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 **2017-2018** onwards)

Semester	Part	Subject Code	Title of the Paper	Instruction	Exam. Marks			Duration of Exam (hours)	Credits
					CIA	ESE	TOTAL		
I	I	17PZO101	C.P.1 Animal physiology	6	25	75	100	3	5
		17PZO102	C.P.2 Cell and Molecular biology and Biochemistry	5	25	75	100	3	4
		17PZO103	C.P.3 Biotechnology and Bioinformatics	6	25	75	100	3	5
		17PZO104	C.P.4 Aquaculture	5	25	75	100	3	5
			Cr.P.1	4					
			Cr.P.2	4					
II	I	17PZO205	C.P.5 Biostatistics and Biophysics	6	25	75	100	3	5
		17PZO206	C.P.6 Molecular Genetics	6	25	75	100	3	5
		17PZO207	C.P.7 Microbiology and Immunology	6	25	75	100	3	4
		15PZO2CL	C.Pr.1	4	40	60	100	4	2
		16PZO2CM	**C.Pr.2**	**4**	**40**	**60**	**100**	**4**	**2**
	17	16PZO2N1	Non Major Ele. I	4	25	75	100	3	5
III	I	15 PZO308	C.P.8 Entomology	5	25	75	100	3	5
		17 PZO309	C.P.9 Bioinstrumentation	5	25	75	100	3	4
		16 PZO310	**C.P.10 Developmental Biology**	**5**	**25**	**75**	**100**	**3**	**5**
			C.Pr.3	4					
			C.Pr.4	4					
	17	16PZO3N2	Non Major Ele. II	3	25	75	100	3	5
		16PZO3E1	Major Ele. I	4	25	75	100	3	5
IV	I	**16 PZO411**	**C.P.11 Biodiversity and Evolution**	**5**	**25**	**75**	**100**	**3**	**5**
		15 PZO412	C.P.12 Applied Entomology	6	25	75	100	3	5
		16PZO4CN	**C.Pr.3**	**4**	**40**	**60**	**100**	**4**	**2**
		15PZO4CO	C.Pr.4	4	40	60	100	4	2
	17	16PZO4E2	Major Ele. II	6	25	75	100	3	5
		15PZO4Z1	Project and Viva voce	5	40	160	200	-	5
			Total				**2200**		**90**

APPROVED BY THE ACADEMIC COUNCIL
Date 24/3/17 Item No: XII ..... Page No PZ01 To PZ059

28/3/17

HOD OF ZOOLOGY
KONGUNADU ARTS & SCIENCE COLLEGE
COIMBATORE-641 029

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 Dietitics
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
	Grand Total	**22**	**2200**	**90**

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.

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 DIGESTION 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**

Comparison of respiration in different animals. Process of gaseous exchange, Transport of oxygen and CO2 ,Factors affecting O2, and CO2 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**

Blood and its component, its role and functions, types of blood pigments, structure and function, comparative anatomy of vertebrate heart, types of heart, cardiac cycle and its control. Plasma proteins, types, characteristics and its clinical importance. Haematological abnormalities (anaemia, leucopenia, leucocytosis, Thromboctopenia) Blood pressure, cardiac cycle and ECG.

UNIT IV MUSCLE PHYSIOLOGY AND EXCRETION **18Hrs**

Ultra structure of muscle fibre, muscle proteins, mechanism of muscle contractions. Comparison of vertebrate kidney, patterns of nitrogen elimination, mechanism of urine formation, Osmoregulation in fishes, Acid base balance. Regulation of excretion.

UNIT V ENDOCRINE GLANDS AND REPRODUCTION **18Hrs**

Pituitary, Thyroid, Parathyroid, Adrenal and Pancreatic glands, Gastro intestinal hormones. Reproductive hormones. Neuro endocrinal regulation and Feedback mechanism.

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 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.

17PZO102

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

Ultra structure and composition of cell membrane, Cell transport, types of cell junction - cell communication. Endoplasmic reticulum, microfilaments and microtubules.

UNIT II **15Hrs**

Nucleus

Types, structure and composition of DNA. C value paradox, Satellite DNA and its role. Chromosomes, Giant Chromosomes, Cell cycle and cell signaling, Interphase nucleus, Chromosomal movement during cell division.

UNIT III **15Hrs**

Protein Synthesis

DNA and RNA types and their structure and functions, Transcription, Translation. Post translational modifications, uncontrolled cell growth (Cancer), Biology of aging.

↳ in prokaryotes & Eukaryotes

UNIT IV **15Hrs**

Biomolecules and Metabolism

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

Amino acids, Structure and Classification, essential and non essential amino acid. Protein classification, structure and function of Hemoglobin Deamination, Transamination and transdeamination. Classification, saturated and unsaturated fatty acids, cholesterol structure. Enzymes-Classification-Mechanism of action. Beta oxidation of lipids.

UNIT V **15Hrs**

Bimolecular structure

Conformation of protein (Ramchadran plot), secondary, tertiary and quartnary structure domain, motifs and folds. Conformations of nucleic acids (A,B,Z forms), t-RNA, m-RNA. Stability of proteins and nucleic acid structure.

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, Chennai.

Reference books

1. The cell; A Molecular Approach, Geoffrey M Cooper, Robert E Heusman (7th Edn 2016), Sinculler Associates Inc.,
2. Cell Biology: Gerald karp (7th Edn 2013), Wiley publishers.
3. Molecular Cell biology : Harvey lodish et al., (8th Edn 2016), Macmillan
4. Fundamentals of Biochemistry: Donald Voet, Judith G. Voet . John Wiley & Sons, 2010. (4th Edn).
5. The principles of Biochemistry. Lehninger. A.L., D.L. Nelson and M.M.Cox., CBS Publishers & Distributors, New Delhi, India. (1993).
6. Text book of Biochemistry. D.M. Vasudevan & SreeKumari. S, Jaypee brothers, Medical publishers (P) Ltd. New Delhi (2007).
7. Fundamentals of Biochemistry. 2016. Life at the Molecular Level, 4th Edition. Donald Voet, Judith G. Voet, Charlotte W. Pratt

17PZO103

I - SEMESTER

CORE PAPER - 3 - BIOTECHNOLOGY

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 :Animal biotechnology

Tissues and cells culture methods of animals. Types of tissue culture medium, Primary culture, stable cell lines, Gene transfer techniques used in animal cells and eggs, Somatic cell fusion, Stem cell culture and preservation, Applications of cell culture and organ culture, Trangenic animals and their applications.

Unit II: Industrial and enzyme biotechnology

Fermentation, types and designs, Upstream and downstream processing, Production of alcohols, enzymes, vitamins and single cell proteins and their recovery and purifications. Immobilization of enzymes and its applications. Production and application of monoclonal and polyclonal antibody, Gene knockout in bacterial and eukaryotic organisms.

Unit III: Recombinant DNA technology

r-DNA technology, scope and tools in r-DNA technology, Methods of introduction of genes, Isolation of genes, Gene fragments amplification, restriction enzymes, linkers and adapters, Cloning vectors, Gene library, enzyme systems, expression vectors, Selection and screening of recombinants, Recovery of cells containing r-DNA.

Unit IV: Agricultural and Environmental biotechnology

Agricultural biotechnology- Genetically modified micro-organisms, Agrobacterium as a natural genetic engineer, Bacterial biofertilizer- Rhizobium, Azospirillum inoculants, Nitrogen, Phosphate and Sulphate fixing mechanisms, Green manuring- Cyanobacterium inoculants, VAM fungi. Bioremediation, use of genetically engineered bacterial strains, Bioremediation of dyes, Biomining and Biosorption, Biosafety and Bioethics.

Unit V: Medical Biotechnology

Medical biotechnology- Production of antibiotics, hormones, vaccines, interferons, interleukins, tissue-plasminogen activator, Molecular marker in forensic science- RFLP, RAPD, AFLP, VNTR and microsatellite, PCR, DNA microarray. Gene therapy- somatic and germ cell line gene therapy.

Text Books

1. A Text Book of Biotechnology - R.C.Dubey, S.Chand&Co.Publications (2012)
2. Text book of Biotechnology- B.D.Singh, Kalyani Publishers.

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. Principles of gene manipulation and genomics- Primose; Richard twyman (7^{th} edition, 2006), Wiley Publishers.
4. Benjamin Levin. Gene IX. 2008. Tokyo University Press, Oxford New York, Tokyo.

17PZO104

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 oppotunities and knowledge for students undergoing Zoology.
3. To make use of the inland waters and marine potential to substitute the protien requirements by the human population.

UNIT I Principle of Aquaculture — 14Hrs

Principles of Aquaculture- The need for Aquaculture, Over view of national and international Aquaculture. Systems of aqua culture –Extensive, Semi-intensive, intensive, and super intensive aqua culture, traditional aqua culture.

UNIT II Culture of Fishes — 15Hrs

Qualities of culturable species of fishes, Types of culture - Monoculture, Polyculture, pond culture, pen culture, cage culture, running water culture, zero water exchange system, culture sewage fish culture, Paddy fish culture , brackish water culture marine fish culture , integrated fish farming .

UNIT III Aquaculture Engineering — 15Hrs

Preliminary survey, site selection, topography, location, design and construction of hatcheries, race ways and farm complex. Tide fed and pump fed farms, creeks ,estuarine and marine water source utilization. Design and construction of ponds and dykes. Water distribution system- main feeder channel, drainage channel. Types of inlet and outlet and their construction

UNIT IV — 16Hrs

Criteria for selection of candidate species for aquaculture. Live feed culture and its nutritional value. Proximate composition of live feed and Green algae, Blue green algae, Spirulina, Diatoms, Rotifers, cladocea, feed for formulation, Manufacturing , Feed additives

UNIT V Fish diseases and Management **15Hrs**

Significance of fish disease in relation to aquaculture. Host,pathogen and environment interaction. Pathogenecity and mechanism of bacterial, viral and fungal infections of finfish and shellfish. Conventional and rapid diagnostic technique. Health management in aquaculture. Drugs, chemicals, antibiotics and probiotics used in aquaculture and their mode of action. Quarantine and health certification in aqua culture

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. Bardach JE, Rhyther JH & Mc. Larney WO. 1972. Aquaculture Farming and Husbandry of Freshwater and Marine Organisms. John Wiley & Sons..
3.Boyd, C. E. and Tucker, C. S. 1992. Water Quality and Pond Soil Analyses for Aquaculture, Alabama Agricultural Experimental Station, Auburn University.
4. ICAR. 2006. Handbook of Fisheries and Aquaculture. ICAR.
5.De Silva SS & Anderson TA. 1995. Fish Nutrition in Aquaculture. Chapman & Hall Aquaculture Series.
6. Andrews C, Excell A & Carrington N. 1988. The Manual of Fish Health. Salamander Books.
7.Shankar KM & Mohan CV. 2002. Fish and Shellfish Health Management. UNESCO Publ. Wedmeyer G, Meyer FP & Smith L. 1999. Environmental Stress and Fish Diseases. Narendra Publ. House..
8.Pillay TVR & Kutty MN. 2005. Aquaculture: Principles and Practices. 2nd Ed. Blackwell.

17PZO205

II - SEMESTER

CORE PAPER-5- BIOSTATISTICS, BIOPHYSICS AND BIOINFORMATICS

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 : Sampling and Tabulation

Variables in biology, Collection, Classification and Tabulation of data, Frequency distribution, Diagrammatic and graphical representation of statistical data, Sampling techniques, Measures of central Tendencies- Mean, Median, Mode, Standard Deviation and Standard error.

Unit II: Test of Significance

Hypothesis testing and estimation, Measures of relationship- Correlation, simple, partial and multiple – Regression analysis, Definitions and applications of Chi-square test, "t" test and "F" test. Analysis of variance (ANOVA) - one way and two way classified data, Application of SPSS in biology.

Unit III: Biophysical methods

Laws of thermodynamics, Oxidation and Reduction reactions, Redox potentials, High energy compounds. Bioenergetics and Enzyme kinetics. UV-Visible spectroscopy and ESR spectroscopy.

Unit IV Bioelectricity

Ionic distribution and origin of membrane potential, resting and action potential of nerves. Mechanisms of action potential and its measurements. Nerve impulse propagation and conduction of nerve impulses.

Unit V: Biological databases

Generalized and Specialized DNA databases with examples. NCBI- Genbank, EMBL, FASTA format - BLAST, maximum parsimony, multiple sequence alignment. Phylogenetic analysis, prediction of protein structure (PDB), molecular docking and drug designing.

Text book

1. Biostatistics for biology - Palanichamy, S. Manoharan, Paramount Publications, Palani (1992).

1. Statistics, Pillai, R.S.N. and Bhagavathi, V. S. [illegible]
2. Biophysics – VasanthaPattabhi, N.Gautham. Narosa publishing house, New Delhi, Chennai, Mumbai & Calcutta (2002).
3. A text book of Biophysis. Dr.R.N.Roy New Central book agencies (P) Ltd. Chintamoni Das Lane, Calcutta (1996).

Sundarlingam

Reference Books

1. Satistical 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. 11th 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. Rastrogi. New age International (P) Ltd. Publications, New Delhi (2001)

17PZO206

II - SEMESTER

CORE PAPER – 6 – MOLECULAR GENETICS

Total Credits: 5 **Total Hours : 90**

Objectives:

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.

UNIT I STRUCTURE OF GENETIC MATERIAL **18Hrs**

Chromatin structure and nucleosome concept, organization &function of genetic material, Repetitive DNA, Overlapping genes, Split genes, Pseudogenes, Mitochondrial DNA. Types and structure of RNA, Trasposons.

UNIT-2: GENE EXPRESSION:

Genetic structure and analysis of eukaryotic genomes. Gene regulation in prokaryotes and eukaryotes, Gene clustering, Mechanism of positive and negative control of gene expression. Translational and transcriptional control of regulatory mechanism of expression, Environmental effects on gene regulation. Gene silencing & Epigenetics (Environmental influences).

UNIT III MUTATION **18Hrs**

Polygenetic inheritance - crossing over - Inborn errors of metabolism - mutation, molecular basis of mutation - Transition and Transversion - spontaneous and induced mutations, Single Nucleotide Polymorphism and genetic disorders.

UNIT IV HEREDITY AND VARIATION

Linkage maps, tetrad analysis, Mapping with molecular markers. Lod score for linkage testing, Karyotyping, Pedigree analysis. Heritability & its measurements, QTL mapping.

UNIT-5: ONCOLOGY

Viral oncogenes, Activation of proto-oncogenes, Tumour suppressor genes, Regulation of gene expression by oncoproteins, Signal transduction by oncoproteins.cell cycle check points.

Text Books

1. Gupta PK. (2005) Genetics. III Edn. Rastogi Publication, India.
4. Stanley R, John E, Cronon Jr. David Freifled. (1994). Microbial Genetics. II Edn. Jones and BrttLett Publishers. Inc.
5. 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.
5. Gardner, M. J. Simmons, D. P. Snustad. Principles of genetics. 2006. John Wiley & Sons.
6. Benjamin Levin. Gene IX. 2008. Tokyo University Press, Oxford New York, Tokyo.

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- History and Scope of Microbiology

Classification of microbes, Economic importance of bacteria, DNA and RNA viruses, Colony morphology and growth, Growth curve and Growth kinetics, Recombination in bacteria, Genetic applications of bacteria and viruses.

Unit II: Food and Environmental microbiology

Microbes of milk and food methods of detection, Pasteurization and food poisoning; food preservation. Micro-organisms in extreme environments- thermophilic, methanogenic and halophilic. Photosynthetic bacteria, Cyanobacteria, Archaea of cold regions and space. Role of microbes in environment protection and management. Normal microflora of human body. Basic concepts, Disinfection- physical and chemical agents.

Unit III: Pathology and microbial control

Pathogenecity, Infection, Virulence – Causative agents, Modes of transmission, Control measures of diseases – Pneumonia, TB, Diphtheria, Leprosy, Tetanus, Typhoid, Polio, Syphilis, Gonorrhoea, AIDS, Viral Hepatitis A and B. Physical and chemical methods. Antimicrobial agents (Antibiotics).

Unit IV: Immunity

Cells and molecules involved in innate and adaptive immunity, Antigen, Antigenicity and Immunogenecity. B and T cell epitopes, Structure and function, of antibody molecules, generation of antibody diversity, Monoclonal antibodies, antibody interactions, MHC molecules, Antigen processing and Presentation, Activation and differentiation of B and T cells, B and T cell receptors.

Unit V: Immune Response

Humoral and Cell mediated immune responses, Primary and secondary immune modulation, the complement system, Toll – like receptors, Cell – mediated effector functions, inflammation, hypersensitivity and auto- immunity, immune response during bacterial (Tuberculosis), Parasitic (Malaria) and Viral (HIV) infections, Congenital and acquired immunodeficiencies, vaccines.

Text books

1. A textbook of Microbiology. P.Chakraborthy, New central book Agency P.L Calcutta, 700 009, India (1995)
2. General Microbiology - Vol I & II - Powar.C.B. Daginawala. 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)

15PZ02CL

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 Na^+ and Cl^- ionsof 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).

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. Spygnomanometer
6. ECG recorded strip

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 technique
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 N2 chamber
    d. Electrophoretic instruments
    e. Northern and Southern blot.
    f. Vermicompost

BIOINFORMATICS

1. Application of bioinformatics tools – Gen Bank and SCOP.
2. Molecular docking(protein docking)
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)

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 of 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.

MODEL QUESTION PATTERN FOR CORE PRACTICAL II

CIA Practical Exam

Model Practical Exam	=	25 -Marks
Observation Note	=	10 - Marks
Attendance	=	5 - Marks
Total	=	**40- Marks**

END OF SEMESTER EXAMINATION

Time-3Hours **Max Marks-60**

Q I: Major Experiment	- 20 marks
Q II: Minor Experiment	- 5 marks
Q III: Spotters 3x5	- 15 marks
Q IV: Record	- 10 marks
Total	- **60 marks**

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.

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

add 2, 4, 5

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.

17PZO309

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

Unit-1: Systems Biology& Microscopic techniques:

Optics and Principles of light microscope and phase contrast microscope, electron microscopy- structure and function of TEM, SEM. Fluresence microscope and Confocal microscope.

Unit-2: Separation of Biomolecules

Paper & Column chromatography, Thin layer chromatography, Ion exchange & Affinity chromatography, Gas chromatography, High pressure liquid chromatography (HPLC), Electrophoresis: Polyacrylamide gel electrophoresis (PAGE) – SDS, Agarose gel electrophoresis, Isoelectric focusing. Blotting techniques- Southern blotting, Northern blotting& Western blotting.

Unit-3: Colorimetry, Spectrophotometry and Spectroscopy:

Ultra filtration units, principles and mechanism of colorimeter, UV- Visible spectrophotometry. Centrifugation – types and working principles. Nuclear Magnetic Resonance spectroscopy (NMR), Raman spectroscopy, Mass spectroscopy, Fourier transform infrared spectroscopy (FTIR).

Unit-4: Radioisotope Detection and Measurement:

Radio Immuno Assay - Enzyme Linked Immuno Sorbent Assay (ELISA), Ionization chamber, GM counter, Solid and liquid scintillation counters, Autoradiography assays.

Unit-5: Biotechnological and histology tools

Isolation of genomic DNA and Plasmid DNA, Flow cytometry, FISH & GISH, DNA microarray, Gel documentation, Hybridoma technology and their applications. Microtome, Staining techniques, Fixation and sectioning of tissue, embryos and cells.

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.
3. C. R. Kothari. 2004. Research Methodology: Methods and Techniques. New Age International (P) Ltd., New Delhi.

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.

III SEMESTER
CORE PAPER 10 DEVELOPMENTAL BIOLOGY

Total hours :75

Total Credits:5

Objectives

1. To understand experiments on the developing embryo.
2. To inculcate knowledge on malformations in embryo and their effects
3. To know harmonic balance during embryonic development.

UNIT - I — GAMETOGENESIS — 15 Hrs

Primodial germ cells and their origin – Spermatogenesis – Oogenesis and Vitellogenesis – Comparison of spermatogenesis and oogenesis — Role of hormones on oogenesis and ovulation in Human, invitro fertilization (IVF) in Human.

FERTILIZATION

Activation of egg - Mechanism of fertilization – Metabolic activities during fertilization, stem cell biology

UNIT- II — DIFFERENTIATION — 15 Hrs

Cleavage : Theories of cleavage – Cleavage planes & patterns — Molecular changes during cleavage in Human, Types of blastula.

Gastrulation : Major events of gastrulation – Mechanism of Gastrulation in Mammals.

UNIT- III — ORGANOGENESIS IN MAMMALS — 15 Hrs

Development: Development of Brain, Heart and Kidney.

EMBRYONIC NUTRITION

Placenta : types, Physiology and Hormonal control during pregnancy and lactation.

UNIT- IV — INDUCTION — 15 Hrs

Primary organizer : Spemann's experiments and conclusions – Types of embryonic Induction (Primary, Secondary, chain of induction) –Experiments on Chemical nature of

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 in invertebrates Physiological changes during regeneration – Factors influencing regeneration, Wolffian 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. Sounders Company Publication Philadelphia, (2008).
4. Elements of Developmental Biology - Jain, P.C, Vishal Publication, New Delhi1998.

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

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IV - SEMESTER

CORE PAPER -11: BIODIVERSITY AND EVOLUTION

Total Credits: 5 **Total Hours: 75**

Objectives

1. To understand the present status of Fauna and Flora.
2. If create an awareness of conservation of Endangered Fauna and Flora.
3. 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, Bioreserves, types of Biodiversity and biodiversity hot spots

UNIT II **15Hrs**

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

UNIT III **15Hrs**

Biodiversity and Wild life management- - project Tiger, project Elephant, 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.

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 Biodiversity B.D Singh

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- RamamurthiRallapalli and Teetha Bali- APH Publishing corporation. New Delhi 2002.
2. Evolution and the Diversity of Life-Ernst Mayr.The Belknap Press Hardvard Univ.Press.London,Ed.4. 1997.
3. Evolution. Monroe W Strickberger.CBS Publishers and Distributors.Delhi.Ed.1. 1994.
4. Glimpses of Biodiversity- B.B. Hosetti(2002) Daya Publishing House.
5. Biodiversity in India-T.Pullaiah 2006 Regency.
6. Organic evolution –Rastogi 1999 kedarnath Publishing House.

15PZO412

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, Moriculure- 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	- **Scirpophagaincertulas**
	Brown Plant hopper	- **Nilaparvatalugens**
2. Coconut pests:	Rhinoceros beetle	- **Oryctes rhinoceros**

3. Red palm weevil : Shoot borer - **Chiloinfuscatellus**
Top borer - **Scirphophagaexcerptalis**

4.Cotton pests : Tobacco cut worm - **Spodoteralitura**
American boll worm - **Helicoverpaarmigera**

B. Stored Produce pests

1. Rice : **Sitophilusoryzae**
2. Flour : **Triboliumcastaneum**
3. Green gram : **Bruchuschinensis**

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. Anathakrishnan 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. 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.

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. Dissloved carbondioxide
4. Dissloved 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

LC50, LD_{50}

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 poilution
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 of the following at the time Practical Examination without which the students will not be permitted to write the examination.

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
Total	=	**40 Marks**

END OF SEMESTER EXAMINATION

Time-3Hours **Max Marks-60**

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
Total	–	**60 marks**

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
Total	=	**40- Marks**

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
Total	-	**60 marks**

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**

Ntritional 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, 4th 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, 4th 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 - NANOBIOTECHNOLOGY

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 and Nanoparticles

Nanotechnology- Introduction, Scope, History, applications. Types of Nanoparticles.

Unit II: Properties and characterizations

Synthesis of nanoparticles- green and microbial synthesis. Characterization of nanoparticles- UV-Vis, X –ray diffraction, EDAX and FTIR.

Unit III: Applications of Nano – materials in Biosystems

Applications of nanomaterials in agriculture, medicine. Impacts of nanomaterials on environments.

Unit IV: Nanomaterials and Diagnostics/ Drug delivery and Therapeutics

DNA coupled Nanomaterials and drug delivary. Metal / metal oxide Nanoparticles (Antibacterila/ Antifungal/Antiviral) Antisotropic and magnetic particles (Hyperthermia).

Unit V: Concept of Nanotoxicity

Types of toxicity based on route of entry, nature of toxin. Cytotoxicity, Genotoxicity, Invivo testol assay.

Textbooks

1. Introduction to nanocomposite materials. Properties, Processing, characterization. Thomas E., Twardowski (2007). DES tech Publications, USA.
2. RK, Rathy, "Nanotechnology" 1st edition, S. Chand Publisher 2009.
3. Sidharth Baliyan, "Basics of Nanotechnology" Anmol Publications PVT. Ltd.
4. CM, Niemeyer, C. A. "Nanotechnology: Concepts, Applications and Perspectives", Wiley- VCH, 2004.
5. P.P. Simeonova, N. Opopol and M.I. Luster, "Nanotechnology- Toxicological Issues and Environmental Safety", Springer 2006.

References

1. Vinod Labhasetwar and Diandra L. Leslie, "Biomedical Applications of nanotechnology", A john Willy & 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.
3. Zafar Vyamadzi (2008). Reference handbook of nanotoxicology.
4. Houdy. P, Lahmani M. Marano F. (2011). Nanoethics and Nanotoxicology. Spriger, Verlag Berlin Heidelberg.

NON-MAJOR ELECTIVE 4 - HUMAN GENETICS AND COUNSELLING

Total Credits: 5 **Total Hours: 60**

Objectives

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

UNIT I **12Hrs**

Blood groups (major types) Blood transfusion, Erythroblastosisfoetalis.

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 BalaRastrogi. 2009 (reprint 2010) 3rd Ed. KadarnathRamnath publishers. Meerut. New Delhi.
2. Genetics. Alice Marcus.2009.MJP Publishers, Chennai.

References

1. Genetics by H. Eldon Sutton, Robert P. Wagner (1985) - Macmillan publishing company New York.
2. Basic Human Genetics. Elaine J. Mange and Arthur P. Mange (1991). 2nd Edit. Sinaver Associates Inc. publishers Sunder land.
3. Principles of Genetics. Robert H. Tamarin. 2002. 7th Ed. Tata McGraw Hill publication company Ltd. New Delhi.
4. Applied Genetics. C.Emmanuel, S. Ignachimuthu and S.Vincent. 2006. MJP Publishers, Chennai.
5. Genetics. Susan L. Elrod and William D.Stansfield. Adapted by G. Bhowmik 2009 4th Ed. McGraw-Hillpublication company Ltd. New Delhi.
6. Cell and Molecular Biology. P.J.Russel, S.L.Wolte, P.E.Hertz,C.Sterr and B.Mc Millan.2009 1st 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 Telemery 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 - Joesph M. Moran, Michael, P. Morgan, James, H. Wiesma, Published by W.H. Freeman and Company, Sanfrancisco, 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, 3rd 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

1. To make the students understand and appreciate biodiversity and the Act to protect the wild species.
2. To make the students learn different techniques to study wild life and develop knowledge of the benefits of ecosystem.
3. 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, endemicity; biodiversity assessment; Endagered species-Indian Wild life protection Actl972 and International Redlist Species Criteria, concept and assessment

UNIT IV FIELD SAMPLING TECHNIQUES **12Hrs**

Population estimation-concept, line transect, quadrate 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:

1. Ecology and Environment. P.D.Sharma.2009/10th Ed. Rastrogi publications. Meerut.
2. Concepts in Wild Life Management Hoselli BB (2008) Daya publishing house New Delhi 110002.

References

1. 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.
2. Fundamentals of Wildlife Management. Gopal, R. 1992. Justice Home. Allahabad. Biodiversity-Gaston, K.J. 1996.
3. A biology of numbers and difference. Blackwell Science, Oxford. Ecology. V.K.Agarwal and Usha Gupta. 2004. 1st Ed. S.Chand and Company Ltd.New Delhi.
4. Environmental Studies. D.K.Asthana and Meerut Asthana. 2006 1st Ed. (Reprint 2007).S. Chand and company Ltd. New Delhi.
5. Fundamentals of Ecology. Madhab Chandra Desh and SathyaPrakashDesh. 2009. 3rd Ed. Tata McGraw Hill Education Pvt.Ltd. New Delhi.