LIFE AND DIVERSITY OF INVERTEBRATES

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
I	21CPZO1A	Core - I	5	75	5	75	Nil	5

COURSE OBJECTIVES

- To comprehend the systematic position, biodiversity, functional morphology, mode of life, affinities and phylogeny of invertebrates.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the systematic position and classification of invertebrate animals based on their hierarchy.	K2
CO2	To understand the evolution and polymorphism of coelenterates and parasitic adaptations of helminthes.	K2
CO3	To imbibe knowledge on the economic importance of invertebrates	K3
CO4	To update the knowledge of mollusca and their evolutionary significance.	K4
CO5	To acquire knowledge on phylogeny of invertebrates and fossils.	K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	M	S	S	S	M
CO3	S	S	S	M	S
CO4	S	S	M	S	M
CO5	S	S	S	S	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **15 Hours**

Broad classification of the Animal Kingdom, Affinities and Phylogeny of Invertebrates - Concepts of species, hierarchial taxonomy.

Protozoa

Feeding, Reproduction and Parasitic adaptations with suitable examples.

Economic importance of Protozoa.

Theories on Origin and evolution of Metazoa.

Porifera

Functional morphology of Freshwater and Marine sponges with suitable examples.

Reproduction in sponges.

Systematic position and Affinities.

UNIT-II **15 Hours**

Coelenterata

Origin and evolution, Polymorphism and Reproduction.

Corals and Coral reefs.

Helminthes

Functional morphology and adaptations for parasitic mode of life. Human Helminth diseases.

UNIT-III **15 Hours**

Annelida

Archiannelida. Interrelationship between different classes of Annelida. Origin and evolution of coelom. Adaptive radiation and Metamerism in Annelida.

Arthropoda

Xiphosura-structure and affinities. Larval forms in crustaceans. Economic importance of Crustaceans. Phylogeny of Arthropoda.

UNIT-IV **15 Hours**

Mollusca

Torsion in Gastropods - Adaptive radiation in Mollusca. Phylogeny of Mollusca.

Echinodermata

Origin and evolutionary significance of Echinoderm larvae.

UNIT-V **15 Hours**

Minor Phyla

Structural peculiarities and affinities of Nemertinea and Rotifera.

Invertebrate fossils: Trilobites and Brachiopod

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Hyman L.H.	The Invertebrata, Vol I to VI.	Mc Graw – Hill Book Co., New York.	1951

2.	Carter, G.S.A.	General Zoology of Invertebrates	Sidewick& Jackson Ltd., London.	1969.
3.	Barrington, E.J. W.	Invertebrate Structure and Functions	English Language Book Society.	1969.
4.	Marshall A.J and Williams W.D	Textbook of Zoology, Vol. I: Invertebrates	7th Edition – ELBS	1976.

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Barnes. R.D	Invertebrate Zoology	W.B. Saunders Co.,Philadelphia	1974
2.	Borradile, L.A. Eastham, L.E.S. and J.T. Saunders	The Invertebrate	Cambridge University Press	1977
3.	Moore, R.C. Lalicker, C.G. and Fisher,A.G.	Invertebrate Fossils.	Mc Graw Hill Book Co., New York	1952
4.	Gardinar, M.S.	Biology of the Invertebrates,	McGraw - Hill Book Co., New York.	1972
5.	Richard C Brusca	Invertebrate Zoology	Hardcever Publiser	2003

WEB SOURCES:
www.sciencedirect.com
www.pubmed.com
www.livescience.com

TEACHING METHODOLOGY

- Class room teaching
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- Dr.G.Vidhya, Assistant Professor
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LIFE AND DIVERSITY OF CHORDATES

COURSE OBJECTIVES

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
I	21CPZO1B	Core-II	5	75	5	75	Nil	4

- To comprehend the systematic position, functional morphology, mode of life, affinities and biodiversity of chordates.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the new trends in taxonomy of chordate animals.	K2
CO2	To update the knowledge on affinities and structural peculiarities of vertebrates (fishes)	K4
CO3	To comprehend the fossil history, evolution and adaptive radiation in fishes and amphibian.	K3
CO4	To acquire knowledge on the adaptive radiation, fossils of reptiles, birds and the evolution of mammals.	K4
CO5	To acquire knowledge on comparative anatomy of vertebrates.	K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	S	S	S	M
CO3	S	M	S	M	S
CO4	M	S	M	S	M
CO5	S	S	S	S	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **15 Hours**

Taxonomy

Principles of taxonomy-Nomenclature- Binomial, Trinomial nomenclature.

Suffix as for super family name-(oidea), family name (idea), use of suffixes 'i', 'orum', 'ae', 'arum', 'ensis' and 'iensis'. Tautonyms, synonyms and Homonyms.

New trends in taxonomy: Ecological approach, Ethological approach, Cytological approach, Biochemical approach and Numerical taxonomy.

Taxonomic key: Indented, Simple non-Bracket Grouped type, combination

Pictorial: Branching type, Circular and Box-type

UNIT-II **15 Hours**

Prochordata: Systematic position and Phylogeny of Prochordates.

Ostracoderms: Silurian and Devonian Ostracoderms. Evolutionary position of the Ostracoderms.

Placoderms: Origin of Jaws -Structural peculiarities of Cyclostomata.

UNIT-III **15 Hours**

Chondrichthyes: Fossil history of Chondrichthyes, tendencies in Elasmobranch evolution.

Actinopterygii: Origin and evolution, Adaptive radiation of bony fishes.

Amphibia: Origin and evolution of Amphibia.

UNIT-IV **15 Hours**

Reptilia: Evolution of Reptilia. Saurischian and Ornithischian Dinosaurs -Rhyncocephalia - Adaptive radiation of Reptiles.

Aves: Birds as glorified reptiles. Fossil history of Birds. Palate in Birds. Adaptive radiation in Birds.

Mammal: Evolution of Mammals, Structural peculiarities of Prototheria, Metatheria and Eutheria.

UNIT-V **15 Hours**

Comparative anatomy: Origin and evolution of the vertebrate integumentary system. Paired fins and limbs, heart and aortic arches and brain of vertebrates.

TEXT BOOK

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Jolie. M	Chordate Morphology.	East West Press. Pvt, Ltd,	1968.
2.	Romer.A.S and Parson. T.S.	Vertebrate Body	W.B. Saunders Co.,Philaelphia.	1978
3.	Holstead	The Pattern of Vertebrate Evolution.	Freeman and Co. San Francisco. U.S.A.	1969
4.	Kapoor. V.C.	Theory and Practice of Animal Taxonomy.	Oxford and IBH Publishing Co., Pvt, Ltd. New Delhi	1998
5.	Kenneth V. Kardong	Vertebrates-Comparative Anatomy,Functions, Evolution, 4th Edition	Tata McGraw Hill Editions	2011

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Waterman. A.J	Chordate Structure and Function.	McMillan Co. London.	1971
2.	Hyman, L.H	Comparative Vertebrate Anatomy.	The University of Chicago Press, Chicago.	1966
3.	Young, J.2	Life of Vertebrates. Clarendon Press, Oxford.	Clarendon Press, Oxford.	1969
4.	Colbert, E.H	Evolutionof Vertebrates.	John Wiley and Sons Inc, New York.	1969
5.	Hobart M. Smith	Evolution of Chordate Structure	Holt, Rinehart and Winston. Inc. New York.	1960

WEB SOURCES:

www.sciencedirect .com

www.pubmed.com

www.livescience.com

TEACHING METHODOLOGY

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CELL AND MOLECULAR BIOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
I	21CPZO1C	Core-III	5	75	5	75	Nil	5

COURSE OBJECTIVES

- To understand the structure and molecular basis of cellular interactions, energy transformation, regulation and control of genes, cell cycle and information transfer.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the knowledge on the structure and functions of cell organelles.	K2
CO2	To understand the knowledge on the structure and functions of nucleus and chromosomes.	K2
CO3	To gain the knowledge about cell cycles and cancer cells.	K3
CO4	To understand the knowledge on chemistry of DNA and its replication.	K2
CO5	To gain the knowledge the experimental techniques of DNA replication and mechanism of genes.	K3

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

Mapping with Programme Outcome

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	M	S	S	M
CO3	M	S	S	M	S
CO4	S	M	M	S	M
CO5	S	S	S	S	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **15 Hours**

STRUCTURE AND FUNCTIONS OF CELL ORGANELLES

Plasma membrane: Structure**,** Membrane receptors, Membrane transport -Membrane Potentials - cell adhesion, intercellular recognition - Intercellular junctions. Endoplasmic reticulum - intracellular transport. Mitochondria - Energetics - cellular respiration - mitochondrial replication. Ribosomes - Structure and function.

UNIT-II **15 Hours**

NUCLEUS AND CHROMOSOMES

Cytoplasmic interactions, Nuclear receptors - Cell fusion: homokaryons, heterokaryons. Structure and function of Chromatin - Euchromatin and heterochromatin - Polytene and lampbrush Chromosomes.

UNIT-III **15 Hours**

CELL CYCLES AND CANCER CELL

Cell cycles - its components G_O-G_1 transition - Spindle organization - Chromosome movements - Regulation and synchronization of cell division.

Cancer cell: Differences between normal and cancer cell- structural and functional characteristics -Tumour Viruses- Oncogenes - Environmental factors inducting cancer. Hormones in relation to cancer-Theories of carcinogenesis.

UNIT-IV **15 Hours**

DNA REPLICATION AND REPAIR

Chemistry of DNA - types of DNA - Enzymology and mechanism of DNA replication in prokaryotes - DNA repair- Mismatch repair, Base Excision Repair, Nucleotide Excision Repair.

UNIT-V **15 Hours**

TRANSCRIPTIONANDTRANSLATION

Types of RNA, RNA polymerase, promoters, transcription in prokaryotes and eukaryotes, post transcriptional modification- splicing, capping and polyadenylation. Genetic code, Wobble hypothesis, Mechanism and regulation of translation in prokaryotes and eukaryotes, post translational modifications. antibiotic inhibitors of Protein synthesis.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	De Robertis. E.D.F. and De Robertis. E.M.F.	Cells and Molecular Biology	B.I Publications Pvt Ltd, India.	2001
2.	Lewin. B.	Genes VII	Oxford University Press, New York.	2000

3.	Shanmugam, G.	A laboratory manipulation in fish	Madurai Kamaraj University	1988
4.	De Witt	An evolutionary approach. Biology of the cell.	Saunders Company	1977
5.	Karp, G.	Cell Biology	McGraw Hill Ltd., Japan.	1979

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Howland J.L.	Cell Physiology	McMillan Publishing Co., New York	1973
2.	Avers. C.J.	Cell Biology	Van Nostrand Company, New York	1976
3.	Korenberg. A	DNA Replication	Dorothy- W.H. Freeman and Company,San Franciso	1974
4.	Hawkins, J.D	Gene Structure and Expression	Cambridge University Press, London.	1996
5.	Albert, B and Watson. J.D.	Molecular Biology of the cell.	Garland Publishing, London.	1990

WEB SOURCES:

www.sciencedaily.com
www.sciencemag.com
www.treehugger.com
www.nature.com

TEACHING METHODOLOGY

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AQUACULTURE AND FARM MANAGEMENT

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
I	21CPZO1D	Elective-I	3	45	3	45	Nil	3

COURSE OBJECTIVES

- The objective of the paper is to understand the culture practices of both fin fish and shell fishes in India and World. This paper is planned to teach in the lines of knowing the candidate species of important fin and shell fishes.
- Gaining knowledge in the food and feeding habits, investigating the seed production and farm management and method of farming. This paper also to provide scope for employment opportunities in aquaculture activities.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To get employment opportunities in the Hatchery and Fish farm.	K3
CO2	To able to design and construct fish farm and prawn farm and to maintain the young ones in the hatchery	K4
CO3	To understand the techniques on seed production, induced breeding and live feed formulation.	K2
CO4	To acquire knowledge on composite fish culture.	K4
CO5	To understand about the water quality management, fish disease diagnostic methods.	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	M	S	M
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **9 Hours**

INTRODUCTION TO AQUACULTURE

Importance of aquaculture, Global scenario, Present status in India - Prospects and scope.

Aquaculture Farms- Site selection, topography, water availability and supply, soil conditions and quality. Design and layout, structure and construction.

UNIT- II **9 Hours**

BIOLOGY OF IMPORTANT CULTIVABLE SPECIES & THEIR ECONOMICS

Standard guidance for choosing cultivable species - Seaweeds, Crustaceans (Prawns & Lobsters), Molluscs (Mussels and Oysters) and fishes - Biological criteria - Environmental adaptability and compatibility - Economic importance - economics, market values, by-products and availability in adjacent region.

UNIT-III **9 Hours**

SURVEY OF SEED RESOURCES - SEED AND FEED PRODUCTION

Distribution and abundance of natural seed resources, collection methods and segregation.

Artificial seed production - breeding under controlled condition, induced breeding technique, larval rearing, packing and transportation.

Live feed - Microalgae, Rotifer and Artemia - their culture. Feed formulation - Conventional and non-conventional ingredients, feed additives, feed attractants and feed formulations.

UNIT-IV **9 Hours**

CULTURE SYSTEMS

Traditional, Extensive , Semi-intensive and intensive systems, composite fish culture, paddy-cum-fish culture, integrated fish culture, sewage water fish culture, raceway culture, cage, pen and rack culture, Culture system management - pond preparation, production and economics.

UNIT-V **9 Hours**

FARM MANAGEMENT

Water quality management - temperature, salinity, p^H, O_2, Co_2 levels, nutrients and trace elements. Control of parasites, predators, weeds and diseases in culture ponds. Disease diagnosis - ELISA, Western blotting - DNA based diagnosis of diseases and fish vaccines.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Sinha, V.R.P. and Srinivastava, H.C.	Aquaculture Productivity	Oxford and IBH Publications Co., Ltd., New Delhi.	1991
2.	Dash, M.C. and Patnik, P.N.	Brackish water culture	Palani Paramount publications, Palani.	1994
3.	Paul Raj, S.	Shrimp Farming techniques, Problems and solutions	Palani Paramount Publications, Palani.	1995

4.	Ponnuchammy, R.	Practical Guide to shrimp farming.	Palani Paramount Publications,palani	1997

REFERENCE BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Balugut, E.A	Aquaculture system and practices	A selected review publishing House, New Delhi.	1989
2.	Michael, B.N. and Singholka, B	Freshwater Prawn Farming.	A manual of culture of Macrobrachium rosenbergii. Daya Publishing House, New Delhi	1985
3.	Paul Raj, S.	Aquaculture	A.D.Palani Paramount Publications, Palani	2000
4.	Post, G.M	Text Book of Fish Health.	TFH Publication	1983
5.	Pillay, T.V.R	Aquaculture Principles and Practices	Blackwell Scientific Publications Ltd.	1990

WEB SOURCES:

www.livescience.com
www.sciencemag.com
www.treehugger.com
www.nature.com

TEACHING METHODOLOGY

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FISHERY SCIENCE

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
I		Elective-I	3	45	3	45	Nil	3

COURSE OBJECTIVES

- The aim of the paper is to understand the morphology, classification and identification of fishes and the fisheries and fishery resources of India. Moreover, information about the biology of the fishes goes a long way in managing the fishery resources and their sustainable utilization.
- As fishes constitute perishable commodity, preservation and processing are also quite essential. To know the different methods of preservation and processing of fishes.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	KnowledgeLevel (K1-K4)
CO1	To get employment opportunities in the Hatchery and Fish farm.To understand the classification and types of fishes.	K3&K2
CO2	To understand the growth and population dynamics of fishes.	K2
CO3	To acquire knowledge on present status and scope of Indian fishes.	K2
CO4	To analyze theinformation about fishery survey methods.	K4
CO5	To acquire knowledge aboutthe crafts and gears of fishes and also get knowledge about the types of spoilage, causative factors - marketing and economics.	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	M	S	M
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **9 Hours**

BIOLOGY OF FISHES AND CLASSIFICATION

General morphology and outline classification of fishes - major groups of fishes and their characteristics - morphometric and meristic characters of elasmobranchs and teleost fishes. Basic anatomy of fish - digestive, circulatory, respiratory, nervous and reproductive systems. Food and feeding habits, maturity, fecundity, spawning and survival of Indian fishes.

UNIT-II **9 Hours**

GROWTH AND POPULATION DYNAMICS

Length-weight relationship and factors influencing growth condition, age determination Theory of fishing, unit stock, recruitment, growth, mortality, migration, fish tagging and marking.

UNIT-III **9 Hours**

INLAND CAPTURE AND MARINE CAPTURE FISHERIES OF INDIA

Fishery zones and type of fisheries in India. Riverine, Estuarine, Coldwater, Reservoir and Pond fisheries. Present status and scope of inland capture fisheries - their fishery characteristics, distribution and importance. Present status and scope (prawn/shrimp, lobster and cephalopods) and fishes - importance. of marine capture fisheries - crustaceans crabs), Molluscs (clam, cockle, mussel, oyster, their fishery characteristics, distribution and importance.

UNIT-IV **9 Hours**

FISHERY SURVEY METHODS

Methods of surveying the fishery resources - acoustic method, aerial method, survey of fish eggs and larvae, analyzing population features - growth mortality selection.

UNIT-V **9 Hours**

CRAFTS AND GEARS

Principal methods of exploitation of fishes - indigenous and modern gears and crafts. Principal methods of fish preservation and processing in India Types of spoilage, causative factors - marketing and economics.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Day.F	Fishes of India, Vol.I and Vol. II	William Sawson & Sons Ltd., London	1981
2.	Jhingran, C.G	Fish and Fisheries of India	Hindustan Publishing Co.India.	1981

3.	Biswas, K. P	A Text Book of Fish, Fisheries and Technology.	Narendra Publishing House, Delhi.	1996
4.	Santhanam,R	Fisheries Science	Daya Publishing House, New Delhi	1980

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Yadav, B.N	Fish and Fisheries	Daya Publishing House, New Delhi	1997
2.	Bal D.V. and Rao, K.V.	Marine Fisheries of India.	Tata McGraw Hill Publishing Co. Ltd., New York.	1990
3.	Maheswari, K	Common fish diseases and their control	Institute of Fisheries Education, Powakads, M.P	1996
4.	Srivastava, C..L	Fish Biology	Narendra Publishing House, Delhi.	999

WEB SOURCES:

www.livescience.com

www.sciencemag.com

www.treehugger.com

www.nature.com

TEACHING METHODOLOGY

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POULTRY FARMING

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
I		Elective-I	3	45	3	45	Nil	3

COURSE OBJECTIVES

- To understand the poultry industry based on the past , present and emphasis of future growth To study the statistical data and various functions involved in poultry industry.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To get employment opportunities in the Hatchery and Poultry farm .To understand the types of poultry and development of poultry industry in India .	K3&K2
CO2	To understand the genetic classification and economic traits of poultry.	K2
CO3	To acquire knowledge on Mendelian inheritance	K2
CO4	To analyze the information about common breeding like inbreeding and out breeding.	K4
CO5	To understand about the feeding habit and digestive process of chickens.	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	M	S	M
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **9 Hours**

INTRODUCTION AND DEVELOPMENT OF POULTRY FARM

Introduction –definition of poultry –broiler,layer and breeder-common terms related to poultry-development of poultry industry in india.Past and present scenario of poultry industry-domestication of poultry. Role of government /private agencies in poultry development.

UNIT-II **9 Hours**

GENETIC CLASSIFICATION OF POULTRY

Origin and breed characteristics of poultry. Basic genetics –common terms-chromosome number in different species-qualitative traits-auto sexing –economic traits.

UNIT-III **9 Hours**

INHERITANCE OFMENDELIAN CHARACTERS

Dominance and Excessiveness of mendelian characters , homozygous and heterozygous individuals. Mendelian inheritance –the law of segregation and recombination , the law of independent assortment. Sex-linked inheritance –distinguishing sex at hatching time.

UNIT-IV **9 Hours**

OBJECTIVES OF POULTRY BREEDING FOR MEAT AND EGG PRODUCTION

Methods of mating –flock,pen,pair and artificial insemination. Breeding –common breeding programs practiced in industry.

Breeding for high hatchability-influence of sire Dam, influence rate of laying, effects of inbreeding and cross breeding.

UNIT-V **9 Hours**

FEEDING AND DIGESTIVE PROCESS

Digestive system-factors influencing the feed consumption in birds-Macro and micro nutrient requirements and feeding for various species of poultry. Classification of feed ingredients-Conventional feeds and Non-Conventional Poultry feeds-Energy sources, vegetative protein sources, animal protein sources.

TEXT BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1	Arumugam, N., Murugan, S., Johnson. and Ram Prabhu, R.	Applied Zoology	Saras Publication, Kanyakumari	2005
2	Isabel Guerrero and Legarreta	Hand Book of Poultry Science and Technology	John Wiley and Sons, New Jersey.	2010

3	Jawaid, A. and Sinha, S. P.	A Handbook of Economic Zoology	S. Chand & Company, New Delhi.	2008
4	Jabde and Pradip V	Text Book of Applied Zoology	Discovery Publishing House, Delhi	2005
5	Upadhya, V.B	Economic Zoology.	Rastogi Publications, Meerut, India.	2006

REFERENCE BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Bell D.Donald and weaver D.William.Jr.	Commercial chicken meat and egg.Production	Springer,India Pvt Ltd.,Noida.	2007
2.	Prakash Malhotra	Economic Zoology	Adhyayna Publishers & Distributors, New Delhi.	2008
3.	Khan, A. A.	Encyclopedia of Economic Zoology. 2 vols	Anmol Publications Pvt. Ltd., New Delhi.	2007
4.	Scott, M.L., Nesheim, M.C. and Young, R.J.	Nutrition of the Chicken. 3rd ed.	Ithaca, New York.	1982
5.	Biester, H.E. and Schwarte, L.H.	Diseases of Poultry, 5th Edn	Oxford and IBH Publishing Co, New Delhi.	1969

WEB SOURCES:

www.livescience.com
www.sciencemag.com
www.treehugger.com
www.nature.com

TEACHING METHODOLOGY

- Class room teaching
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SELF STUDY PAPER (OPTIONAL)

ORGANIC FARMING

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
I	POCZO1SS	Self study paper	-	-	-	-	Nil	2(extra)

COURSE OBJECTIVES

- The course will provide an adequate hands on experience for the students towards an independent handling and capability to produce organic farm .
- Subject content is so designed and hence the students can avail to become an entrepreneur herself**.**

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the scope and benefits of organic farm.	K2
CO2	To learn about the classification and types of biofertilizers	K1
CO3	To Update the knowledge on pest control and pest management.	K4
CO4	To acquire knowledge on the methods of plant production in organic forming.	K4
CO5	To get employment opportunities in the Entrepreneurship development.	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	M	S	M
CO3	S	M	S	M	S
CO4	M	S	M	S	S
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I

CONCEPT OF ORGANIC FARMING

Introduction to Organic Farming- Scope, Concept, Development, Principles and Need for Organic Farming. Agencies and Institutions related to Organic Agriculture- Types of Organic Farming- Biodynamic Farming- Benefits and Present State of Organic Farming- Requirements -Components for an Organic Farm.

UNIT -II

VERMICOMPOSTING

Earthworms- Introduction-Classification and Biology of Lampito marutii.

Vermicomposting Methods –Anaerobic (Pit) and Aerobic (Heap) method, Tank method, Bin method and Wormery. Harvesting the Compost.

Bio-fertilizers- Introduction, Types of Bio-fertilizers-Advantages of using Biofertilizers in Agriculture.

UNIT -III

PEST CONTROL AND PEST MANAGEMENT

Pest Control- Use of Bio-control agents, Bio-pesticides, Pheromones, trap crops**.**

Pest Management-Introduction-Culture Practices. Biological Pest Management with the Agrivi Farm, Botanical Powder Formulations- Integrated diseases and Pest Management.

UNIT-IV

PLANT PROTECTION IN ORGANIC FARMING:

Plant Protection –Introduction-Organic-Integrated and Conventional methods. Plant Protection Strategies in Organic Farming.

Prevention Methods- Nutrition Management-Cultivation Practices-Crop rotation.

UNIT-V

ENTREPRENEURSHIP DEVELOPMENT

Entrepreneurship- Concept, Characteristics, Approaches and Need for Entrepreneurship. Agri-Enterprises- Stages of Establishing Enterprise, Project Identification, Step to be Considered in Setting up an Enterprise, Feasibility Report- Product Selection.

Project Management and Appraisal – Market, Technical, Social, Financial Analysis. Planning for Marketing, Target Marketing and Competitive Strategy.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Kristensen, P., Taji, A. and Reganold, J.	Organic Agriculture	Global publishers	2006
2.	Altieri, M.	Agroecology	The Science of Sustainable Agriculture.	1990

3.	Bavec, F. and Bavec, M.	Organic Production and Use of Alternative crops	University of maribore	2007
4.	Joshi, M., Setty, T.K.P. and Prabhakarasetty	Sustainability through organic farming	Kalyani publications	2006
5.	David Oates,	A Guide to Entrepreneurship	Jaico Publishing House, Mumbai, Edn	2009

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Atwal, A. S. .	Agricultural Pests of India and South – East	Kalyani Publishers,New Delhi.	1991
2.	C.Jayanthi	Organic farming	1stEdition.Kalyani Publishers, Ludhiana, India	2006
3.	Agarwal, R.L	Seed Technology	Oxford and IBH Publication Co., New Delhi.	1995
4.	Dhirendra Khare and Mohan S. Bhale.	Seed Technology	Scientific Publishers (India), Jodhpur	2007
5.	Collins and Lazier W	Beyond entrepreneurship	Prentice Hall, New Jersey	1992

WEB SOURCES:

www.livescience.com
www.sciencemag.com
www.treehugger.com
www.nature.com

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- Dr.G.Vidhya, Assistant Professor
- Dr. S. Vijayakumari, Assistant Professor

GENETICS

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
II	21CPZO2A	Core-IV	5	75	5	75	Nil	5

COURSE OBJECTIVES

- To understand the fine structure of genetic materials and regulation of their action. To know the chromosomal basis of genetic disorders, development and differentiation.
- To know the importance of population genetics and nuances of genetic engineering and applied genetics.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the fundamental aspects on structure of DNA and RNA and microbial genetics.	K2 & K3
CO2	To understand the concept of gene action, Operon concept and inborn errors of metabolism in man.	K2
CO3	To understand the human genetic disorders and to gain knowledge on genetic counseling.	K2
CO4	To know about the carcinogenesis, mutagens and the population genetics.	K4
CO5	To gain knowledge on genetic engineering and its applications in hospital with ethics.	K3 & K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOME

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	M	S	S	S
CO3	S	S	S	M	S
CO4	M	S	M	S	M
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **15 Hours**

MOLECULAR STRUCTURE OF GENETIC MATERIAL

Molecular structure of DNA and RNA - Replication, theories, Gene concept - One gene one polypeptide concept. Chemical Nature of genetic material (DNA and RNA). Microbial Genetics - Conjugation, transformation and transduction and Sexduction. Chromosome mapping in prokaryotes (Virus, Bacteria) and eukaryotes (Neurospora and Man)

UNIT-II **15 Hours**

REGULATION OF GENE ACTION

Enzyme regulation of gene action. Gene regulation of gene action - Operon concept - GAL and LAC Operon system. Evidence of regulation of gene action. Genes and metabolism. Inborn errors of metabolism in Man (With reference to protein, carbohydrates, Lipid and nucleic acid).

UNIT-III **15 Hours**

CHROMOSOME AND GENETICS DISORDERS

Evolution of sex chromosomes. Dosage compensation - X inactivation. Genomic imprinting.

Human Genetics: Normal human karyotype - Variations in karyotypes (autosomal and sex chromosomal, structural and numerical) with special reference to classical syndromes in man. Principles and methods of pedigree analysis - statistical evaluation. Genetic counselling - Objectives, ethics and principles . Methods of counselling for point mutation, structural and chromosomal disorders.

UNIT-IV **15 Hours**

GENES IN DEVELOPMENT, RADIATION GENETICS AND POPULATION GENETICS AND CYTOGENETICS

Genes in development and differentiation Mechanism of chromosomal breakage – physical, chemical and biological factors or agents. Mutagens,mutagenesis and carcinogenesis - genetic changes in Neoplasia in man.

Population genetics: Population and gene pool. Hardy Weinberg Law-Genetic equilibrium. Factors affecting Hardy Weinberg equilibrium.

Calculation of gene frequencies for Autosomal (Complete dominance, codominance and multiple alleles) and sex linked genes.

Cytogenetics-Structural and Numerical Changes in Chromosomes (Mutation-I and Mutation-II)

UNIT-V **15 Hours**

GENETIC ENGINEERING AND APPLIED GENETICS

Genetic Engineering - Restrictive enzymes - Recombinant DNA techniques. Applications of Recombinant DNA technology.

Applied Genetics - Application of genetics in animal breeding. Application of genetics in Crime and Law - DNA fingerprinting, Genetic basis of intelligence. Studies on Twins.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Daniel L. Hartl	Geneties	Jones and Barflaff Publishing, Boston.	1994
2.	Lewin, B.	Genes VII	Oxford University Press, New York.	2000
3.	Ayala, F. I. and Kieger, J.A. Jr.	Modern Genetics	The Benjamin Publishing Co. London,	1980
4.	Tamarin, R.H.	Princples of Geneties	WCB Publishers Munro	1996
5.	Market, C.L. & Ursprung,	Development Genetics	Prentice Hall.	1973

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Watson. J.D. Hopkins, N.H.., Roberts, J.W., Steitz, J.A. and Weiner, A.M	Molecular Biology of the Gene. W.A.	Benjamin/Cummings Co., New York.	1987
2.	Sinnot. E.W., Dunn. L.C., Dobzhansky, T.H	Principles of Genetics	McGraw Hill Co., New Delhi.	1973
3.	Goodenough, U	Genetics	Saundes College Publishing Co., London	1984
4.	Jenking, J.B.	Human Geneties	The Benjamin Cummings Publishing& Co., Londan	1983
5.	Pandian, T.J. and Muthukrishnan, J	Research Methods for Gene and Choromosome Manipalation in Fish	Department of Biotechnology, Govt. of India, New Delhi	1990

WEB SOURCES:

www.sciencemag.com

www.treehugger.com

www.nature.com

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ENVIRONMENTAL BIOLOGY& EVOLUTION

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
II	21CPZO2B	Core-V	4	60	4	60	Nil	4

COURSE OBJECTIVES

- To understand the nature of relationships among organisms that comprise functioning of ecosystem. To provide the knowledge on interactions between organisms and their environments to drive the dynamics of populations and communities.
- To know the different types of pollution and their management to protect the health and welfare of human population in the world.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To acquire knowledge on the ecosystem , energy transformations across tropic levels.	K3
CO2	To gain knowledge on physic-chemical parameters in coastal ecosystem and renewable and non renewable resources.	K4
CO3	To analyze the germplasm conservation, cryopreservation and environmental protection acts.	K4
CO4	To understand the concepts of evolution through fossil evidences.	K2
CO5	To know the process of evolution in mammals, genetic drift, hybridization and role of polyploidy.	K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOME

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	S	S	S	S
CO3	S	S	S	M	S
CO4	M	S	M	S	S
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **12 Hours**

ECOSYSTEM AND COMMUNITY

Review of concept of ecosystem - Physical environment; biotic environment; biotic and abiotic interactions -Natural and Man-made ecosystem, with examples. Energyflow - Trophic structure and levels - Pyramids, food chain and web - ecological efficiencies, and productivity and its measurement. Influence of competition, predation and disturbances -

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones

UNIT-II **12 Hours**

HABITAT AND RESOURCES ECOLOGY

Biomass, Adaptations with reference to physico - chemical features of environment. Aquatic environments (Freshwater, Marine and Eustarine) Terrestrial environments (Forest and Grass land)

Renewable and non - renewable resources - animal resources. Conventional and non - conventional energy sources.

UNIT III **13 Hours**

ENVIRONMENTAL CONSERVATION AND MANAGEMENT

Principles of conservation - Rain water harvesting - Soil health and fauna - Biosphere reserves - agricultural ,Wildlife conservation and management (Project Tiger)- biodiversity - Germplasm conservation and cryopreservation. Problems of urbanization - Sewage, soil waste and industrial waste disposal and management. Social forestry - tribal welfare. Environmental Protection Act.

UNIT-IV **11 Hours**

EVIDENCES AND POLYMORPHISM

Evidences: The need of evidences for the fact of evolution - evidences from comparative anatomy, embryology, physiology and biochemistry. Biogeography, Plate tectonics and continental drift - Evidences from systematic, evolutionary taxonomy - Paleontology – Evolutionary time scale-Era periods and Epoch.evolutionary trends in fossils, types of fossils.

Mimicry - Batesian and Mullerian mimicry and evolution.

Polymorphism - Transient and stable - Maintenance of polymorphism.

UNIT-V **12 Hours**

GENETIC BASIS OF EVOLUTION AND SPECIATION

Mutations and their role in evolution - the concept of neutral evolution- population size and evolution - the role of genetic drift - hybridization and evolution - The role of polyploidy, isolating mechanisms - premating, post mating - problems of the origin of isolating mechanism. Genetics and Ecology of speciation. Mayer's founder principle and genetic evolution in the peripheral isolates - Ecological opportunities for speciation.

Human Evolution- Evolution of Man.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Berwer. A	The Science of ecology	Saunder's college publishing	1988
2.	AlphaSoli,I. Arceivala.	Wastewater treatment for pollution control	Second Ed. Tata McGraw Hill Publication Company Ltd., New Delhi.	1998
3.	P.A.Moody.	Introduction to Evolution	Harper International.	1978
4.	G.L. Stebbine.	Process of Organic Evolution	Prentice Hall India, New Delhi.	1979
5.	M. Grene.	Dimensions of Darwinism	Cambridge University Press. UK	1983

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Odum. E.P	Fundamentals of Ecology.	Nataraj Publishers	1996
2.	Trivedi, P.R.and Gurdeepraj, K.	Environmental Biology	Akashdeep Publishing House, New Delhi.	1992
3.	Asthana, D.K. and Asthana, M	Environmental Problems and Solutions.	S. Chand and Co., New Delhi.	2001
4.	Abraham,J.C.B	Evolution (A Laboratory Manual)	Macmillan india Ltd.,Chennai	1987
5.	E.C.Minkoff	Evolutionary Biology	Addison Wesley,London	1984
6.	E.O.Dodson	Evolution	Reinhold,Newyork	1990

WEB SOURES:

www.sciencedaily.com

www.sciencemag.com

www.treehugger.com

www.nature.com

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BIOTECHNOLOGY AND BIOINFORMATICS

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
II	21CPZO2C	Core-VI	4	60	5	60	Nil	4

COURSE OBJECTIVES:

- To familiarize the use of the data and techniques of engineering and technology in biology for the study of living organisms, to make or modify products or processes for specific use.
- To understand the basic concepts of bioinformatics in order to analyze through computational management.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the fingerprinting, cloning, blotting techniques and applications of biotechnology in human welfare.	K2
CO2	To acquire knowledge on organ culture, embryo transfer in human, cryobiology and Good laboratory Practices at global level	K3 & K4
CO3	To know the practical uses of biotechnology and its applications in medicine, food production and agriculture	K3
CO4	To analyze the information from genomics and proteomics database software.	K4
CO5	To gain knowledge on algorithm and tool sequence analyzes.	K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOME:

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	M	S	S	S
CO3	S	S	S	M	S
CO4	S	S	M	S	S
CO5	S	M	S	M	S

S- Strong; M – Medium; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **12 Hours**

RECOMBINANT DNA TECHNOLOGY

Gene cloning - the basic steps - various types of restriction enzymes - ligase linkers and adaptors - c DNA - transformation - Hybridization techniques (Blotting techniques - Southern blotting - Northern blotting - Western blotting). Gene probe - Molecular finger printing (DNA finger printing) - RFLP and RAPD- the PCR techniques - Genomic library .

UNIT-II **12 Hours**

ANIMAL BIOTECHNOLOGY

Cell culture - Organ culture - whole embryo culture - Embryo transfer - In vitro fertilization (IVF) technology - Dolly - embryo transfer in human. Transgenic animals (Mice ,Goat and Rabbit). Human gene therapy. Cryobiology.

UNTI-III **12 Hours**

ENVIONMENTAL BIOTECHNOLOGY AND APPLICATIONS OF BIOTECHNOLOGY

Bioremediation - bioremediation of hydrocarbons - Industrial wastes - Heavy metals - Xenobiotics - bioleaching - biomining - biofuels. Applications of biotechnology in agriculture, medicine and food science. Genetically modified organism (GMO'S) - GM foods. Biotechnology & biosafety - IPR.

UNIT-IV **12 Hours**

BASIC BIOINFORMATICS

Bioinformatics - Biological / Specialized Database - Servers for Bioinformatics (NCBI, EBI, Genoment) Virtual Library - Data mining - Data Warehousing - Genomics and its application to health and agriculture, including gene therapy. Proteomics.

UNIT-V **12 Hours**

ALGORITHM IN BIOINFORMATICS

Algorithm and tools sequence analysis - Similarity Search - Genetic algorithm - Gene finding - Protein prediction - Biomolecular visualization - Phylogenetic analysis - Drug designing.

TEXT BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	R.C.Dubey	A text book of biotechnology	Rajendra Ravindra Printer. New Delhi.	2001
2.	Dawson,M.T.Powell.R ,and Gannon, F.	Gene Technology	Bios Scientific Publishers	1996
3.	Lydell Norris	Textbook of Biotechnology	Syrawood Publishing house	2016
4.	Arthur, M.L.	Introduction to Bioinformatics	Oxford University Press, New Delhi.	2003

5.	Baxevanis,A. and Ouellette, B.F.	Bioinformatics: A practical guide to the analysis of genes and proteins	Wiley Interscience, Hoboken, New Jersey, USA.	1998

REFERENCE BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Purohit, S.S. and S.K.Mathur	Biotechnology Fundamentals and Application	Agro Botanica, New Delhi	1999
2.	Chopra, V.L. and Nanin, A	Genetic Engineering and Biotechnology.	Oxford and IBH Publishing Co., New Delhi	1992
3.	Gupta, P.K	Biotechnology and Genomics.	Rastogi Publications, Meerut	2004
4.	Higggins D.and Taylor, W.	Bioinformatics: Sequence, Structure and Databanks.	Oxford University Press, New Delhi	2000
5.	Westhead, D.R., Parish, J.H. and Tugman, R.M.	Bioinformatics.	Viva Books Pvt. Ltd., New Delhi	2003
6.	Arthur M. Lesk.	Introduction to Protein structure	Oxford University Press, New Delhi	2006

WEB SOURCES:

www.pubmed.com

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ENDOCRINOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
II	21CPZO2D	Elective-II	3	45	3	45	Nil	3

COURSE OBJECTIVES

- To acquire knowledge on the structure of Thyroid gland, Parathyroid, Adrenal, Thymus and Pineal gland. To acquire knowledge on the synthesis of their hormones.
- To Understand the gastrointestinal hormones and sex hormones. To understand the role of hormones in pregnancy and lactation.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the structure and functions of hormones and its mechanism.	K2
CO2	To understand the structure and functions of Pituitary, Thyroid and Parathyroid glands.	K2
CO3	To understand Structure and functions of the, pancreas, pineal gland, adrenal glands and their action on stress management.	K2 &K3
CO4	To acquire knowledge on the hormones secreted by insects, crustaceans and moulting.	K4
CO5	To understand the hormonal control of anuran amphibians and reproductive hormones of male and female gametes in human.	K3

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	M	S	S	S	M
CO3	S	S	S	M	S
CO4	S	S	M	S	M
CO5	S	S	S	S	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **9 Hours**

INTRODUCTION TO ENDOCRINOLOGY

Introduction, objectives and scope of endocrinology - modern concepts and problems in Endocrinology - endocrine glands in crustaceans, insects and vertebrates. Experimental methods of hormone research - general classes of chemical messengers.

UNIT-II **9 Hours**

PITUITARY AND THYROID GLANDS

Pituitary gland - characteristics, structural organization-adenohypophysis and neurohypophysis - hormone secretion, its functions and disorders - Hypothalamic control – Feedback mechanism and releasing factors.

Thyroid gland - structural organizations, metabolic effects of thyroxine and thyroid dysfunction - effects on reproduction - parathyroid - its structure and functions.

UNIT-III **9 Hours**

PANCREAS AND ADRENAL GLANDS

Structure of pancreas, pancreatic hormones and their functions. Regulation of insulin secretion Structural organizations of adrenals, functions of cortical and medullary hormones – Emergency hormones.

UNIT-IV **9 Hours**

INSECTS AND CRUSTACEAN ENDOCRINOLOGY

Concepts of neurosecretions - endocrine systems in crustaceans - endocrine control of molting and metamorphosis - neuroendocrine system in insects - endocrine control of molting - metamorphosis and reproduction.

UNIT-V **9 Hours**

VERATEBRATE REPRODUCTIVE ENDOCRINOLOGY

Structure of mammalian testis and ovary - male and female sex accessory organs - hormones of testis and ovary – hormonal regulation of estrous and menstrual cycle - hormones of pregnancy - parturition - hormonal control of lactation. Hormonal control of metamorphosis in an anuran amphibian.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Barrington, E.J.W.	An introduction to general and comparative endocrinology	Claredon Press Oxford.	1985

2.	Philip felig,Lawrence A.Frohman	Endocrinology and Metabolism	McGraw-Hill Medical	2001
3.	Melmed, Shlomon Williams and Robert Hardin.	Textbook of endocrinology	Philadelphia: Elsevier/Saunders.	2011
4.	Shlomo Melmed ,Kenneth S. Polonsky MD	Textbook of Endocrinology	Elsevier Publications	2016
5.	Mala Dharmalingam	Textbook of Endocrinology	Jaypee Publications	2010

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Haris, G.W. and B.T. Donovan	The Pituitory Gland	S. Chand and Co.	1968
2.	Bentley, P.J	Comparative vertebrate endocrinology	Cambridge University Press. Cambridge	1985
3.	Turner, C.D. and J.T. Bangara	General endocrinology Saunders International Student edition.	Toppan Company Limited. Tokyo	1986
4.	Ingleton, P.M. and J.T. Bangara	Fundamentals of comparative vertebrate endocrinology	Kluwer Academic Publishers.	1986
5.	Mac Hadley	Endocrinology, 3rd Edition	A Simon & Schuster Company, Englewood Cliffs, New Jersey. USA.	1992

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PARASITOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
II		Elective-II	3	45	3	45	Nil	3

COURSE OBJECTIVES

- To gain knowledge on types of parasites and lifecycle.
- To study the mode of transmission diseases and to know about the parasites diseases.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the types and transmission of parasites.	K2
CO2	To analyze the lifecycle ,mode of transmission and treatment of viruses.	K4
CO3	To understand about the definition ,types and control of vectors.	K2
CO4	To acquire knowledge about theProtozoa & Cestoda parasites.	K4
CO5	To understand about the Trematoda & Nematode parasites.	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	M	S	S	S	M
CO3	S	S	S	M	S
CO4	S	S	M	S	M
CO5	S	S	S	S	S

S- Strong; M – Medium; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **9 Hours**

Introduction of parasites-Types of parasites ,types of hosts ,inter relationship between host and parasite. Responses and hosts to parasitic infection ,mode of transmission of parasite, host specificity and parasitic adaptation.

UNIT-II **9 Hours**

Vibrio cholera-life cycle, mode of transmission ,infection and treatment. Yersinia pestis-life cycle, mode of transmission, infection and treatment. Influenza and H1N1 viruses- life cycle, mode of transmission, infection and treatment. Dengue- life cycle, mode of transmission ,infection and treatment

UNIT-III **9 Hours**

Vectors –definition, types of vector, Arthropod vector of medical and veterinary importance-Sand flies, mosquitoes horse files and Rat flea, ticks, mites and vector control.

UNIT-IV **9 Hours**

Study of parasites from Protozoa & Cestoda

Trypanosoma of humans,

Intestinal flagellates Giardia

General lifecycle of cestodes: Taenia.

UNIT- V **9 Hours**

Study of parasites from Trematoda & Nematoda: Schistomata, Fasciola. Nematodes: Wuchereria , Ancylostoma, Plant nematodes: Cyst nematode.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Bogitsh, B. J. Cheng, T. C.	Human Parasitology. 2nd Ed	Academic Press, New York.	2000
2.	Cheng, T. C	General Parasitology. 2nd ed	Academic Press, Inc. Orlando.U.S.A.	1986
3.	Cox, F. E. G.	Modern Parasitology. 2nd ed.	Blackwell Scientific Publications. Lea and Febiger, Philadelphia	1993
4.	Hati, A. K.	Medical Parasitology. Allied Book	Allied Book Agency, Kolkata.	2001
5.	Smyth, J. D.	Animal Parasitology. 3rd ed.	Cambridge University Press.	1994
6.	Schmidt, G. D.	Essentials of Parasitology	Wm. C. Brown Publishers (Indian print;1990, Universal Book Stall).	1989

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Chandler, A. C. and Read. C. P	Introduction to Parasitology, 10th ed.	John Wiley andSons Inc	1961
2.	Chatterjee, K. D.	Parasitology	(Protozoology and Helminthology).13th ed. CBS	1981
3.	Noble, E. R. and Noble G. A.	Parasitology. The Biology of animal Parasites. 6th ed	Lea and Febiger, Philadelphia.	1989
4.	Roberts, L. S., Janovy, J. and Nadler S.Gerald D. Schmidt &Lary S.	Roberts' Foundation of Parasitology. 9th ed	McGraw-Hill International, Johns Hopkins University	2013
5.	Schmidt, G. D. and Roberts, L. S.	Foundation of Parasitology. 3rd ed	McGraw Hill Publishers. Dubuque, Iowa.	2001

WEB SOURCES:

www.sciencemag.com

www.treehugger.com

www.nature.com

TEACHING METHODOLOGY

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SYLLABUS DESIGNERS

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ECONOMIC ZOOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
II		Elective-II	3	45	3	45	Nil	3

COURSE OBJECTIVES

- The aim of the paper is to understand the types of earthworm, vermicompost method, moreover information about the morphology and biology of honeybees,
- To know about the prawn culture processing methods and prawn exports. As fishes constitute perishable commodity , preservation and transport are also quite essential. To understand the knowledge of poultry management and nutrivity value of eggs and meat.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the types ,methods and uses of vermiculture	K2
CO2	To understand about the morphology, social behavior and medicinal values of honeybees.	K2
CO3	Togain knowledge about the culture methods ,types and export of prawns.	K3
CO4	To acquire knowledge about the fish culture ,preservation methods and export methods of fishes.	K4
CO5	To understand about the breeding methods,nutritive values and hatching methods of chickens .	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	M	S	M
CO3	S	S	S	M	M
CO4	S	S	M	S	M
CO5	S	M	S	S	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-1 **9 Hours**

VERMICULTURE

Introduction to vermiculture. Types of earthworm, Biological of Eisenia foetida. Rearing of earthworms, Equipment's devices used in vermiculture, vermicompost technology – Methods and products, vermiwash collection, composition and use.

UNIT-2 **9 Hours**

APICULTURE

Morphology and biology of honey bees – Honeybee species – social behavior of honey bees – bee keeping and ancillary industries – newton's bee hive extraction of honey – Medicinal value of honey – bee products – importance of bee colonies in crop pollination.

UNIT-3 **9 Hours**

PRAWN CULTURE

Prawn fishery – Types of prawn fishery – culture of fresh water prawn – culture of marine prawn – preparation of farm. Preservation and processing of prawn. Export of prawn.

UNIT-4 **9 Hours**

FISH CULTURE

Fish culture – Aim of fish culture – Breeding pond – Fish seed – Hatching pond. Transport of fish fry of rearing ponds. Harvesting – Preservation of fish – composite fish forming. By – Products of fishing industry.

UNIT-5 **9 Hours**

POULTRY MANAGEMENT

Breeds of fowl, Housing and Equipment, Deep litter system, Laying cages. Methods of breeding and rearing, debeaking. Management of growers, Layers, broilers – Feed formulations for chicks, Growers and broilers. Diseases of fowl. Nutritive value of eggs and meet. Incubation and hatching of eggs.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Vasantharaj David, B. And Kumaraswami T.	Elements of economic, entomology	Pop. Book depot. Chennai .	1998
2.	Arumugam , N.	Aquaculture	Saras Publication Nagarkoil, Tamilnadu	2008
3.	Arul K.Sharma	A Hand book of organic farming, Agro	Bio. Jothpur, India	2015
4.	Isabel Guerrero and Legarreta	Hand Book of Poultry Science and Technology	John Wiley and Sons, New Jersey.	2010
5.	Jawaid, A. and Sinha, S. P.	A Handbook of Economic Zoology	S. Chand & Company, New Delhi.	2008

6.	Jabde and Pradip V	Text Book of AppliedZoology	Discovery Publishing House, New Delhi	2005

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Bhatnagar, R.K and Palpa, R.K	Vermiculture and vermicomposting	Kalyani Publishers, New Delhi	1996
2.	Shukla, G.S and Xupadhyay G.S.	Economic zoology	Rastogi Publications, Meerut	2010
3.	Shanmugam,K.	Fishery Biology and Aquaculture	LEO Pathipagam, Chennai .	1992
4.	Prakash Malhotra	Economic Zoology	Adhyayna Publishers & Distributors, New Delhi.	2008
5.	Khan, A. A.	Encyclopedia of Economic Zoology. 2 vols	Anmol Publications Pvt. Ltd., New Delhi.	2007

WEB SOURCES

www.sciencemag.com

www.treehugger.com

www.nature.com

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HUMAN RIGHTS

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
II	21CPHUR2A	Compulsory Paper	2	20	2	20	Nil	2

COURSE OBJECTIVE

- To enable the students to understand the Definition of Human Rights.
- To make the students to understand the Universal Declaration of Human Rights.

COURSE OUTCOMES

On the successful completion of the course the student will be able to

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Highlight the Definition of Human Rights	**K3**
CO2	State the Role of Universal Declaration of Human Rights	**K3**
CO3	Explain Human Rights Declarations	**K2**
CO4	Discuss about the International Human Rights in Domestic Courts.	**K2**
CO5	Understand about Contemporary Issues on Human Rights	**K3**

Knowledge Level : K1-Remember ;K2 –Understands ; K3 – Apply ; K4- Analyse

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	M	S	M	S	M
CO2	M	S	S	S	M	S
CO3	S	S	S	M	S	M
CO4	M	S	M	S	M	M
CO5	S	M	S	M	S	M

S- Strong; M- Medium; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **4 Hours**

DEFINITION OF HUMAN RIGHTS

Definition of Human Rights-Nature, Content, Legitimacy and Priority-Theories on Human Rights- Historical Development of Human Rights.

UNIT-II **4 Hours**

UNIVERSAL DECLARATION OF HUMAN RIGHTS

International Human Rights –Prescription and Enforcement till World War II – Human Rights and the U.N.O.-Universal Declaration of Human Rights-International Covenant on Civil and Political Rights –International Covenant on Economic, Social and Cultural Rights and Optional Protocol.

UNIT-III **4 Hours**

HUMAN RIGHTS DECLARATIONS

Human Rights Declarations –U.N. Human Rights Declarations – U.N. Human Commissioner.

UNIT-IV **4 Hours**

INTERNATIONAL HUMAN RIGHTS IN DOMESTIC COURTS.

Amnesty International –Human Rights and Helsinki Process-Regional Developments-European Human Rights System-African Human Rights System-International Human Rights in Domestic Courts

UNIT-V **4 Hours**

Issues on Human Rights: Children's Rights-Women's Rights– Dalit's Rights-Bonded Labour and Wages-Refugees-Capital Punishment-Fundamental Rights in the Indian Constitution-Directive Principles of State Policy-Fundamental Duties- National Human Rights Commission.

TEXT BOOKS

S.no	Authors	Title	Publishers	Year Of Publication
1	Paul Willams	The International bill of Human Rights	Entwhistle Books	1981
2	Mausice Cranston	What are Human Rights	Bodley Head	1973
3	A.R. Desai	Violation of Democratic rights in India	Popular prakashan	1986

REFERENCE BOOKS

S.no	Authors	Title	Publishers	Year Of Publication
1	Dr.J.N. Pandy	Constitutional law	Central Law Agency	2018
2	J.C. Johari	Human Rights and new World order	Anmol	1996
3	G.S. Bajwa	Human Rights in India	Anmol	1995

WEB SOURCES:

https://www.ohchr.org

https://www.aaas.org

SYLLABUS DESIGNER :

- Dr. A. Amirthavalli, Head and Associate Professor of History.
- Dr. A. Zarina Begum, Assistant Professor of History.

PRACTICAL -1

LIFE AND DIVERSITY OF INVERTEBRATES AND CHORDATES

Semester	Subject Code	Category	Practical		Theory	Practical	Credits
			Hrs/ week	Total Hours/ Semester			
II	21CPZO21	Core Practical-I	4	60	Nil	60	4

COURSE OBJECTIVES:

- To identify and study of selected Protozoans
- To understand the evolution /different types of coelom.
- To dissect and mount the digestive system of insects
- To Study of the specimens and their adaptive features for their respective modes of life
- To Study of the skull types with reference to jaw suspensions

INVERTEBRATA **30 Hours**

Identification and study of selected Protozoans (Entamoeba histolytica, Plasmodium vivax) and Helminthes (Taenia solium)

Different Types of Coelom

Identification and study of sections of available animals from Cnidaria (Hydra), Aschelminthes (Ascaris lumbricoides- Male and Female) and Annelida (Nereis) Identification and study of larval forms (Crustaceans and Echinoderms) of major phyla of Invertebrates.

Major Practical-Dissection

Dissection of digestive system of insect (Cockroach), Sepia.

Dissection of nervous system of Prawn, insect (Cockroach), and Sepia.

Dissection of reproductive system of insect (Cockroach)

Minor Practical -Mounting

Mouth parts of Honey bee, Housefly, Mosquito

Appendages or Prawn

Sting apparatus of Honeybee

Radula of Phyla

Study of prepared slides - mouthparts of bug and Butterfly to relate their structure and function.

CHORDATA **30 Hours**

To study of the following specimen to bring out their affinities:

a. Amphioxus

b. Balanoglossus

c. Ascidian

To study of the following specimens with reference to their adaptive features for their respective modes of life

d. Echeneis

e. Ichthyophis / Uraeotyphlus

f. Hyla

g. Draco

h. Pigeon

i. Bat

To study of the following skull types with reference to jaw suspensions

j. Fish

k. Frog

l. Calotes

m. Snake

n. Rat/Rabbit

Dissection and mounting

Webberian ossicles in Cat fish.

Aortic arches in Teleost

IX and X Cranial nerves of Cat fish.

PRACTICAL -II

CELL AND MOLECULAR BIOLOGY, GENETICS, BIOTECHNOLOGY AND BIOINFORMATICS

Semester	Subject Code	Category	Practical		Theory	Practical	Credits
			Hrs/ week	Total Hours/ Semester			
II	21CPZO22	Core Practical-II	4	60	Nil	60	4

COURSE OBJECTIVES

- To measure using ocular and stage micrometers of cell from any prepared slide.
- To understand the culture of Drosophila, Sex identification. Identification of blood groups A,B, ABO and Rh
- To observe the demonstration of principle and application of Tissue culture techniques.
- To understand and interpretation of Biological data bases.

CELL AND MOLECULAR BIOLOGY **20 Hours**

CYTOLOGICAL TECHNIQUES

Micrometry – measurements using ocular and stage micrometers – measurements of cell from any prepared slide.

Vital staining – Buccal smear stained with Methylene blue.

CHROMOSOME

Chromosome preparation – procedure. Preparation of meiotic chromosomes from any fish – (demonstration)

MOLECULAR BIOLOGY TECHNIQUES (Demonstration only)

Centrifuge, Isolation of DNA from Liver – Isolation of RNA – Denaturation of DNA – measurement of spectrophotometry – Isolation and analysis of proteins –electrophoresis.

GENETICS **20 Hours**

Preparation of culture medium Culture of Drosophila. Methods of maintenance. Sex identification. Identification of four mutants.

1. Identification of blood groups A,B, ABO and Rh.
2. Mounting of salivary glands of Drosophila larva or Chironomus larva. Analysis of banding pattern

3. Karyotyping using human metaphase chromosome plates (Giemsa stained). Eye Karyotyping, Identification of syndromes (Down, Klinefelter and Turner) from Karyotype Photographs showing clinical features of each syndrome case.

BIOTECHNOLOGY **10 Hours**

Visit to Biotechnology Lab. to observe the demonstration of principle and applications of

1. Tissue culture.
2. Titration and preparation of virulent phage.
3. Isolation of DNA from the plasmids.
4. Restriction enzymes digestion of DNA.
5. DNA electrophoresis in Agarose gel.
6. PCR

Necessary books may be referred to learn the techniques and to be recorded in the record Note books. Observation of photographs of different instruments used in Biotechnology, their principles and applications.

BIOINFORMATICS **10 Hours**

1. BIOLOGICAL DATA BASES

a) Nucleotide sequence data base

b) Protein sequence data base

c) Structural data bases (NDB, PDB).

2. SEQUENCE ANALYSIS

a) Pairwise sequence alignment

b) Multiple sequence alignment

c) Similarity search

d) File format conversion

3. PROTEIN STRUCTURE PREDICTION

Primary structureprediction

Secondary structureprediction

Tertiary structureprediction & Function prediction

PRACTICAL -III

ENVIRONMENTAL BIOLOGY AND EVOLUTION

Semester	Subject Code	Category	Practical		Theory	Practical	Credits
			Hrs/ week	Total Hours/ Semester			
II	21CPZO23	Core Practical-III	4	60	Nil	60	4

COURSE OBJECTIVES:

- Isolation and identification of Plankton (Freshwater).
- To understand the mechanisms and factors involving in aquatic system
- To study the interaction and adaptation among species

ENVIRONMENTAL BIOLOGY **50 Hours**

1. Estimation of Aquatic - Primary productivity - Dark and Light bottle.
2. Estimation of Dissolved oxygen, Salinity, Nitrites, Phosphates, Calcium, Silicates and Alkalinity in water samples.
3. Analysis of Industrial effluent - TDS, TSS, BOD, (COD - Demonstration).
4. Collection, isolation and identification of Plankton (Freshwater).
5. Study of sandy, muddy and rocky shore fauna with special reference to the adaptation to the environment (any FOUR).
6. Animal Association - parasitism, mutualism and commensalisms (any ONE/TWO)
7. Visit to:-
    a). Drinking water treatment plant.
    b). Effluent treatment plant
    c). Sewage treatment plant.
    d). Sandy, Muddy and Rocky Shores.

EVOLUTION (Slides / Specimens /Models) **10 Hours**

1. Observation of forelimbs and hindlimbs of vertebrates (Frog, Calotes, Bird and Mammal) to study the common pattern of pentadactyl limb and common ancestry of vertebrates.
2. Observation of fossils to study paleontological evidences of evolution.
3. Observation of leaf insects and stick insects in the museum to study adaptation by cryptic colouration and natural selection.
4. Observation of Monarch and Viceroy butterflies to study Batesian mimicry.

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PAPER-VII-COMPARATIVE ANIMAL PHYSIOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
III	21CPZO3A	Core-VII	5	75	5	75	Nil	5

COURSE OBJECTIVES

To drive an unified knowledge of the behavioral physiology, respiratory ,circulation, excretion ,neuro muscular and endocrine regulation

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	Understand and analyze the adaptations, concepts of homeostasis and bioluminescence in invertebrates and vertebrates.	K2
CO2	Remember, understand, analyze, and evaluate the physiology of circulation, and respiration	K1,K2&K4
CO3	Understand and analyze the Osmatic regulation and Excretion in invertebrates and vertebrates.	K2&K4
CO4	Understand and analyze the physiology of effectors, receptors and neuronal conduction.	K2&K4
CO5	To Understand and acquire knowledge on the physiology of endocrine glands in insects and man.	K2&K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	M	S	S
CO3	S	M	S	M	S
CO4	M	S	S	S	M
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I DIGESTION, METABOLISM AND STRESS **15 Hours**

Digestion and Role of gastrointestinal hormones in digestion. Metabolism-Carbohydrates, Proteins, Fats and Minerals. Stress Physiology - Basic concept of environmental stress and strain; concept of elastic and plastic strain; stress resistance, stress avoidance and stress tolerance. Physiological response to oxygen deficient stress - Physiological response to body exercise - Meditation, Yoga and their effects.

UNIT- II RESPIRATION AND CIRCULATION **15 Hours**

Respiration in Invertebrates and Vertebrates-Comparative physiology of Respiration in relation to different habitats– Structures – Respiratory gases – uptake– transport of respiratory gases- O_2 &CO_2 dissociation curves – respiratory pigments -BMR

Circulation - structure of heart -a comparative study- types of hearts - physiology of cardiac muscle –Mechanism of heart beat and its regulation - blood coagulation and theories.

UNIT III OSMO IONIC REGULATION AND EXCRETION **15 Hours**

Osmoregulation in Freshwater and Marine aquatic organisms and Osmoregulation in terrestrial animals. Excretory physiology –Comparative study of excretory products in relation to different habitats, kidney-urine formation, concentration, elimination, micturition, Role of Hormones in regulation of water balance.

UNIT-IV NEURO-MUSCULAR PHYSIOLOGY **15 Hours**

Gross anatomy of brain and spinal cord, Neurons – action potential – transmission of nerve impulse (Chemical and Electrical) – neurotransmitters – mechanism of neural transmission – neuro-degenerative diseases. Muscular physiology-Muscle contraction – theories – molecular mechanism of muscle contraction.

Receptor Mechanism: Chemoreceptor, Phonoreceptor and Photo receptor and tango receptor.

UNIT- V ENDOCRINE REGULATION AND BEHAVIOURAL PHYSIOLOGY

15 Hours

Endocrine glands – Feedback regulation – Hypothalamus-Pituitary – gonadal axis – Role of reproductive hormones – gamete formation; fertilization; embryonic development; parturition; lactation; neuroendocrine regulation -Pheromones in insects. Hibernation, Aestivation and Diapause.

TEXT BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Eckert, R	Animal Physiology: Mechanisms and Adaptations	W.H. Freeman and Company, New York	2007
2.	Hochachka, P.W. and Somero, G. N	Biochemical Adaptation	Princeton, New York	2015
3.	Hoar, W.S.	General and Comparative Animal Physiology	Prentice Hall of India	1991
4.	Schiemdt Nielsen	Animal Physiology: Adaptation and Environment	**Cambridge** University Press	1997
5.	Strand, F.L	Physiology: A regulation System Approach	Macmillan Publishing Co., New York	1997
6.	Brown	Comparative nimal physiology III ED edition	W.B.Saundars Company,Phiadelphia	1985
7.	Prosser, C.L	Environmental and Metabolic Animal Physiology	Wiley-Liss Inc, New York	1991
8.	Rastogi	Essencials of animal physiology IV Edn	New age international(p)Ltd	2005

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	S.K.Nelson	Animal physiology, Adaptation and Environment	Cambridge University Press	1985
2.	Hill – Wyse-Anderson	Textbook of animal physiology second edition	Sinauer associates publications	2008
3.	Knut Schmidt – Nielsen, Liana Bous, C.Richard Taylor	Comparative physiology primitive animals	Cambridge university press	2009
4.	August Krogh	Osmatic regulation in aquatic animals	Cambridge university press	2009
5.	P.K. Biswas	Handbook of animal physiology	Agrotech press	2012

WEB SOURCES:

www.sciencedirect.com

www.pubmed.com

www.livescience.com

www.biology.lu.se

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DEVELOPMENTAL BIOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
III	21CPZO3B	Core-VIII	5	75	5	75	Nil	5

COURSE OBJECTIVES

To understand the basic concept of embryonic development, gametogenesis, early development of embryo, organogenesis, apoptosis and reproductive technology.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the basic concept of Embryonic development.	K2
CO2	To study and understand about the gametogenesis, fertilization and early development in embryo	K2
CO3	To understand the morphogenesis, organogenesis, neoteny and regeneration in vertebrates.	K2
CO4	To analyze and understand the regenerate and development of immune system in vertebrates.	K2&K4
CO5	To imbibe current knowledge pertaining to apoptosis and reproduction.	K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	S	S	M
CO3	S	M	S	M	S
CO4	M	S	M	S	S
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT- I **15 Hours**

BASIC CONCEPTS OF DEVELOPMENT

Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development. Experimental analysis in the early development of Amphibians (Spemann and Mangold).

UNIT-II **15 Hours**

GAMETOGENESIS, FERTILIZATION AND EARLY DEVELOPMENT

Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry

UNIT-III **15 Hours**

MORPHOGENESIS AND ORGANOGENESIS

Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, Amphibia and Chick; organogenesis – vulva formation in Caenorhabditis elegans. Development of eye lens, ear and heart in mammals. Limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.

UNIT- IV **15 Hours**

NEOTENY AND REGENERATION

Occurrence and significance – Regeneration: Regenerative capacity in the Animal Kingdom – Factors influencing regeneration – Stimulation and Suppression – Polarity and Gradients – Development of immune system in vertebrates.

UNIT- V **15 Hours**

APOPTOSIS AND REPRODUCTIVE TECHNOLOG

Apoptosis-aging and senescence - Asexual reproduction - Assisted Reproductive Technology (ART) – Male infertility – Sperm abnormalities. Artificial Insemination– Female infertility- Superovulation – IVF, ICSI, GIFT – Screening of genetic disorders.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Gilbert, B. F	Developmental Biology, VIII Ed	Sinaur Associates Inc. Publishers, Sunderland , Massachusetts USA	2006
2.	Balinsky, B.I	Introduction to Embryology. V Ed	Saunders, Toppan	1981
3.	Lewis Wolpert	Principles of Development. II Ed	Oxford University Press	2002
4.	Nakamura, O., &Sulo, J	Organizer, A milestone of a HalfCentury from Spemann	Elsevier/North Holland Biomedical Press	1978
5.	VasundaraRao	Developmental Biology - A Modern Synthesis	Oxford IBH, New Delhi.	1994
6.	Russo, V.E.A., Brody, S., Cove, D and Ottolenghi, S	Development. The Molecular Genetic Approach	Springer Verlag, Berlin	1992
7.	N.Arumugam	A Text book of Developmental Biology	Saras publication	2014

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Dr. A. Subramanian	Development biology	Springer	2012
2.	A.K. Rathoure	Understanding embroyological origins	Brillion publishers	2017
3.	K.S. Madhavan	Developmental biology	Wave books publishers	2017
4.	Manuel mari	Beffa kay experiment in practical development biology	Cambridge university press	2005
5.	Oppenheimer, S.B	Introduction to Embryonic Development	Allyn and Bacon,Inc. U.S.A.	1980

WEB SOURCES:

www.sciencedirect .com

www.pubmed.com

www.livescience.com

Wikipedia .org

www.journals.elsevier.com

TEACHING METHODOLOGY

- Class room teaching
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MICROBIOLOGY AND IMMUNOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
III	21CPZO3C	Core-IX	5	75	5	75	Nil	5

COURSE OBJECTIVES

- To understand the structure and functions of Antibodies, Complement system , molecular structure of T-cell receptor, B-cell receptor, culture techniques and industrial ,food and dairy microbiology.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand about the nature of antigens and antibodies and its interactions.	K2
CO2	To understand and imbibe knowledge on histocompatibility and expression of immunoglobulins.	K2
CO3	To understand about the mediate of immune system	K2
CO4	To understand the sterilization and culture techniques of microorganisms.	K2
CO5	Applications of microbes in food and diary industries and also in bioremediation	K3

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

Mapping with Programme Outcome

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M
CO2	S	M	S	S	M
CO3	M	S	S	M	S
CO4	S	M	M	S	M
CO5	M	S	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **15 Hours**

BENEFICIAL, HARMFUL AND INDUSTRIAL MICROBIOLOGY

Microbes in food - Role of microbes in food production. Dairy and non-dairy products fermented foods and alcoholic beverages. Pharmaceuticals (antibiotics and vaccines) Control of Microbes. Basic concepts of Probiotics. Bacterial (Cholera, Typhoid), Viral (Rabies, HIV), Fungal (Candidiasis, Dandruff) and Epidemiology (Transmission , Disease Susceptibility - control measures–Mitigation of Covid-19) diseases in man.

Industrial microbiology - Industrial uses of microbes - fermentation products (ethyl alcohol, antibiotic-penicillin, enzymes-protease and vinegar), bioconversions - bioremediation.

UNIT-II

STERILIZATION AND CULTURE **15 Hours**

Sterilization: Principles - dry heat, moist heat, filtration, Tyndallization, pasteurization, Radiation - disinfection. Culture techniques - media preparation - Aerobic and anaerobic culture techniques - Wet mount, hanging drop, Staining methods-dyes, simple differential and special staining techniques - acid fast stain, spore stain, capsule stain, staining for pure and mixed cultures.

UNIT-III-IMMUNE SYSTEM **15 Hours**

Innate and Acquired Immunity Phylogeny and Ontogeny of immune system - Organization and structure of lymphoid organs Cells of the immune system and their differentiation - Lymphocyte traffic .

Nature of immune response Antigenicity and immunogenicity - Factors influencing immunogenicity - Epitopes and haptens - Super antigens - Structure and Functions of Antibodies - Classes and subclasses - Gross and fine structure - Antibody mediated effector functions - Antigen- Ab interactions

UNIT-IV

RESPONSES OF IMMUNE SYSTEM **15 Hours**

T-cell generation, activation and differentiation Isolation, molecular components and structure of T-cell receptor complex - T-cell maturation and thymus - T- cell differentiation - Cell death and T- cell population .

Mediators of Immune system-B- cell generation, activation and differentiation - B-cell receptors - B-cell activation and proliferation -T_H B- Cell interactions-Cytokines and Immune response-Effectors cells and molecules - CTL and NK cells- mechanism of action. Hypersensitivity-Types and Immunological reactions.

UNIT-V

COMPLEMENTS OF IMMUNE SYSTEM **15 Hours**

MHC haplotypes - Class I and class II molecules -Cellular distribution - Peptide binding - Expression and diversity - Disease susceptibility.

MHC (Major Histocompatibility complexes)/HLA (Human leukocyte antigen genes)Organization and expression of Ig genes - Models for Ig gene structure - Multigene organization of Ig genes DNA rearrangements and mechanisms - Generation of antibody diversity - Differential expression of Ig genes.

TEXT BOOKS

S. NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	W. Paul	Fundamentals of immunology	Printed in china, Library of congress cataloging in publication	2012
2.	Kuby, J	Immunology. 6 t h edition	W.H. Freeman & Company, New York	2007
3.	Fathimunisa Begum	Immunology	PHI Learning Pvt. Ltd.	2014
4.	Roitt, I	Essential Immunology, VI edition	Elsevier Science Publishing Company, New York	2002
5.	M.Ledyard, A. Whelan and M.V. Fanger	Instant Notes in Immunology	Bios Scientific Publishers Ltd, Oxford,	2000
6.	Creager, J. C., Black J.D., Davison V. E.	Industrial Microbiology	New Age International Publishers, New Delhi	1990
7.	Dubey,R.C. and Maheshwari, D.K	Microbiology – Principles and Applications	Prentice Hall, Englewood Cliffs, New Jersey	2014
8.	Joanne,M., Linda,W., Sherwood,M. Christopher, J.	A Text book of Microbiology	S. Chand and Company Ltd.	2014
9.	Boston. Stainer et al	General Microbiology	Macmillan, London	2008

REFERNCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Dk. Maheshwari , Dr.Mc. Dubey	Textbook Of Microbiology	S. Chand Publications	2015
2.	A. Mani , Lm. Narayana, Dulsy Fatima , Am.Selvaraj & M. Arumugam	Immunology And Microbiology	Saras Publications	2014
3.	Michal L. Pelczar , Jr, E.C.S. Chan, Noel R. Krieg	Microbiology , Concept And Applications	Mcgraw Hill Education	2001
4.	A. Mani , Lm. Narayana, Dulsy Fatima , Am.Selvaraj & M. Arumugam	Immunology And Microbiology	Saras Publications	2014
5.	Lansing.M.Prescott	Microbiology,VEd	Fermentation. Blackwell Scientific Publication	2002

WEB SOURCES:

www.sciencedaily.com
www.sciencemag.com
www.treehugger.com
www.nature.com

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BIOCHEMISTRY AND BIOPHYSICS

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
III	21CPZO3D	Elective-III	3	45	3	45	Nil	3

COURSE OBJECTIVES:

- To understand the structure of atoms, principles of biophysical chemistry, Stabilizing interactions, Bioenergetics, Photo biophysics , metabolism of amino acids and vitamins.
- To understand and analyse the principle of colorimetry
- To understand the stability and metabolism of amino acids and vitamins.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the structure of atoms ,molecules and chemical bonds and study about the principles of biophysical chemistry**.**	K2
CO2	To understand about the stabilizing interactions and structure of biomolecules	K2
CO3	To understand and imbibe knowledge on bioenergetics, principles and mechanism of enzyme catalysis.	K2
CO4	To understand and analyze about the electromagnetic spectrum and delayed effects of radiation.	K2&K4
CO5	To update the knowledge on stability of proteins and nucleic acids and metabolismof nutrients.	K3

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	M	M	S	S	M
CO3	S	S	S	M	S
CO4	M	S	M	S	M
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I

BASICS OF BIOMOLECULES AND BONDING **9 Hours**

Structure of atoms, molecules and chemical bonds. Composition, nature of bonds/linkages, structure of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).

Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties). Forces between Molecules (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.).

UNIT- II BIOCATALYST AND BIOENERGETICS **9 Hours**

Enzymes: Principles of catalysis, classification of enzymes and enzyme kinetics, enzyme regulation, inhibitors of enzymes - mechanism of enzyme catalysis, isozymes Stability of proteins and nucleic acids. Metabolism of amino acids, carbohydrates, lipids, nucleotides and vitamins.

UNIT-III MICROTECHNIQUES **9 Hours**

Fixation, histological and histochemical staining methods for proteins, carbohydrates, lipids and nucleic acids, Different fixation and staining techniques for electron microscope. **Immunocytochemistry** – principles and applications- in situ localization by FISH and GISH. Photometry – Principle and applications of flame photometry and flow cytometry.

UNIT- IV NUCLEAR MEDICINE : **9 Hours**

In-vitro & in-vivo imaging using radioisotopes, Blood volume determinations by isotopic method, Radioiodine diagnosis & therapy in thyroid disorders.

Principle, method and applications of Radioimmunoassay, organ scans-thyroid, liver, brain, bone, renal imaging, cardiac imaging, PET scan, nuclear medicine for therapy, radiopharmaceuticals-concept, production & use.

UNIT-V PHOTO BIOPHYSICS **9 Hours**

Electromagnetic spectrum - visible and invisible region. Principles involved in Photoelectric colorimetry. Principle of Spectroscopy - UV & IR Spectroscopy in biological investigation. Effects of UV on biological systems. Delayed effects of radiation - Senectitude, reduction in life span and cancer. Radioactive isotopes - measurements - GM tubes, Liquid Scintillation counters. Autoradiography. Effects of radiation.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Murray, R. K., Granner, D. K.,	Harper's Biochemistry	Prentice Hall International Inc.	2000

	Mayes, P. A., Rodwell, V. W			
2.	C Jain, J.L., Sunjay Jain and Nitin Jain	Fundamentals of Biochemistry	S. Chand & Company Ltd., New Delhi	2007
3.	C. Satyanarayanan	Essentials of Biochemistry,	Uppala Author – Publisher Interlinks, Vijayawada Lehninger,	2004
4.	Voet. D., Judith, G. Voet, Charlotte W. Pratt.	Fundamentals of Biochemistry.	John Wiley & Sons Inc. New York	1999
5.	Casey, E. J	Biophysics - Concepts and Mechanisms	East West Press Pvt. Ltd. New Delhi	1962
6.	Daniel, M	Basic Biophysics for Biologist	Agro Botanical Publishers, Bihaner, India	2005
7.	Narayanan, P	Essentials of Biophysics	New Age International (P) Ltd.Publishers	2007
8.	Skoog, A. D. and James, J. L.	Principles of Instrumental Analysis	Saunders GoldenSunberst Series.	1992
9.	Vasanthan, P. and Gautham, N.	Biophysics	Narosa Publishing House, New Delhi.	2002

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Rodney Cotteril	Biophysics – An Introduction	Johnwiley & Sons Publications	2003
2.	.P.K.Srinivastava	Elementary Biophysics An Introduction	Alpha Science International	2005
3.	V.Satyanarayana And V. Chakarapani	Essentials Of Biochemistry	Elsevier Generic Publications	5th Edition 2019
4.	V.Sathyanarayana	Essentials Of Biochemistry	Books and Allied (P)Ltd Publishers	2008
5.	Dr. Jain, Sunjay Jain , Nitin Jain	Fundamentals Of Biochemistry	S.Chand Publications	2016
6.	R. Ferrier	Lippincott's Illustrated Review Biochemistry	7th Edition Wolters Kluwer India Pvt Ltd	2017

WEB SOURCES:

www.livescience.com

www.sciencemag.com

www.treehugger.com

www.nature.com

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NANOBIOTECHNOLOGY AND APPLICATIONS

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ Week	Total Hours/ Semester	Hrs/ Week	Total Hours/ Semester		
III		Elective-III	3	45	3	45	Nil	3

COURSE OBJECTIVES

- To understand the overview nanobiotechnology
- To understand the role of nanotechnology in biology
- To learn the different methodology for nanoparticles synthesis
- To learn the various instruments for characterization of nanoparticles
- To understand the impact of nanoparticles on the environment.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the outline of nanobiotechnology.	K2
CO2	To learn about the role of nanotechnology in biology .	K1
CO3	To learn about the various methodologies for synthesis of nanomaterials.	K1
CO4	To acquire knowledge on the working principle of different instruments for nanomaterials characterization.	K3&K4
CO5	To understand the impacts of nanoparticles on human health and environment	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES:

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M
CO2	M	S	S	M	S
CO3	S	M	S	M	S
CO4	M	S	M	S	M
CO5	S	M	M	S	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT -I **9 Hours**

INTRODUCTION TO NANOTECHNOLOGY`

Introduction - Importance of nanoscience and nanotechnology in biomedical applications. Interaction between biomolecules and nanoparticles. Applications of nanotechnology in biotechnology, killing cancer cells, providing oxygen and artificial mitochondria. Nano biosensors.

UNIT -II **9 Hours**

NANOMATERIALS FOR BIOLOGY

Carbon based nanomaterials - carbon nanotubes for biomedical applications, SWCNT and MWCNT. Magnetic nanoparticles - Quantum dots - Quantum dot biomolecular tags. Conjugation of quantum dots with biomolecules. Si nanowires. Nano biomaterials: Biocompatibility; Antibacterial activity; DNA and Peptide based nanomaterials; Polymer nanostructures.

UNIT -III **9 Hours**

SYNTHESIS OF NANOPARTICALS

Top-Down approach, Bottom-Up approach, PVD, CVD, Micro emulsion method, Sol-gel processing. Biological synthesis of nanoparticles - Use of bacteria, fungi, Actinomycetes for nanoparticle synthesis, Role of plants in nanoparticle synthesis.

UNIT- IV **9 Hours**

CHARACTERIZATION OF NANOBIOMATERIALS

Basic principles, operations and applications of UV-Visible spectroscopy, FI-IR spectroscopy, SEM, TEM, Fluorescence spectroscopy, Fluorescent resonance energy transfer (FRET), AFM of DNA, STM of DNA and Co focal microscopy.

UNIT- V **9 Hours**

ENVIRONMENTAL NANOTECHNOLOGY

Nanotoxicology, Environmental and Health impacts of nanomaterials, Waste remediation, Nanoporous polymers and their application in water purification, Energy conversion. Photocatalytic fluid purification, Current status of nanobiotechnology, Future perspectives of nanobiology and safety measures of nanomaterials.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	A.K. Bandyopadhyay	Nanomaterials	New Age International Publishers	2007
2.	Challa Kumar	Tissue, cell and organ engineering	Wiley-VCH, Verlag	2006
3.	C.N.R. Rao, A. Muller, A.K. Chutham	The Chemistry of Nanoparticles	Wiley-VCH, Verlag	2006
4.	Robert A. Freitas	Nanomedicine, Vol. IIA	Landes Bioscience, Georgetown.	2003
5.	Hari Singh Nalwa	Handbook of Nanostructure Biomaterials and Their Applications in Nanobiotechnology	American Scientific Publishers	2006
6.	Bharat Bhusha	Handbook of Nanotechnology	Springer	2007
7.	Dr. Christof M. Niemeyer Dr. Chad A. Mirkin	Nanobiotechnology : Concepts, Applications and Perspectives	Elsevier publication	2004
8.	C. Shad Thaxton Chad A. Mirkin Dr. Christof M. Niemeyer	DNA–Gold-Nanoparticle Conjugates	Elsevier publication	2004

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	C.M.Niemeyer, C.A. Mirkin	Nanobiotechnology	WILEY-VCH Verlag GmbH & Co. KG Weinheim.	2004
2.	Pulickel M. Ajayan, Linda S. Schadler, Paul V. Braun	Nanocomposite Science & Technology	WILEY-VCH Verlag GmbH & Co. KG A, Weinheim	2004
3.	C. P. Poole and F. J. Owens	Introduction to Nanotechnology	Wiley	2006
4.	M. Ratner and D. Ratner	Nanotechnology: A Gentle Introduction to the Next Big Idea	Prentice Hall.	2002

5.	L. E. Foster	Nanotechnology – Science, Innovation, and Opportunity	Pearson Education.	2006

WEB SOURCES:

www.livescience.com

www.sciencemag.com

www.treehugger.com

www.nature.com

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WILD LIFE BIOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
III		Elective-III	3	45	3	45	Nil	3

COURSE OBJECTIVES:

- To learn the fundamentals of biodiversity and gain insights on values of wildlife.
- To study grounds of habitat loss in animals and ensure species assessments.
- To familiarize with tools and techniques employed for studying wildlife, habitat and ecosystem process.
- To know laws and regulations adopted for animals.
- To provide students with a multidisciplinary education in Wild life biology.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To get employment opportunities in the wild life conservation .	K3
CO2	To learn about the wild life inventory studies of Vertebrates , Invertebrates and Plants .	K1
CO3	To know about the Conservation priorities.	K4
CO4	To acquire knowledge on wild life senses techniques.	K3
CO5	To gain knowledge on the working of various International and National animal laws and projects.	K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	M	S	S	M	S
CO3	S	M	S	M	S
CO4	M	S	M	S	M
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT – I **9 Hours**

INTRODUCTIONAND SCOPE OF WILDLIFE

Wildlife concept, Causes of wildlife depletion, degradation and destruction of wildlife habitats, exploitation for commercial purposes, deforestation, urbanization, and industrialization , hunting, forest fire, and for agricultural expansion.

UNIT – II **9 Hours**

SIGNIFICANCE OF WILDLIFE MANAGEMENT

Importance of wildlife conservation –(ecological, ethical, educational, scientific, commercial,aestheticandrecreational)wildlifecategories-
endangered,threatened,vulnerable,rare and extinct species. Red data book, green data book. Wild life corridors, human wildlife conflicts, Role of tribes in wild life management

UNIT-II **9 Hours**

WILDLIFE SURVEY AND INVESTIGATORY STUDIES

Direct count: Line transects, Point counts. Mark-recapture. Indirect count: pellet count, calls, sent mark, camera trap, radio telemetry, remote sensing. Behavioral sampling
Total species list, total genera or families list, parallel-line searches, encounter rates, documenting rarities, sample collection of dead (plants, fungi, invertebrates, fishes, amphibians reptiles, birds and mammals), labeling and preservation.

UNIT – IV **9 Hours**

WILDLIFE CONSERVATION

Wild life legislation: IBWL, Wild life protection Act,1972.wild life conservation strategies:IUCN classification, protected area network. In situ conservation-wild life sanctuaries, national parks, bioreserves and their management, Ex situ conservation-captive breeding, modern zoo, safari, zoo authority of India ,Artificial insemination ,cryopreservation and germplasm banks

UNIT – V WILDLIFE PROJECT **9 Hours**

A. Tiger project- Tiger species, distribution, threats, conservation action taken,
B. Elephant project: Elephants species, distribution, threats, conservation action taken.
C. Crocodile Project-crocodile species, distribution, threats, conservation action taken.
D. Vulture crisis in India, Wildlife Laws.

TEXT BOOKS:

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Sutherland W.J	The conservation hand book:research, management and policy	Blackwell Science Ltd	2000
2.	William Morris, Daniel Doak, Martha Groom et al.	A Practical handbook for Population Viability Analysis	The Nature Conservancy	1999
3.	Rodgers, W.A. and H.S. Panwar .	Planning a Protected Area Network in India	Wildlife Institute of India, Dehra Dun	1988

4.	Anon.	Convention on Biological Diversity - Text and annexes	World Wide Fund for Nature - India.	1992
5.	Giles, H	Wildlife Management Techniques	Natraj Publishers, Dehra Dun	1984

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Martin and Bateson	Measuring Behaviour	Cambridge University Press	2007
2.	Andrawartha, H.C. and L.C. Birch.	The distribution and abundance of animal.	The University of Chicago press, London	1974
3.	Agarwal, V.P.	Forests in India	Oxford and IBH Publishing Co. New Delhi	1980
4.	Davis, M.	Infectious diseases of wild mammals.	The IOWA state	1981
5.	Saharia, V.B.	Wild life in India	Nataraj Publishers, Dehra Dun.	1982
6.	Gopal, R.	Fundamentals of Wildlife Management.	Justice Home. Allahabad.	1992

WEB SOURCES:

www.wildlifebiology.org
www.environmentalscience.org
www.ncbs.res.in
www.nature.com

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MUSHROOM CULTURE

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
III	POCZO3SS	Self study paper	-	-	-	-	Nil	2(extra)

COURSE OBJECTIVES

- The course will provide an adequate hand on experience for the students towards an independent handling and culture capability of all edible mushrooms.
- Subject content is so designed and hence the students can avail to become an entrepreneur herself**.**

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To understand the identification of mushrooms and lifecycle of mushrooms.	K2
CO2	To learn about the history of mushroom cultivation and harvesting methods.	K1
CO3	To Update the knowledge on various Spawn production methods.	K4
CO4	To acquire knowledge on the methods of mushroom cultivation .	K4
CO5	To get employment opportunities in the harvesting and marketing of mushroom.	K2

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOMES

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	M	S
CO2	M	S	M	S	M
CO3	S	M	S	M	S
CO4	M	S	M	S	S
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I

Life cycle of Mushrooms - Identification - edible and poisonous Mushrooms - external factors for growth. Economic importance of Mushrooms as food

UNIT-II

History of mushroom cultivation -- selection - 'starter' - preparation of spawn - preparation of Compost (outdoor and indoor beds) - incubation - Harvesting and marketing

UNIT-III

Spawn production - grain, powder and granular spawn - mother spawn - planting spawn - preparation of culture (Tissue culture and spore culture), preservation and storage of culture - various media (PDA, malt extract, Wheat extract, compost extract)

UNIT-IV

Cultivation of white Button Mushrooms (Agaricus bisporus) and Oyster Mushrooms (Pleurotus spp) – materials – sterilization – spawning and fruiting – house design for pleurotus – preservation, canning drying, Cultivation of paddy straw Mushrooms – Preparation, Spawn making – Methods of Cultivation.

UNIT-V

Mushroom technology – nutritive value of edible Mushrooms- Medicinal value of Mushrooms, Advantages of Mushrooms Cultivation – Harvesting & Marketing.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Dr. Teagan Beahan Sr.	Hand book of mushroom cultivation	TNAU Publications	1999
2.	Nita Bahl	Hand book on mushroom 4 th edn	Vijay primlani for Oxford &IBH Publishing Co.Pvt .Ltd.,Newdelhi	2002
3.	Kannaiyan.S and Ramasamy.K	A Handbook of Edible Mushroom	Printers and Publishers, New Delhi	1980

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Pathak V.N, Nagendra Yadav and Maneesha Gaur	Mushroom Production and Processing Technology	Agrobios (India) Jodhpur	1998
2.	Chang T.S. and Hayes W.A.	The biology and cultivation of edible mushrooms	Academic Press,Newyork	1978

3.	M.C.Nair,C.Gokulapalan and Luludas	Mushroom cultivation	Scientific Publishers,Jodpur,India	1997
4.	Ignacimuthu.S	Applied plant Biotechnology	Oxford &IBH Publishing Co.Pvt.Ltd, New Delhi	1997

WEB SOURCES:

www.livescience.com

www.sciencemag.com

www.treehugger.com

www.nature.com

TEACHING METHODOLOGY

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RESEARCH METHODOLOGY AND BIOSTATISTICS

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
IV	21CPZO4A	Core-X	6	90	5	90	Nil	5

COURSE OBJECTIVES

- To acquire the knowledge of the Chromatography, spectroscopy
- To understand the Preparation of manuscripts and collection of data.
- To imbibe the knowledge and analysis of statistical data **.**

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	The main objectives of this paper is to understand the state of art of the instruments.	K2
CO2	To understand the introduce in principles and methods of various instruments used in biology	K2
CO3	It also helps to acquire knowledge on the preparation of research manuscripts etc	K4
CO4	To imbibe the knowledge and analysis of biological data.	K4
CO5	To apply and analyze the test of significance.	K3 & K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOME:

COS	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	S
CO2	M	M	S	S	M
CO3	S	S	M	M	S
CO4	M	S	M	S	M
CO5	S	M	S	M	S

S-Strong; M-Medium; L- Low

DISTRIBUTION OF MARKS: THEORY 55% AND PROBLEM 45%

UNIT-I CONCEPTS OF RESEARCH **18 Hours**

Meaning, Objectives, Motivation and Approaches, Types of Research (Descriptive / Analytical, Applied / Fundamental, Quantitative / Qualitative, Conceptual / Empirical, Research Methodology). Research methods Vs Research Methodology.

Research Design- Definition-Characteristics and Types of research design.

UNIT-II RESEARCH FORMULATION **18 Hours**

Observation and Facts, Prediction and explanation, Induction, Deduction. Defining and formulating the research problem, Selecting the problem and necessity of defining the problem.

Literature review - Importance of literature reviewing in defining a problem, Critical literature review, Identifying gap areas from literature review, Hypothesis - Null and alternate hypothesis and testing of hypothesis.

UNIT-III RESEARCH REPORTS AND IPR **18 Hours**

Effective technical writing of a report, research paper and review paper. Preparation of a Research Proposal, Format of research proposal, a presentation and assessment by a review committee. Academic Writing Tools and Research Software.

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

UNIT-IV BASICS OF BIOSTASTICS **18 Hours**

Introduction to Statistics – Data Collection: Sources of Data – Primary Data – Secondary Data - Procedure Questionnaire – Sampling Methods – Merits and Demerits – Experiments – Observation Method – Sampling Errors - Type-I Error & Type-II Error.

UNIT-V STASTICAL ANALYSIS **18 Hours**

Probability Theories – Conditional Probability, Poisson Distribution, Binomial Distribution and Properties of Normal Distributions – Hypothesis Testing –Sampling Distribution-Level of Significance. Correlation—Types of Correlation- Standard Deviation – Co-Efficient of Variations -Chi-Square Test-. Introduction to SPSS.

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Bailey, N.T. J	Statistical Method in Biology	The English Language book society and English University Press Ltd	1959
2.	Ipsen, J. and Feigl, ,P	Bancroft's Introduction to Biostatistics	Harper and RowPublishers, New York, London.	1970
3.	Snedecor, G. W. & William, G.	Statistical methods	Harvard University, Oxford & IBH Publication Co., Calcutta. Bombay, New Delhi	1975
4.	Sokal, R, and James, F.R.	Introduction to Bio-statistics	W.H. Freeman & Company, Toppan company, Ltd., Tokyo, Japan.	1973
5.	Anderson, Durston and Polle.	Thesis and Assignment writing	Wiley Eastern Ltd., New Delhi.	1970
6.	Comir and Peter Wood Ford	Writing scientific papers in English	Pitman Medical Publishing Co., London.	1979
7.	Palanichamy, S. and M. Shanmugavelu	Research methods in biological sciences	Palani Paramount Publications, Tamil Nadu, India.	1997

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Deepak Chawla , Neena Sondhi	Concepts and Cares	2nd Edition Vikas Publications	2017
2.	Dr. Vijay & Shende Arvind	Research Methodology	S. Chand Publications	2010
3.	Pranab Kumar Banerjee	A Textbook Of Biometry	S.Chand Publication	2007

4.	Orlando Wayne	A Step By Step Approach To Biostatics	Kindle Editions Publications	2017
5.	Day, R.A	How to write and publish a scientific paper	Cambridge University Press, London.	1994

WEB SOURCES:

www.sciencemag.com

www.treehugger.com

www.nature.com

TEXT BOOKS

- Home test
- PPT Presentations
- Demonstration from the Video slides, videos and interactive software.

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ELECTIVE PAPER-IV

ENTOMOLOGY

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
IV	21CPZO4B	Elective-IV	3	45	3	45	Nil	3

COURSE OBJECTIVES

- To catch up with the tremendous strides of expansion of knowledge in Entomology
- To comprehend the classification of insects, economic importance of Entomology with special reference to beneficial insects.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To comprehend knowledge on the classification of insects.	K1&K2
CO2	To understand about the biology of beneficial insects like honey bees and silkworm	K2
CO3	To imbibe and analyse the knowledge of insect pests like paddy ,sugarcane and beverages.	K4
CO4	To understand about the principles and methods of pest management	K2
CO5	To apply and analyse the knowledge of vector borne diseases.	K3&K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOME

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	M
CO2	M	S	S	M	S
CO3	S	M	S	M	S
CO4	M	S	M	S	S
CO5	S	M	S	M	S

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I **9 Hours**

SCOPE OF ENTOMOLOGY

Introduction and Scope of insects- characteristics of class insecta –Morphology and Classification of insects up to order with examples (Apterygota and Pterygota)- Economic importance of insects.

UNIT-II **9 Hours**

BENEFICIAL INSECTS

Api culture:

Apis **:** Biology and social life of honey bees . Management of honey hives–Nutritive and medicinal value of honey bee. Honey bee as Pollinators.

Sericulture:

Bombyx mori**:** Biology of silkworm- different species of silkworm. Economic importance and byproducts

Lac culture:

Lac insects **: (Kerriidae)** Biology and their importance of Lac insects

Butterflies as pollinators

UNIT-III **9 Hours**

HARMFUL INSECTS

Insects as crop pests: (Rice,Pulses ,Sorghum, Sugarcane, Beverages-Tea & Coffee) Types of injuries and loss caused to plants in general. Factors governing the outbreak of pests. Stored grain pests

UNIT-IV **9 Hours**

INSECTS AS VECTORS

Vector borne diseases in man: Method of transmission of parasitic agents with special reference to mosquitoes (Aedes agypti ,Anapheles, Culex) and houseflies.

UNIT-V **9 Hours**

PEST-VECTOR CONTROL AND THEIR MANAGEMENT

Principles and methods of pest suppression- Natural Control-Climatic factors and Physical factors. Cultural, mechanical, physical, chemical, Biological and Artificial Control. Integrated pest management . Integrated Vector Management (IVM).

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	William S. Romoser and John G. Stoffolano.W.	The Science of Entomology	C.Brown Publishers, England	1994
2.	Yataro Tazima, Kodarsha	The silkworm	Scientific Book Ltd., Japan	1978
3.	Ananthakrishnan, T.N	Insect Plant Interactions	Oxford and I.B.H, New Delhi.	2002
4.	P.G.Fenemore, Alkaprakash	Applied Entomology	Wiley Eastern Ltd., Delhi	1992
5.	Nayar, K.K., Ananthakrishnan, T.N. and B.V.David	General and Applied Entomology	Tata McGraw Hill Publications, New Delhi.	1989
6.	Larry P.Pedigo	Entomology and Pest Management	Prentice Hall, New Jersey.	1989
7.	Richards, O.W. and Davies, R.G	General Text Book of Entomology Tenth Edition. Vol I and II	R.I Publications, New Delhi.	1997

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	T.V. Prasad	Hand Book Of Entamoly Third Edition	New Vishal Publication	2014
2.	D.S.Reddy	Applied Entamoly New Revised Edition	New Vishal Publication	2010
3.	David B.V., Muralirangan M.C. And Meera Murali Rangan	Harmful And Beneficial Insects.	Popular Book Depot, Chennai	1992
4.	Ramakrishna Ayyar T.V	Handbook Of Economic Entomology For South India.	Books And Periodicals Supply Service, New Delhi	1989
5.	Frost S.W	General Entomology	Narendra Publishing House, Delhi	1994

6.	Dennis S.Hill	Agricultural Insect Pests Of The Tropics And Their Control	Cambridge University Press, U.K.	1993
7.	Saxena. A.B	Harmful Insects	Anmol Publications, New Delhi.	1996
8.	Rathinaswamy, T.K.	Medical Entomology	S.Viswanathan And Co., Madras	1986
9.	Sundari, M.S.N. And Santhi, R.	Entomology	Mjp Publishers, Chennai.	2006

WEB SOURES:

www.sciencedaily.com

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www.treehugger.com

www.nature.com

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APICULTURE

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
IV		Elective-IV	3	45	3	45	Nil	3

COURSE OBJECTIVES

- To Understand the social life of honey bees and their behavior
- To apply knowledge on care and management of apiary
- To identify major bee keeping challenges and opportunities

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To remember the types of species and the steps involved in modern bee keeping techniques and its practical difficulties	K1
CO2	To Understand the medicinal values of honey and commercial products of apiary reveals the importance of apiculture	K2
CO3	To comprehend methodologies involved in bee keeping .	K3
CO4	To apply modern tools in bee keeping techniques and its by products .	K3
CO5	To motivate the students for their self employment opportunities	K3&K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOME

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	M
CO2	M	S	S	M	S
CO3	S	S	M	M	M
CO4	M	S	M	S	S
CO5	S	M	S	M	M

S- Strong; M – Medium ; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT-I BASICS OF BEE KEEPING **9 Hours**

History of bee keeping: Definition, Bee keeping in world wide, In India. Traditional bee keeping, Modern beekeeping, Urban or backyard beekeeping. Introduction to honey bee; Origin, systematics and distribution; Types of honey bees, Species of honey bees. Bee identification. Types of beehives - structure - location, care and management.

UNIT- II **9 Hours**

SOCIAL ORGANISATION AND COMMUNICATION OF HONEY BEES

Colony life and social organization – Queen, drone, worker. Annual biological cycle of the bee colony. Communication in honey bees: Bee learning and communication – Learning - Color learning in honeybees, Color discrimination, Color learning rates and preferences, Color memory, Timing in color learning, Neurobiology of color vision; Communication - Odor plume, Trophallaxis,

UNIT-III BEE PASTURAGE AND POLLINATION **9 Hours**

Definition, types of bee pasturage – single year productive, multi year productive, permanent productive. Installing a bee pasture. Pollination by bees – pollinator. Pollinator conservation methods: Pollinators definition, Types of pollinators, Pollinators at Risks, Threats to Pollinators, Actions to Help Pollinators, Conservation methods.

UNIT- IV BEE ENEMIES AND DISEASES **9 Hours**

Bee enemies – Wax Moth, Ants, Wasps, Mites, Microorganisms, Pests. Diagnosis and Identification. Bacterial, viral, fungal & protozoan diseases: Bacterial disease - American Foulbrood, European Foulbrood, Viral disease - Deformed Wing Virus, Sacbrood Viru, Black Queen Cell Virus, Kashmir Bee Virus, Acute Bee Paralysis Virus; Fungal disease - Chalkbrood, Stonebrood; Protozoan disease - Nosemosis, Nosema cerana

UNIT-V VALUES AND FINANCIAL ASSISTANCE FOR BEE KEEPING **9 Hours**

Bee products – An introduction, honey, pollen, royal jelly, bees wax, propolis & venom, Significance of bee products. Value added honey products. Properties of honey products, Nutrients and composition of honey, Acid content and flavor effects. Types of value added honey products. Preparing for bee keeping project-Steps involved in starting a beekeeping project, Funding sources for beekeeping projects. Funds mobilization from state and national banks. Grant Resource and utilization**.**

TEXT BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Singh, Sardar	Beekeeping in India.	ICAR, New Delhi.	1962
2.	Cherian R, & K.R. Ramanathan	Bee keeping in India.	ICAR, New Delhi.	1992
3.	Mishra, R.C.	Honey bees and their Management	ICAR, New Delhi.	1985
5.	David W.	Bee Keeping- A Novices' Guide	Ashford Colour Press ltd., United Kingdom	2010
6.	Devanesan, S.and Jacob,A	Thai sacbrood virus disease of Asian honeybee Apis cerana indica Fab., in Kerala, India. Proc. 37th	International Apiculture Congress, Durban, South Africa.	2001

REFERENCE BOOKS

S.NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Roger, A. Morse	The ABC and XYZ of Bee culture, 40th edition,	A.I.Root & Co., Medina, Ohio	1990
2.	Cramp, D.	The Practical Manual of Beekeeping.	Spring-hill House, Oxford, United Kingdom.	2008
3.	Capinera, J.L.	Encyclopedia of Entomology. Second Edition, Vol. 4.	Springer Science and Business Media B.V.	2008
4.	Bhat, P.R., and Kolatkar, M.	Performance and Problems of the Beekeeping Industry in Karnataka.	Indian Institute of Science, Bangalore.	2011
5.	Engle, M.S.	The honeybees of India (Hymenoptera: Apidae),	Journal of Bombay Natural History Society 99 (1): 3-7.	2002
6.	Danaraddi, C.S., Viraktamath, S., Basavanagoud, K., and Bhat, R.S..	Nesting habits and nest structure of stingless bee, Trigona iridipennis Smith at Dharwad, Karnataka.	Karnataka J. Agric. Sci. 22(2): 310-313.	2009

WEB SOURES

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SERICULTURE

Semester	Subject Code	Category	Lecture		Theory		Practical	Credits
			Hrs/ week	Total Hours/ Semester	Hrs/ week	Total Hours/ Semester		
IV		Elective IV	3	45	3	45	Nil	3

COURSE OBJECTIVES:

*To know the Biology of silkworm, their economic importance and methods in sericulture.

* To develop sericulture is a need-based curriculum.

COURSE OUTCOMES:

On the successful completion of the course, students will be able to:

CO Number	CO Statement	Knowledge Level (K1-K4)
CO1	To Understand the concept and structure of silkworm	K2
CO2	To gain knowledge about the types of mulberry	K3
CO3	To understand about the development, reproduction and genetical methods	K2
CO4	To apply modern control techniques about viral, fungal and bacterial diseases of mulberry.	K3
CO5	To motivate the students for their self employment opportunities and hatching and marketing methods	K3&K4

Knowledge Level : K1-Remember ; K2 –Understand ; K3 – Apply ; K4 – Analyze

MAPPING WITH PROGRAMME OUTCOME:

COS	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	S	M
CO2	M	S	M	S	S
CO3	S	M	S	M	M
CO4	M	S	M	S	S
CO5	S	M	S	M	M

S- Strong; M – Medium; L- Low

DISTRIBUTION OF MARKS: THEORY 100%

UNIT -I **9 Hours**

BIOLOGYOF SILKWORM

Introduction of sericulture -as cottage industry-Prospects and status - Silk producing species - their distribution - Bombyx mori - life cycle - organization of larvae, pupae and moth - structure of the silk gland. Economic importance

UNIT-II **9 Hours**

MORICULTURE

Mulberry - varieties - distribution - methods of cultivation and preparation - Harvest - Transport and preservation of leaves. Feeding and nutrition - specificity of diet - Factors of nutrition - Diet and growth. Pest and diseases of mulberry.

UNIT-III **9 Hours**

GROWTH AND DEVELOPMENT OF SILKWORM

Growth and Development of silkworms -Morphology of male female moths-Incubation - Hatching - brooding -silkworm seed production, embryonic growth, Hibernation of eggs,- Physiology of molting in different varieties (Uni, bi and multivoltine)

UNIT-IV **9 Hours**

DISEASES OF SILKWORMS

Pathology - Viral, bacterial, fungal and protozoan diseases -Pebrine, Flacherie, Grasserie, Muscardine-causative agents, symptoms and control measures. Pest-Uzi fly. Beetles and other animals and their control menace.

UNIT-V **9 Hours**

SILKWORM REARING AND SILK REELING

Principles of Rearing-Rearing house, Rearing equipments, Rearing operations -Maintenance of environmental conditions for rearing, -Brushing Care at Moulting, Mounting and Harvesting of coccons. Reeling techniques - lacing spinning. Re-reeling.

TEXT BOOKS

S. NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Ganga, G. and Sulochana Chetty	An Introduction to Sericulture	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi	1997
2.	Hisao Aruga	Principles of Sericulture	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi	1994
4.	Mahadevappa,D., Halliyal, V.G., Shankar, D.G. and Bhandiwad, R.	Mulberry Silk Reeling Technology	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	2000

REFERENCE BOOKS

S. NO	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Eikichi Hiratsuka.	Silkworm Breeding	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	1999
2.	Ganga, G.	Comprehensive Sericulture Vol-II: Silkworm Rearing and Silk Reeling.	Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	2003
3.	Soo-Ho Lim, Young-Taek Kim, Sang-Poong Lee.	Sericulture Training Manual	Published by FAO - USA. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.	1990
4.	Wu Pang-Chuan and Chen Da-Chuang.	Silkworm Rearing	Published by FAO - USA. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi	1994

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PRACTICAL -IV
ANIMAL PHYSIOLOGY AND IMMUNOLOGY

Semester	Subject Code	Category	Practical		Theory	Practical	Credits
			Hrs/ week	Total Hours/ Semester			
IV	21CPZO41	Core Practical-IV	4	60	Nil	60	4

COURSE OBJECTIVES:

- The Students learns the skills of performing experiments and analyzing the results .
- To understand and analyse the principle and application of instruments.
- To analyse the estimation of haemoglobin and ESR.
- To Understand ,apply and evaluate the concepts of immunological techniques

ANIMAL PHYSIOLOGY **45 Hours**

1. Estimation of RQ in Fish with reference to Light and temperature.
2. Salt loss and salt gain in fish
3. Estimation of Proteins, Carbohydrates and Lipids in the tissues of Fish
4. Estimation of Blood Urea and Cholesterol.
5. Blood Clotting Time, Bleeding Time, Rouleaux Formation, Preparation of Haemin Crystal.
6. Principle and Application of Sphygmomanometer, Kymograph, Electrophoresis, Haemoglobinometer, ESR.
7. Estimation of Haemoglobin and ESR.

IMMUNOLOGY **15 Hours**

1. Haemagglutination - Quantitative analysis - haemagglutination titration-Rh factor
2. Preparation of Antigen - RBC - Demonstration.
3. Ouchterlony technique - Demonstration. (Ouchterlony double diffusion).
4. Immunoelectrophoresis - Demonstration.
5. Study and Identification of Slides showing Primary and Secondary lymphoid organs.

SYLLABUS DESIGNERS

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Dr.V.Kiruthiga, Assistant Professor
Dr V.Rekha, Assistant Professor
DrA.Vinodhini, Assistant Professor
Dr.G.Vidhya, Assistant Professor
Dr. S. Vijayakumari, Assistant Professor

PRACTICAL –V
DEVELOPMENTAL BIOLOGY AND MICROBIOLOGY

Semester	Subject Code	Category	Practical		Theory	Practical	Credits
			Hrs/ week	Total Hours/ Semester			
IV	21CPZO42	Core Practical-V	4	60	Nil	60	4

COURSE OBJECTIVES:

- To understand the developmental stages of frog.
- To analyse the C.S of heart ,kidney lens ,limb of chick and uterine cycles in rat.
- To observe and identification of microorganisms in pond water.
- To understand the bacterial staining methods and identification of parasitic protozoans.
- To analyse the preparation techniques of culture medium for bacterial growth.

DEVELOPMENTAL BIOLOGY **15 Hours**

1. Different stages in development - frog (egg, cleavage, Blastula, Yolk plug stage 24,48,72 and 96 hr)
2. Slide showing C.S.of heart, kidney lens and limb of chick.
3. Slides showing the uterine cycles in a mammal (Rat).
4. Observation of regeneration potential in tadpole.

MICROBIOLOGY **45 Hours**

1. Microscopic observation and identification of microorganisms in pond water.
2. Types of bacteriophage bacteria , fungi and algae from the prepared slides/photographs from the book.
3. Collection and Identification of fungus-Bread mould Coconut mould.
4. Identification of parasitic protozoans (e.g. Plasmodium, Entamoeba, Trypanosoma, Leishmania donovani)
5. Identification of bacteria –staining methods –Gram positive and Gram negative bacteria
6. Demonstration of

a. Isolotion of single colonies streak plate and serial dilution.
b. Enumeration of microorganisms spread plate and pour plate methods.
c. Preparation techniques of culture medium for bacterial growth.

SYLLABUS DESIGNERS.

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PRACTICAL –VI
RESEARCH METHODOLOGY, BIOSTATISTICS AND ENTOMOLOGY

Semester	Subject Code	Category	Practical		Theory	Practical	Credits
			Hrs/ week	Total Hours/ Semester			
IV	21CPZO43	Core Practical-VI	4	60	Nil	60	4

OBJECTIVES:

- To understand and observed the principle and application of the instruments.
- To understand the principles and methods of various instruments used in biology.
- It helps to acquire knowledge on the Computer aided techniques for data analysis (SPSS)
- To imbibe the knowledge and analysis of biological data.
- To comprehend the morphology of insects, morphology of silworm, digestive system , nervous system , mounting of silk glands and study of silkworm pathology.
- It helps to acquire knowledge on the Preparation of Insect Box.

RESEARCH METHODOLOGY AND BIOSTATISTICS **20 Hours**

1. Spectrophotometric estimation of any biological constituent.
2. Electrophoresis - Paper / Agarose gel / PAGE
3. Computer aided techniques for data analysis (SPSS)
4. Problems relating to test of significance (Chi - square test and t - test)
5. Problems relating to correlation, regression and ANOVA.

ENTOMOLOGY **40 Hours**

1. Study of morphology of an insect (local insects to be used)
2. Study of external morphology of silkworm moth, larvae and pupae.
3. Dissections of digestive and nervous systems in Bombyxmori larvae.
4. Mounting of Silk glands of Silkworm.
5. Study of silkworm pathology: viral - bacterial - fungal diseases (Field visit - Slides/Specimens /Xerox)
6. a. Field study to collect insect species
   b. Identification of at least 10 insects belonging to different orders.
7. a. Field study for various methods of pest management.
   b. Field visit to ware houses and Plant protection centers.
8. Insect Box Preparation.

SYLLABUS DESIGNERS

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