New Delhi.

**MAJOR ELECTIVE 3 – ENVIRONMENTAL BIOLOGY AND TOXICOLOGY****Total Credits: 5****Total Hours: 90****Objectives**

1. To assess the environmental quality and management.
2. To understand the impact of environmental change on plants & animals.
3. To create awareness about environmental education, toxicity and sustainable development.

**UNIT I      AIR POLLUTION****18Hrs**

Air pollutants, sources of Air pollution, Effects on the environment -acid rain, green house effect and ozone depletion, Effects on the living organisms including man, Control methods of air pollution.

**UNIT II      WATER POLLUTION****18Hrs**

Water pollutants, sources of water pollution, Types of Pollution (Organic, Pesticidal, Heavy metal and Oil pollution), Effects on the living organisms including man, Control methods of water pollution.

**UNIT III      SOIL, NOISE, THERMAL AND RADIOACTIVE POLLUTION****18Hrs**

**Soil pollution** - Sources and their effects on the environment and organisms including man, solid waste management.

**Noise Pollution** - Sources of noise and their effects on the environment, organisms including man and Control of Noise pollution.

**Thermal and radioactive pollution** - Sources and their effects on the environment, organisms including man and Control of Thermal and Radioactive pollution.

**UNIT IV      ENVIRONMENTAL QUALITY, AWARENESS AND MANAGEMENT****18Hrs**

Ecoindicators and the environment, Environmental education and Awareness, Environmental monitoring and environmental impact assessment (EIA), Environmental management and bioremediation.

**UNIT V      TOXICOLOGY****18Hrs**

Scope and significance, Classification, Toxic substances, Absorption and Excretion of toxicants, Toxicity – Acute and chronic toxicity, Toxicological testing methods – Evaluation of toxicity in organisms.

**Text Books**

1. Environmental Biology and Toxicology - P.D.Sharma, Rastogi publications, India, 2012.
2. Environmental Biology - Biswarup Mukherjee, Tata McGraw Hill publishing company Ltd. New Delhi 1<sup>st</sup> reprint-1997.

**Reference Books**

1. Water pollution - Causes, effects and control - P.K. Goel, New Age International Pvt. Ltd. Publishers, New Delhi, 1996.
2. Environmental water pollution and its control - G.R.Chattwal, M.C. Mehra, J. Katyal, M. Satake, Mohan Katyal, T. Nagatiro, Ahmol Publications, New Delhi, 1989.
3. Environmental Air pollution and its control - G.R. Chattwal, M.C. Mehra, J. Katyal, M. Satake, Mohan Katyal, T. Nagahiro, Anmol Publications, New Delhi, 1989.
4. Environmental pollution - Jimmy Katayal and M. Satake, Anmol publication Pvt. Ltd., New Delhi, 2001.
5. Environmental Pollution - causes, effects and control - P. PurohitAgarwal, Agrobios publishes, India, 2006.
6. Concepts of Ecology- Edward John Kormondy 4<sup>th</sup> Edition- Printice Hall of India, New Delhi, 1969.
7. Toxicology principles and methods – M.A. Subramanium, M.J. Publishers, Chennai, 2004.
8. Water quality Monitoring and Assessment – Editor - Voudouris, Intech Publishers 2012.

**MAJOR ELECTIVE PAPER – 4**  
**POULTRY SCIENCE AND MANAGEMENT**

**Total Credits:5**

**Total Hours:90**

**Objective**

4. To make the students develop knowledge on the history and the role of poultry in rural development and its structure.
5. To make the students learn methods of rearing, breeding and production of poultry.
6. To make the students know about the preparation of feed antibiotics, vaccines and marketing.

**UNIT I**

**18Hrs**

History and importance of Poultry farming, Role of the Poultry in rural development, employment potential, Economics and contribution to national productivity, Egg production, Table bird production, manure as by-product. Anatomy and physiology of poultry birds with reference to digestive and reproductive system.

**UNIT II**

**18Hrs**

Breeds of poultry birds and scientific methods of breeding Hybrid and cross breed. Indian and exotic selecting chicks and parents for production factors in selection, Hatching, selecting eggs for hatching, Natural and artificial incubations, Types of incubators. Maintenance of temperature and humidity sterilization of room during hatching, separation and selling.

**UNIT III**

**18Hrs**

Poultry house and equipment, space requirement, types of house, number birds, equipments for feeding, protection from enemies and adverse conditions.

**UNIT IV**

**18Hrs**

Nutrition of Poultry birds, requirement according to age feed formulation, classification of feed stuffs. Milling by products, distilleries and brewery by products. Availability of raw materials and their cost, food grinders and mixtures, use of antibiotics.

**UNIT V****15Hrs**

Brooding and rearing, sexing, vaccination, natural and artificial breeding, types of brooding, temp. requirement culling. Debeaking, characters of good layers and broilers caponettes and capons, rearing of chicks.

**Text Books**

1. A Hand book of poultry practice. Keith Wilson (2007) 2<sup>nd</sup> Ed. Agrobios (India), Jodhpur.
2. The poultry science L.C.R. Norris Elye. 2005. Biotech books.Delhi.35.

**Reference Books**

- 1 Economic Zoology: Manju Yadav.2003. 1<sup>st</sup> Ed. Discovery publishing house. New Delhi.
- 2 Feeding of Poultry. B.Pande.V.R.Reddy, V.R.Sadagopen and A.K.Shrinivasan.1984 (reprinted 1997), Indian council of Agricultural research. Power Printers New Delhi.
- 3 Poultry farm guide. Dr.R.Venkatakrishnan, 1995. 1<sup>st</sup> Ed. Balaji publications. Madras.
- 4 Hand book of Animal Husbandry Indian Council of Agricultural Research 1997. 2<sup>nd</sup> Ed. (reprint) published by Dr.R.D.Sharma, Director Directorate of Publications and information on Agriculture. New Delhi.

**JOC-ECO TOURISM**

**UNIT I      BASIC CONCEPTS IN TOURISM**

Definition of Tourism- Technologies Related to Tourism- Elements of Tourism- Growth of Tourism- Basic Patterns of Tourism- Special Patterns of Tourism- Sectors in the Tourism Industry.

**UNIT II      PROTECTIVE MEASURES**

Environment (protection) Act- Air (prevention & control of pollution) Act- Water (prevention & control of pollution) Act- Wild Life (protection) Act- Forest (Conservation) Act.

**UNIT III      ROLE OF INFORMATION TECHNOLOGY**

Advent of Information Technology in the tourism industry: impact of Information Technology in the tourism industry.

**UNIT IV      TRAVEL FORMALITIES**

Passport and Visa Formalities- Health Documents- Health Preventive Measures for Travelers- Travel Insurance.

**UNIT V      MITIGATION MEASURES**

Tsunami, Earthquake, Cyclone, Flood, Global Warming, Land slides, Soil erosion and Volcanoes Impact of Tourism on Environment.

**Text books**

1. A text book of Environmental Studies. P. Arul, Environment Agency, Chennai, 2004
2. Tourism Management and Marketing- A.K. Bhatia, Sterling publications, New Delhi, 1997.

**Reference Books**

1. Facts on Tourism- R. ShanthaKumari- 1<sup>st</sup> edit.- Imprint- Chennai Shantha Publishers (1996).
2. South India Tourist Guide-VatsalaIyengar and MalathiRahavan3<sup>rd</sup>Edit.Vasan book depot (1997).
3. Ecology and Environment- P.D. Sharma, Rastogi Publications, Meerut, India (1993).
4. Biodiversity – Principles and Conservation- Second Edition. U. Kumar & MahenderaJeetAsija. Student Edition Chopasani Road, Jodhpur. (2005)



**JOC- VERMITECHNOLOGY****UNIT I**

Introduction to Earthworm - origin and evolution - Distribution - different species of earthworm. General body structure - External characters - Body wall - Food and feeding habits digestive system - Gut microflora and their importance - Reproductive system cocoon formation.

**UNIT II**

Role of Earthworms in sustainable agriculture - organic farming - Earthworm activities - soil fertility and texture - soil aeration. Vermitechnology - Definition - History - in other countries - in India.

**UNIT III**

Advantages of vermiculture - Vermi - cast - Decomposition of bio-degradable Wastes and vermicomposting - vermiculture in pollution abatement - Miscellaneous usages of vermiculture. Vermiculture - General Planning - Selection of suitable species - Basic characteristics of suitable species - Description of suitable species - Maintenance of Base culture.

**UNIT IV**

Vermicomposting - Advantages of vermicomposting - small scale vermicomposting - large scale vermicomposting. Type of vermicomposting - requirements for vermicomposting - vermicomposting schemes - Maintenance of vermicomposting.

**UNIT V**

Recycling of different wastes by vermi composting - Organic wastes - Solid wastes - Municipal wastes - Animal Drug - Agricultural wastes. Application of Vermicompost - In horticulture - in agriculture - Quality management - storage - pricing - marketing. Vermitechnology - by products - economy.

**Text books**

1. Vermiculture and Vermicomposting. Bhatnagar, R.K. and Palta, R.K., Kalyani publishers, New Delhi (1996).
2. A hand book of Organic Farming, Arun K. Sharma, Agrobios, Jodhpur, India (2002)
3. The Earthworm book, S.A. Ismail. Other India press, Goa - 403 507, India (2005)

**Reference Books**

1. Vermicompost- Crown Jewel of organic farming. R. D. Kale, Author publication, 4- Archana apartment, (S-1), 12 cross, Margosa Rd, Malleswaram, Bangalore-560 003, India (2006).
2. A Hand book of organic forming, ArunK.Sharma, Agrobios, Jothpur, India (2002).
3. The Earthworm book, S.A.Ismail. other India press. Goa 403 507, India (2005).
4. Earthworms in Agriculture, Talashilkar&Dosani. Published by Agrobios (India).Chopasani Road Jodhpur- 342003.
5. The complete technology book on “ Vermiculture and Vermicompost” published by National Institute of Industrial Research, Delhi(2004).

**Aim:**

The course is intended to impart thorough knowledge on all aspects related to ornamental fishes to students for make them equipped to independently operate a ornamental fish breeding unit. Therefore, visit to ornamental fish farms should be carried out along with the theory classes to get hands on experience.

**Objectives :**

1. To give overview on the potential ornamental fishes and their breeding habits
2. To develop idea about the various management practices for breeding and rearing of ornamental fishes
3. To have a basic understanding of aquarium setting and aquarium accessories involved.

**Unit 1: Introduction**

Introduction to aquarium, ornamental fishes and aquarium accessories. World aquarium trade and present status. Design and construction of public fresh water and marine aquaria. Aerators and filters. Water quality requirements. Temperature control. Biofilters in aquarium.

**Aquarium Management**

Cleaning the aquarium; maintenance of water quality. Control of snail and algal growth. Handling, care and transportation of fish. Temperature acclimation, oxygen packing.

**Unit 2: Freshwater Ornamental Fishes**

Species of ornamental fishes; their taxonomy and biology- Live bearers, Gold fish and koi, Gourami, Barbs and Tetras, angel fish, cichlids. Maturation, secondary sexual characters, breeding habits, spawning, parental care, fertilization and development of eggs. Hatching, larval rearing and their health.

**Unit 3: Commercial Production of Freshwater Ornamental Fishes**

Requirements and design for the commercial production units of ornamental fishes. Commercial production of goldfish, live bearers, gouramies, barbs and tetras, angel fish. Natural ponds for the mass production of ornamental fishes and their economics.

#### **Unit 4: Marine Ornamental Fishes**

Marine ornamental fishes – varieties and their habitat. Major marine ornamental fish resources of India. Method of collection and transportation of live fish. Use of anesthetics. Quarantine measures. Breeding of marine ornamental fishes. Reef aquarium and live rocks. Other ornamental organisms – anemones, worms, lobsters, shrimps, octopus, starfish and their economic value.

#### **Unit 5: Nutrition and Disease**

Nutritional requirements of aquarium fishes. Different kinds of feeds. Culture of fish food organisms; Preparation of dry feeds; feeding methods. Use of pigments for colour enhancement. Larval feeds and feeding. Provision of nutrients and optimum environmental conditions for their growth. Identification of common parasites infecting ornamental fishes. Study of bacterial, viral, fungal diseases of ornamental fishes and their control and prophylaxis. infecting ornamental fishes.

#### **Text Books**

1. Marine Aquarium keeping : The Sciences, Animals and Art. John Wiley & Sons, New York
2. Ramachandran.A, Breeding, Farming and Management of Fishes, CUSAT
3. Madhusoodanakurup et al – Ornamental Fish – Breeding, Farming and Trade CUSAT.
4. Jhingran,V.G. Fish and Fisheries of India.
5. Santhanam, et.al. a Manual of Freshwater Aquaculture

#### **Reference Books**

1. Murthi.V.S. 2002 Marine ornamental Fishes of Lakshadweep CMFRI, Special publication 72
2. Butting.B., Holthus, P.S. Dalding,S. 2003, Marine Aquarium Industry and conservation.
3. Oliver, K 2003. World trade in ornamental species
4. Marine Ornamental species; collection,..... and Conservation
5. Fish Disease and Disorders, CAB international, Oxford.

**Component for Project:**

<b>CIA / ESE</b>	<b>Particulars</b>	<b>Project Out of 200 Marks (PG)</b>
<b>CIA</b>	Project Review	30
	Regularity	10
	<b>Total Internal Marks</b>	<b>40</b>
<b>*ESE</b>	Project Report Present	120
	Viva Voce	40
	<b>Total External Marks</b>	<b>160</b>
<b>Total Marks(CIA+ESE)</b>		<b>200</b>

**\* Project report and Viva voce will be evaluated jointly by both the Project Supervisor (faculty of the Department) and an External Examiner.**

**QUESTION PAPER PATTERN for CIA and ESE**

**THEORY**

**Maximum marks 75**

**Section A (10X1=10marks)**

**Q.NO.1to10:Multiple choice types alone with four distracters each.**

**Section B (5X5=25marks)**

**Q.NO.11to15:Either or short notes type questions (one question 'a' or 'b' from each unit).**

**Section C (5X8=40marks)**

**Q.NO.16to20:Either or essay type questions (one question 'a' or 'b' from each unit).**

**Break up Marks for CIA of Theory**

<b>CIA Exam</b>	<b>-</b>	<b>15</b>
<b>Assignment</b>	<b>-</b>	<b>5</b>
<b>Attendance</b>	<b>-</b>	<b>5</b>
		<b>-----</b>
<b>Total</b>	<b>-</b>	<b>25</b>
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