Sadakathullah Appa College

(Autonomous)

(Reaccredited by NAAC at an 'A' Grade and ISO 9001:2015 Certified Institution)

Rahmath Nagar, Tirunelveli – 627 011, Tamil Nadu.

PG DEPARTMENT OF ZOOLOGY

CBCS SYLLABUS

For

M.Sc. Zoology

(Applicable for students admitted in June 2019 and onwards)
(As per the Resolutions of the Academic Council Meetings held on 03-03-2018, 17-10-2018 and 02-03-2019).

CONTENTS

POST GRADUATE DEPARTMENT OF ZOOLOGY
CBCS SYLLABUS M.Sc. ZOOLOGY (2018 - 2021)
COURSE STRUCTURE (CBCS)
(Applicable for students admitted in June 2019 and onwards)

I SEMESTER			**II SEMESTER**		
COURSE	**H/W**	**C**	**COURSE**	**H/W**	**C**
DSC 1	6	4	DSC 4	5	4
DSC 2	6	4	DSC 5	5	4
DSC 3	6	4	DSC 6	5	4
DSE 1	4	4	DSE 2	4	4
P-I	4	2	P-III	4	2
P-II	4	2	P-IV	4	2
			IDC-I	3	3
TOTAL	**30**	**20**	**TOTAL**	**30**	**23**
III SEMESTER			**IV SEMESTER**		
DSC 7	5	4	DSC 10	5	4
DSC 8	5	4	DSC 11	5	4
DSC 9	5	4	DSC 12- Project	8	8
DSE 3	4	4	DSE 4	4	4
P-V	4	2	P-VII	4	2
P-VI	4	2	P-VIII	4	2
IDC 2	3	3			
TOTAL	**30**	**23**	**TOTAL**	**30**	**24**
I – IV SEMESTER					
MOOC*		2#			

DISTRIBUTION OF HOURS, CREDITS, NO. OF PAPERS, & MARKS				
SUBJECT	**HOURS**	**CREDITS**	**NO. OF PAPERS**	**MARKS**
DSC THEORY + PROJECT	66	52	12	1200
DSC PRACTICALS	32	16	8	400
DSE	16	16	4	400
IDC	6	6	2	200
MOOC*		2#	1	
TOTAL	**120**	**90+2#**	**27**	**2200**

COURSE STRUCTURE
POST GRADUATE AND RESEARCH DEPARTMENT OF ZOOLOGY
CBCS Syllabus – M.Sc., Zoology (2019-2020 onwards)

Sem	P	Title of the Paper	S. Code	H/W	C	Marks		
						I	E	T
I	DSC 1	Systematics and Animal Diversity	18PCZO11	6	4	25	75	100
	DSC 2	Developmental Zoology	18PCZO12	6	4	25	75	100
	DSC 3	Biochemistry	18PCZO13	6	4	25	75	100
	DSE-1	A) Ecology	18PEZO1A	4	4	25	75	100
		B) Vermiculture	18PEZO1B					
	P- I	Core Zoology Practicals-I	18PCZO1P1	4	2	40	60	100/2
	P –II	Core Zoology Practicals-II	18PCZO1P2	4	2	40	60	100/2
II	DSC 4	Cell and Molecular biology	18PCZO21	5	4	25	75	100
	DSC 5	Animal Physiology	18PCZO22	5	4	25	75	100
	DSC 6	Genetics and Evolution	18PCZO23	5	4	25	75	100
	DSE-2	A) Nano-biotechnology	18PEZO2A	4	4	25	75	100
		B) Wildlife Management	18PEZO2B					
	P-III	Core Zoology Practicals-III	18PCZO2P1	4	2	40	60	100/2
	P-IV	Core Zoology Practicals-IV	18PCZO2P2	4	2	40	60	100/2
	IDC-1	Mushroom culture	18PIZO21	3	3	25	75	100
III	DSC 7	Immunology	18PCZO31	5	4	25	75	100
	DSC 8	Biostatistics and Bioinformatics	18PCZO32	5	4	25	75	100
	DSC 9	Animal Biotechnology	18PCZO33	5	4	25	75	100
	DSE-3	A) Sericulture	18PEZO3A	4	4	25	75	100
		B) Apiculture	18PEZO3B					
	P-V	Core Zoology Practicals-V	18PCZO3P1	4	2	40	60	100/2
	P-VI	Core Zoology Practicals-VI	18PCZO3P2	4	2	40	60	100/2
	IDC-2	Poultry and dairy science	18PIZO31	3	3	25	75	100
IV	DSC 10	Microbiology	18PCZO41	5	4	25	75	100
	DSC 11	Aquaculture	18PCZO42	5	4	25	75	100
	DSC 12	Project	18PCZO43	8	8			100
	DSE-4	A) Entomology	18PEZO4A	4	4	25	75	100
		B) Poultry Sciences	18PEZO4B					
	P-VII	Core Zoology Practicals-VII	18PCZO4P1	4	2	40	60	100/2
	P-VIII	Core Zoology Practicals-VIII	18PCZO4P2	4	2	40	60	100/2
I-IV		Massive Open Online Course *		-	2#			
			Total	**120**	**90+2#**			**2200**

* As per the guidelines of the UGC all the UG and the PG students shall enroll for one Massive Open Online Course offered through SWAYAM, NPTEL, etc.
# Two extra credits will be given on completion of the course.

I SEMESTER			
DSC 1	**SYSTEMATICS AND ANIMAL DIVERSITY**		**18PCZO11**
Hrs/ Week: 6	**Hrs / Sem : 90**	**Hrs/ Unit : 18**	**Credits :4**

- **Objectives:** To realize the biodiversity potential of our country and to understand the principle and methods of nomenclature and Systematics.

UNITI I: INTRODUCTION TO ANIMAL TAXONOMY

Importance of taxonomy, stages in taxonomy, Morphological, embryological, cytological, biochemical and Differential systematics.

UNIT II: NOMENCLATURE AND TAXONOMIC TOOLS

Classification, components and types of classification, Linnaean hierarchy. Species concepts, Kinds of species, Origin of code, ICZN, Zoological records. Collection methods, preservation of data, curating, storing and cataloging, methods of identification, description of taxonomic characters, taxonomic keys, taxonomic publication.

UNIT III: ECOSYSTEM DIVERSITY

Concepts on Biodiversity, Ecosystem of India, Species and genetic diversity. Wildlife Protection Act- 1972, Zoos, Sanctuaries, National Parks, Biosphere reserve sand protected areas in India. Extinct, critical, endangered and vulnerable fauna of India, Biotechnological tools for conservation of biodiversity.

UNIT IV: DIVERSITY OF TERRESTRIAL AND FRESHWATER ECOSYSTEMS

Wetlands, reserve forests, rain forests and desert plains in India and their faunal resources, animals of lotic and lentic ecosystems, Threats to wetlands and conservation. Rivers of India and their faunal diversity.

UNIT V: DIVERSITY OF MARINE AND MANGROVE ECOSYSTEMS

Coastal, coral reef, mangrove, sea grass and seaweed ecosystems and their faunal resources. Threats to marine biodiversity. Animals of lagoons and estuaries. Pelagic and benthic animal of the sea. Marine productivity.

TEXTBOOKS

1. Mayr.E& Ashlock, P.D., 1991, Principles of Systematic Zoology. (Mc Graw Hill International Edition) 475 pages.
2. Larry S.Roberts, Cleve land P., Hickman, David J.Eisenhour, Allan L and Susan L. Keen. 2014. Animal Diversity. Dewey Edition. Mc Graw Hill Education 2014.

REFERENCE BOOKS

1. Agarwal and MU. Gupta,2004.Animal Taxonomy, S.Chand, NewDelhi.86pp.
2. John Milton MC, 2008. (Ed) Training Manualon GIS and Marine Biodiversity, 320pp.
3. KapoorV.C.1998.Theory and practice of animal taxonomy, Oxford .and IBH, NewDelhi, 247pp;
4. Negi, S.S.1996. Biosphere Reserves in India: Landuse, Biodiversity and Conservation. Indus, NewDelhi.
5. Singh B.K, 2004. Biodiversity:Conservation and Management, Mangal Deep Publication, 586 pp.
6. Sivramiah Shantharam and Jane F.Montgomery, 1999. Biotechnology, Biosafety and Biodiversity, Oxford IBH, 237pp.
7. Swaminathan, M.S and S.Jana.1992., Biodiversity Mac Millian, Chennai, 326pp.
8. Traffic India,1990. The Wildlife protection Act,1972,154 pp.

I SEMESTER			
DSC 2	**DEVELOPMENTAL ZOOLOGY**		**18PCZO12**
Hrs/ Week: 6	**Hrs / Sem : 90**	**Hrs/ Unit : 18**	**Credits :4**

Objectives: To acquire knowledge on spermatogenesis, Oogenesis, cleavage and cleavage patterns, gastrulation, organogenesis, types of placenta and regeneration.

UNIT - I GAMETOGENESIS AND FERTILIZATION

Gametogenesis: Spermatogenesis - Oogenesis Structure and types of sperms and eggs, egg membranes; Organization and polarity of eggs. **Fertilization**: Mechanism of fertilization. Significance of fertilization. Parthenogenesis.

Genes in development

Gene expression and regulations- Chromatin and DNA methylation- signal transduction- nuclear transplantation- Cellular differentiation – differential action- developmental genetic defects- Role of cell death in development- Terattogenesis.

UNIT - IIPARTHENOGENESIS, CLEAVAGE AND FATE MAPS

Cleavage: Types of animal eggs; patterns of yolk on cleavage; cleavage rules; germ layers; cell lineage. Cleavage in *Amphioxus*, frog, chick and man. **Fate maps:** Fate maps of frog, chick and man.

UNIT - III GASTRULATION, ORGANOGENESIS

Gastrulation: Morphogenetic movements; Gastrulation in *Amphioxus*, frog, chick and man. **Organogenesis**: Development of brain and heart in Chick.

Caenorhabditis elegans: life cycle, cell lineage, cell- cell interactions and polarity; *hox* gene; genetic control and micro RNAs. Ascidian- mosaic development; cytoplasmic factors, mesenchyme and notochord development.

UNIT - IV

Extra embryonic membrane and placentation: Development, types and physiology of Extra Embryonic Membrane**. Placenta**: Types and physiology. Post embryonic development in Amphibian (metamorphosis). **Organizer**: Concept; inductive tissue interactions.

UNIT- VAPPLICATION OF MODERN TECHNIQUES

Induced ovulation in humans- multiple ovulation and embryo transfer in cattle- embryo splitting – invitro fertilization – IVF in human cryopreservation- prenatal diagnosis, human cloning and its ethical implications, embryo transfer. Metamorphosis, regeneration in planaria and amphibians, Aging and developmental potential.

TEXTBOOKS

1. Scott F.Gilbertans Susan R. Singer 2011 Developmental Biology Vol. 1 Inc. Publishers 2006. The University of Michigan.
2. Subramanian, M.A. 2011. Developmental Biology Oscar Publications, India.

REFERENCE BOOKS:

1. Arora, M.P., Embryology, Himalaya Publishing House, Ramdrot, Dr. Balerao Mass, Gurgaon - Mumbai.
2. Balinsky, B.I.,1981 Introduction to Embryology, W.B. Saunders.
3. Beril, N.J., Developmental Biology, TATA McGraw Hill Publishing Company Limited.
4. Verma, P.S. and Agarwal, V.K.,2014. Chordate embryology, S Chand and Company Limited, New Delhi.
5. Subramoniam, T., 2013. Molecular Developmental Biology, Narosa Publishing House Private Limited, Chennai.

I SEMESTER			
DSC3	**BIOCHEMISTRY**		**18PCZO13**
Hrs/Week: 6	**Hrs / Sem : 90**	**Hrs/ Unit : 18**	**Credits :4**

Objectives: To acquire knowledge on the structural integrity of the substrate, functioning of enzyme systems, different metabolic process and the thermodynamic laws governing them.

UNIT I: INTRODUCTION

Structure of an atom and molecule. Chemical bonds. Covalent bonds – Characteristic geometrics, non-covalent bonds, properties of hydrogen bonds, Vander waals interaction, pH and acid base balance. Henderson – Hasselbech equation. Acidosis and Alkaloids. Chemical equilibrium and Biological fluids. Biochemical energetics.

UNIT II: CARBOHYDRATES

Structure, classification, properties and functions – metabolism – glycolysis, Kreb's Cycle, Glycogenesis, glycogenolysis and gluconeogenesis. HMP Shunt.

UNIT III: PROTEINS

Aminoacid – Structure, classification, properties and functions. Metabolism of individual aminoacids- tryptophan, phenylalanine and tyrosine. Metabolism of Purines and Pyrimidines. Protein – Hierarchical structure, properties (folding, modification, degradation), Classification and functions.

UNIT IV: LIPIDS

Lipid - structure, Classification, Properties and functions - Biosynthesis of fatty acids triglycerides and phospholipids. Metabolism – β oxidations, ketogenesis, Metabolism of Cholesterol.

UNIT V: ENZYMES, VITAMINS AND HORMONES

Enzymes – Nomenclature, Classification and functions. Enzyme Kinetics – Michael's menton equation. Coenzymes – Activators and inhibitors. Vitamins – Composition, structure and functions. Hormones – Classification

TEXTBOOKS

1. Amita Saxena. 2006, Textbook of Biochemistry Discovery Publishing House, New Delhi – 110002.
2. U.Satyanarayana, Biochemistry. 2017. Books & Allied (P) LTD-Kolkata. ISBN: 9788131248850

REFERENCE BOOKS:

1. A.Shanumugam, 2005. Fundamentals of biochemistry for Medical students. Navabharat Printers and Traders, Madras-86.
2. Stryer, L., W. H., 2005. Biochemistry. Freeman and Company, San Francisco.
3. Lehninger, A. L., 2006. Principles of biochemistry. CBS Publishers and Distributors, New Delhi-32.
4. Murray, R. K., Granner, D. K., Mayes, P. A. and Rodwell, V. W., 1996. Harper's biochemistry (24th edition). Prentice Hall of Japan, Inc., Tokyo.
5. West E. S., Todd, W. R., Mason, S. H. and Van Bruggen, J. T., 1974.Textbook of biochemistry (4th edition). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi-2.
6. P. W. Kuchel& G. B. Ralston, 2003. Schaum's outlines of biochemistry (2nd edition). Tata McGraw-Hill Edition.
7. S. C. Rastogi. 2003. Biochemistry (2nd edition). Tata McGraw-Hill Publishing Company Ltd.
8. Jeremy M. Berg and John L. Tymoczko, Lubert Stryer 2015, Biochemistry W. H. Freeman,7th edition.

I SEMESTER		
DSE 1A	**ECOLOGY**	**18PEZO1A**
Hrs/Week: 4	**Hrs / Sem :60 Hrs/ Unit : 12**	**Credits :4**

Objectives: To acquire knowledge on eco system, components, functions, resources and pollution management.

UNIT I ECOSYSTEM

Ecosystem: Concept – types - stability - food chain and food web – Ecological pyramids – energy flow in an ecosystem. Biochemical cycles: Carbon, nitrogen, oxygen, phosphorous and sulphur. **Productivity:** Primary productivity process – productivity of different ecosystems – measurement of primary productivity, Biogeography-major terrestrial biomass, island Biogeography, biogeographical zones of India. (r and k selection)

UNIT II POPULATION AND COMMUNITY ECOLOGY

Population: Attributes, characters- growth curves and regulation - life history strategies – competitive niche- concept. Biotic and abiotic interactions, community -nature, structure, attributes, edges and ecotones

UNIT III BIODIVERSITY AND CONSERVATION

Biodiversity: Genetic – species and ecosystem diversity, measurements - **Diversity indices:** Shannon-Weiner– Diversity an ecosystem processes. Hotspots – values and uses of diversity – loss of animal diversity – rare and Endangered species – red list –**Conservation practices:** Wildlife sanctuaries – National parks and biosphere reserves – tiger, major habitat types of the subcontinent.

UNIT IV RESOURCE MANAGEMENT

Resources: Natural resources – renewable and non-renewable resources. **Forest resources:** Renewable resources: Ecological and economic importance of forest – types and management –Nonrenewable resources. **Water resources:** Worldwide supply – renewable and distribution – Indian water resources – river water disputes. **Energy resources:** energy resources types: solar, wind, hydel, tidal energy and biomass.

UNIT V POLLUTION AND ENVIRONMENTAL AWARENESS

Pollution: Air, water, soil, noise, thermal pollution – sources, effects and control measures – Nuclear hazards. **Social issues and environment:** Urban environmental problems –solid waste management, Succession-types, mechanism, concept of climax. Species interaction-inter and intra specific interaction, symbiosis-herbivore, carnivore.

TEXTBOOKS

1. Martin R. Speight Marine Ecology: Concepts and Applications. 1st Edition, Library of Conglass Cataloguing in Publications. ISBN – 978-1-4051-2699.
2. Jeffery clarke : Ecology : Concepts, Methods and Applications.

REFERENCE BOOKS:

1. Agarwal, A. C., 1999, Environmental biology, Agro Botanica, Bikaner.
2. Anjaneyala, Y. B., 2004, Introduction to environmental science, S. P. B. S. Publications, Hyderabad.
3. Odum, E. P., 1983, Basic ecology, CBS College, Publishing, Saunders.
4. Saxsena, K. K., 2004, Environmental Sciences, University Book Hour (P) Ltd., Jaipur.
5. Trivedi, P. C., Sharma, K. C., 2003, Biodiversity conservation, Aavishkar Publishers, Jaipur.
6. Sven Erik Jørgensen, 2007, A New Ecology,1st Edition, Elsevier Science

I SEMESTER			
DSE1B	**VERMICULTURE**		**18PEZO1B**
Hrs / Week : 4	**Hrs /Sem :60**	**Hrs/ Unit : 12**	**Credits :4**

Objective: To impart training on Earthworm culture technology and to create knowledge on Self - Employment opportunity.

UNIT – I

Earthworms – Taxonomic position and diversity; types – morphological and ecological grouping – Epigeic species, Endogeic species and Anecics; Ecological roles and economic importance of earthworms – need for earthworm culture.

UNIT – II

Vermiculture – definition, scope and importance; common species for culture; Environmental requirements; culture methods – wormery – breeding techniques; indoor and outdoor cultures - monoculture and polyculture – relative merits and demerits; Windows Method-Process – advantages.

UNIT – III

Applications of vermiculture – Vermiculture Biotechnology, vermi-composting, use of vermicastings in organic farming/horticulture, earthworms for management of municipal/selected biomedical solid wastes; as feed/bait for capture/culture fisheries; forest regeneration.

UNIT – IV

Marketing the products of vermiculture – quality control, market research, marketing techniques – creating the demand by awareness and demonstration, advertisements, packaging and transport, direct marketing.

UNIT – V

Future perspectives – Predator / pathogen control in wormeries; Potentials and constraints for vermiculture in India.

TEXT BOOK

Hand book of Biofertilizers and Vermiculture Eri board.

REFERENCE BOOKS

1. 1.Sultan Ahmed Ismail, 2005. The Earthworm Book, Second Revised Edition. Other India Press, Goa, India..
2. Bhatt J.V. & S.R. Khambata (1959) “Role of Earthworms in Agriculture” Indian Council of Agricultural Research, New Delhi
3. Dash, M.C., B.K.Senapati, P.C. Mishra (1980) “ Verms and Vermicomposting” Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, Jyoti Vihar, Orissa.
4. Edwards, C.A. and J.R. Lofty (1977) “Biology of Earthworms” Chapman and Hall Ltd., London.
5. Lee, K.E. (1985) “Earthworms: Their ecology and Relationship with Soils and Land Use” Academic Press, Sydney.

I SEMESTER		
PI	**CORE ZOOLOGY PRACTICALS-I**	**18PCZO1P1**
Hrs/week :4	**Hrs / Sem :60**	**Credits :2**

SYSTEMATICS AND ANIMAL DIVERSITY AND DEVELOPMENTAL ZOOLOGY PRACTICALS

Systematics and Animal Diversity

1. Calculation of biodiversity indices using preserved specimens.
2. Diversity of planktons in freshwater.
3. Morphological features of prawn – penaeids and non-penaeids.
4. Visit to Zoo or wildlife sanctuary.

Developmental Zoology

5. Mounting and observation of various stages of onion root tip.
6. Mounting and observation of male or female gamete in fish
7. Temporary mounting and observation of chick embryos.
8. Observations on developmental stages of frog (fertilized eggs, stages of cleavage, blastula, gastrula, tadpoles).
9. Effect of growth hormones on amphibian metamorphosis (minigroup project).
10. Induced ovulation in fish (Demonstration only).

Developmental Biology

1. SPOTTERS: Frog a)T.S. of testis and Ovary, b) Fertilized Egg, c)Yolk Plug Stage, d) Neurula, e)Tadpole.
2. Chick embryo: a) Primitive streak, b)24 hours of chick embryo, c)36 hours of chick embryo d)48 hours of chick embryo, e)72 hours of chick embryo, f)96 hours of chick embryo.
3. Slides on cleavage: (Chick) 2 cell, 4 cell and 8 cell stages, blastula and gastrula.
4. Types of Placenta: a) discoidal. b) diffuse, c) cotyledonary placenta.
5. IVF Techniques in human-Chart.

I SEMESTER		
P-II	**CORE ZOOLOGY PRACTICALS-II**	**18PCZO1P2**
Hrs/week :4	**Hrs / Sem :60**	**Credits :2**

BIOCHEMISTRY & CELL AND MOLECULAR BIOLOGY PRACTICALS

Biochemistry Practical

1. Effect of Salivary amylase on substrate concentration.
2. Effect of Salivary amylase on enzyme concentration.
3. Chromatographic separation of amino acids.
4. Estimation of Carbohydrate.
5. Estimation of protein.

MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

Biochemistry

a) spectrophotometer
b) pH meter,
c) Paper Chromatography,
d) Centrifuge.

Model:

a) Atoms
b) Enzyme- Substrate, Food and nutrients-vitamin.

Cell and Molecular Biology

1. Study of giant chromosomes in chironomous larva.
2. Preparation of squamous epithelial cells (human).
3. Preparation of blood smear (fish, human)

MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

Cell and Molecular Biology

a) Oncogene
b) Apoptosis
c) Cancer cell cycle
d) Fine structure of Mitochondria
e) Types of DNA
f) Types of RNA.

II SEMESTER		
DSC 4 BIOLOGY	**CELL AND MOLECULAR**	**18PCZO21**
Hrs / Week :5	**Hrs / Sem : 75**	**Hrs/ Unit : 15**
Credit : 4		

Objectives: To understand the fundamental unit of life with specific insight into the organization of pro and eukaryotes.

UNIT I:INTRODUCTION

Eukaryotes and Prokaryotes – Structure and function. Structure and function of plasma membrane – models, membrane transport, structure and function of endoplasmic reticulum, lysosomes and Golgi bodies.

UNIT II: ORGANELLES

Structure and function of mitochondria. Ribosome – Membrane protein and Secretory protein – insertion in to Endoplasmic reticulum membrane. Post transitional modifications of proteins both in the RER and SER. Protein glycosylation in endoplasmic reticulum.

UNIT III: NUCLEIC ACIDS

Nucleic Acids – DNA – Structure and functions – DNA replication – unit of replication, enzymes involved, replication origin and replication fork. Plasmid replication (Transcription, translation, elongation and Termination).

RNA – Structure, types, RNA polymerase, RNA predating, edition and Transport.

UNIT IV: CANCER – CAUSES, DIAGNOSIS AND TREATMENT

Oncogenes and anti – Oncogenes, P53 gene, Cancer cell cycle, Interactions of cancer cells with normal cells, apoptosis, Genetic rearrangements in progenitor cell.

UNIT V: GENE EXPRESSION

Structure of chromatin and chromosomes, Heterochromatin, Euchromatin and Transposans. Regulatory mechanism in eukaryotes – Gene expression – Regulation at transcriptional and Translational levels. Control of regulatory mechanism of gene expression.

TEXTBOOKS

1. Rastogi, S.C. 2006 Cell and Molecular Biology 2nd Edition. New Age International Publishers, New Delhi.
2. Jonathan M.W. Slack 2006. Essential Developmental Biology. ISBN:1405122161/9781405122160

REFERENCE BOOKS:

1. Harvey Lodish, Arnold Berk, S Lawrence Zipursky, Paul Matsudaira, David Baltimore, and James Darnell. 2000, Molecular Cell Biology, 4th edition New York: W. H. Freeman; 2000.
2. B. Alberts, D. Bray, J. Lewis, M. Raff, K., Roberts and J. D. Watson. 1983. Molecular Biology of the Cell, Garland Publishing Inc., New York.
3. Gerald Karp, Janet Iwasa, Wallace Marshall. 2016, Cell and Molecular Biology. Concepts and Experiments, John Wiley and Sons, Inc., New York.
4. Schaum's Outlines of Molecular and Cell Biology, Tata McGraw-Hill Edition.
5. De Robertis, E. D. P. and De Robertis, E. M. F. 1980. Cell and Molecular Biology Saunders College, Philadelphia.
6. Gerald Karp, Janet Iwasa, Wallace Marshall, 2015,Karp's Cell and Molecular Biology, 8th Edition, John Wiley and Sons, Inc., New York.

II SEMESTER			
DSC 5	**ANIMAL PHYSIOLOGY**		**18PCZO22**
Hrs / Week : 5	**Hrs / Sem : 75**	**Hrs/ Unit : 15**	**Credits : 4**

Objectives: Understanding the physiology of animals, working mechanism and functions of various organs.

UNIT I FOOD AND DIGESTION

Balanced diet – malnutrition – digestive tract – structure and functions. Secretory functions of the alimentary tract and the glands. Gastro-intestinal hormones, digestion, absorption and metabolism of carbohydrates, proteins and lipids.

UNIT II BLOOD AND CIRCULATION

Human: Blood components – functions of blood – factors affecting RBC production. Functional anatomy of heart – cardiac cycle – cardiac output – regulation of cardio vascular function – blood pressure – nutrition and metabolism of the heart – coronary circulation – cerebral circulation – placental – foetal and neonatal circulation.

UNIT III RESPIRATION AND EXCRETION

Respiration in air and water. **Human**: Physiology and anatomy of the respiratory tract – gas transport between the lungs and tissues – regulation of respiration. Respiratory adjustments in health and diseases. Excretory products – organs of excretion in different animals. **Human:** Kidney – nephron – renal circulation – urine formation – renal disorders – micturition and dialysis.

UNIT IV NEUROMUSCULAR AND SENSORY PHYSIOLOGY

Neuron – nerve fibres – classification and properties – neurotransmitters – synapse – reflex activity – structure and function – spinal cord and brain – electroencephalogram (EEG). **Muscles:** Classification and properties – mechanism of muscular contraction – energetics of muscular contraction – neuromuscular junction.

Sense organs and receptors: Sense organs of vision, hearing and equilibrium, smell and taste, cutaneous, deep and visual sensations.

UNIT V REPRODUCTIVE PHYSIOLOGY

Reproductive physiology of human: Leydig and Sertoli cells – spermatogenesis and oogenesis – induced ovulation and *in vitro* oocyte maturation – fertilization and early embryonic development – adolescence and senescence – embryonic stem cells, assisted reproduction techniques – GIFT, ZIFT, SUZI, ICSI, Population control – family planning.

TEXTBOOKS

1. Text book of Animal Physiology Dr.P.B. Reddy.
2. Principles of Animal Physiology Christopher D.Moyes, Patricia Mischuttle.

REFERENCE BOOKS:

1. Kunt Schmidt-Nicolsen, 1997 Animal Physiology-Adaptation and Environment.5th Edition, Cambridge University Press.
2. K. Sembulingam and P. Sembulingam, 2012. Essentials of Medical physiology, 6th Edition, Jaypee Brothers Medical Publishers Ltd. New Delhi.
3. Kim E.Barrett and Susan M. Barman.2015. Ganong's Review of medical physiology. 25th edition. Lange Basic Science.
4. A. C. Guyton and J. E. Hall. 2011. Textbook of medical physiology.12th edition. Saunders Elsevier.Philadelphia..
5. Tuttle, W. W. and Bryon, A. and Schottlius 1969, Textbook of physiology. (Mosby International Edition), The C. V. Mosby Company, Saint Rocis, Toppa Co. Ltd., Tokyo, Japan.
6. J. J. Bray, P. A. Cragg, A. D. C. McKnight, R.G. Mills and D.W. Taylor, Lecture notes on human physiology. (3rd edition), Blackwell Scientific Publications.

II SEMESTER			
DSC 6	**GENETICS AND EVOLUTION**		**18PCZO23**
Hrs / Week :5	**Hrs / Sem :75**	**Hrs/ Unit : 15**	**Credits :4**

Objectives: To facilitate the students to understand the genetic basis of inheritance and the basic concepts of evolution

UNIT I - MENDELIAN PRINCIPLES

Segregation , independent assortment of genes, multiple alleles and genetics of ABO Rh blood groups in man, Sex linked inheritance, linkage and crossing over. Localization of DNA in chromosome and gene mapping. Extra nuclear DNA:DNA in mitochondria and plastid. Maternal effects and cytoplasmic inheritance.

UNIT II - CONCEPT OF GENE

Cistron, recon and muton, DNA as the genetic material, Regulation of gene expression in prokaryotes and eukaryotes, inherited genetic disorder in man-Syndromes, Colour blindness, Haemophilia, Inborn Errors of metabolism- Sickle cell anaemia, lbinism. phenylketonuria

UNIT III - GENETICAL DISORDERS.

Dominant gene, recessive gene – sex linked and chromosomal genetic disorder – Huntington's chorea – cystic fibrosis – thalassemia - muscular dystrophy –and Tay Sac's disease –screening for genetic disorders – amniocentesis – chorionic villus sampling – foetoscopy – gene therapy.

UNIT IV - TRADITIONAL EVOLUTION

Origin and evolution of prokaryotes and eukaryotes – phylogenetic gradualism and punctuated equilibrium – major trends in the origin of higher categories – micro- and macroevolution.

UNIT V - MOLECULAR EVOLUTION

Construction of phylogenetic trees – quantifying genetics – variability – genetic structure of natural population – phenotypic variation – pattern of genetic variation – Founder's effect and bottle necks – models explaining changes in genetic structures of population.

TEXT BOOK

Genetics : Analysis of Genes & Genomes: 8th Edition. Daniel L.Harti.

REFERENCE BOOKS:

1. M. W. Strickberger. 2005. Genetics.3rd Edition, Prentice-Hall, India.
2. Benjamin Lewin. 2000. Genes VII. Oxford University Press.
3. Robert J. Brooker,2012. Genetics – Analysis and Principles,4th Edition, (International Edition), NY McGraw Hill, New York..
4. J. M. Smith. 1998. Evolutionary genetics.2nd Edition, Oxford University Press.
5. M. Ridley. 1996. Evolution. 2nd Edition, Blackwell Science Inc, Cambridge, Massachusetts.
6. G. Ledyard Stebbins. 1971. Processes of organic Evolution, 2hd edition. Prentice-Hall, Inc., Englewood cliffs, New Jersey.
7. William D. Stansfield. 1983. The science of evolution, MacMillan Publishing Co. Inc.
8. Paul Amos Moody. 2011. Introduction to evolution, Nabu Press, United States.
9. Douglas J. Rutuyma. 2013. Evolution, 3rd edition, Sinauer Associates.inc.

II SEMESTER			
DSE 2A	**NANO-BIOTECHNOLOGY**		**18PEZO2A**
Hrs / Week :4	**Hrs / Sem : 60**	**Hrs/ Unit : 12**	**Credit:4**

Objectives: To understand the comprehensive overview of all major aspects of nan-obiotechnology and its applications in biology.

UNIT -I - INTRODUCTION TO NANOTECHNOLOGY:

Introduction - Importance of nanoscience and nanotechnology in biomedical applications. Types of solid and powder crystals. Interaction between biomolecules and nanoparticles. Applications of nanotechnology in biotechnology: killing cancer cells, providing oxygen and artificial mitochondria. Nanobiosensors.

UNIT –II - 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. Nanobiomaterials: Biocompatibility; Antibacterial activity; DNA and Peptide based nanomaterials; Polymer nanostructures.

UNIT –III - SYNTHESIS OF NANOPARTICLES:

Top-Down approach, Bottom-Up approach, Nano-Lithography, PVD, CVD, Wet deposition techniques, 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- CHARACTERIZATION OF NANOBIOMATERIALS:

Basic principles, operations and applications of UV-Visible spectroscopy, FT-IR spectroscopy, SEM, TEM, STM, Atomic and Molecular spectroscopy, Photoacoustic spectroscopy, Fluorescence spectroscopy, Fluorescent resonance energy transfer (FRET), computations, AFM of DNA, STM of DNA and Confocal microscopy.

UNIT –V - ENVIRONMENTAL NANOTECHNOLOGY:

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

REFERENCE BOOKS:

1. Nanomaterials by A.K. Bandyopadhyay, 2007, New Age International Publishers, New Delhi.
2. Tissue, cell and organ engineering, by Challa Kumar, 2006, Wiley-VCH, Verlag.
3. The Chemistry of Nanoparticles (Synthesis, Properties and Applications) by C.N.R. Rao, A. Muller, A.K. Chutham., 2006, Wiley-VCH, Verlag.
4. Nanomedicine, Vol. IIA: Biocompatibility by Robert A. Freitas, 2003, Landes Bioscience, Georgetown
5. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology - Hari Singh Nalwa, 2006, American Scientific Publishers.
6. Nanobiotechnology, by C.M.Niemeyer, C.A. Mirkin, 2004, WILEY-VCH Verlag GmbH & Co. KGA, Weinheim
7. Nanocomposite Science & Technology by Pulickel M. Ajayan, Linda S. Schadler, Paul V. Braun, Wiley.
8. Handbook of Nanotechnology - Bharat Bhusha, 2007, Springer.
9. Introduction to Nanotechnology", C. P. Poole and F. J. Owens, 2006, Wiley.
10. Nanotechnology: A Gentle Introduction to the Next Big Idea", M. Ratner and D. Ratner, 2002, Prentice Hall.
11. Nanotechnology – Science, Innovation, and Opportunity", L. E. Foster, 2006, Pearson Education.

II SEMESTER			
DSE 2B	**WILDLIFE MANAGEMENT**		**18PEZO2B**
Hrs / Week :4	**Hrs / Sem : 60**	**Hrs/ Unit : 12**	**Credits: 4**

Objective: To understand the principles of conservation, management and protection of wildlife and biodiversity.

UNIT – I WILDLIFE AND ECOLOGY

Ecological concepts and principles related to nature and natural resources: Ecosphere and Biosphere – types of resources – renewable and non renewable resources – stability of population. Distribution of wildlife in India – organization and legislation. Bio diversity– endangered fauna and flora – threatened species - rare species – vulnerable species – extinct species – red data book, Hotspots.

UNIT – II POPULATION ECOLOGY

Population dynamics – Population estimation – census – sampling indices – population manipulation– types of transect – line transect – Emlentransects – clutch effort estimators – mark recapture estimators. Age and sex criteria with special reference to Indian wildlife – consideration of special and unique habitats – the place of sangs in forest ecosystem – consideration of featured species – forage/ cover ratio as an integrating factor/ cover .

UNIT – III THREATS TO BIODIVERSITY

Biological diversity –value of biological diversity – threats to biological diversity – loss of biological diversity – habitat destruction, fragmentation and degradation – exotic species introductions – disease and over exploitation –conservation at the population level – problems of small populations –establishing, designing and managing protected areas – Wildlife sanctuaries and National parks in India and around the world - *ex situ* conservation strategies – establishing new populations.

UNIT – IV CONSERVATION AND MANAGEMENT

Concepts of conservation – need for conservation – factors for decline of wildlife – predation of wildlife in natural environment – conservation and management –role of MAB,IUCN,IPR,TRIPS,IKS - fundamental principles of applied remote sensing – remote sensing application– radio telemetry as a wildlife research tool – application – radio transmitters and its application - management plans.– silviculture options to provide timber and wildlife – habitat prescription.

UNIT – V CONSERVATION AND MAN

Global perspective on the selection of natural resources – critical reserve area habitat. **Wildlife management principles:** ecological basis – hunting – refuges – predator control – artificial stocking – carrying capacity – habitat improvement – interspersion – territories. **Special projects for endangered species:** project tiger – the Gir lion sanctuary – crocodile breeding project. Exploitation of wildlife resources – man and biosphere – inter dependence of organisms– man and wildlife survival -conservation and human societies - international agreements – international funding.

REFERENCE BOOKS:

1. B. D. Sharma, High altitude wildlife of India,1994, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. V. B. Saharia, Wildlife in India, Nataraj Publishers, 17 Rajpur Road, Dehradun – 248001.
3. Francois & Ramode, Ecology of natural resources, John Wiley &Sons,
4. R. B. Singh, Suresh Mistra, Environmental law in India,1996, Concept Publishing Company, New Delhi.
5. Richard Teague, A manual of wildlife conservation,1971, The Wildlife Society, Washington, D.C.
6. Richard B. Primack, Essentials of conservation biology,2014, Sinauer Association Inc., Sunderland, Massachusetts, USA.
7. R. F. Dasmann, Environmental conservation,1984, John Wiley & Sons, New York.
8. S.K.Singh, Text book of Wild Life Management 2015, 2nd Edition.

II SEMESTER		
P-III	**CORE ZOOLOGY PRACTICALS-III**	**18PCZO2P1**
Hrs / Week :4	**Hrs / Sem :60**	**Credits :2**

ANIMAL PHYSIOLOGY PRACTICALS

Animal Physiology

1. Effect of Temperature on opercular movement of fish.
2. Effect of Temperature on human salivary amylase activity.
3. Rate of Oxygen consumption in a fish
4. Estimation of Total Haemoglobin, ESR and blood clotting time.
5. Haemin crystals in human blood.
6. Quantitative analysis of Nitrogenous waste products.
7. Virtual dissection of frog- Blood vascular system or Digestive system.
8. Bomb Calorimeter – Demonstration

Animal Physiology

a) Simple muscle twitch
b) Sphygmomanometer
c) Haemocytometer
d) Reflex arc model
e) ECG model
f) Cardiac cycle
g) Dialysis
h) Family planning devices

II SEMESTER		
P-IV	**CORE ZOOLOGY PRACTICALS-IV**	**18PCZO2P2**
Hrs / Week :4	**Hrs / Sem :60**	**Credits :2**

GENETICS AND EVOLUTION PRACTICALS

1. Verification of Mendel's law-Monohybrid and Dihybrid crosses using coloured beads.
2. Human Mendelian traits.
3. ABO blood group data, in a large sample of human population or classroom sample.
4. Estimation of gene and genotype frequencies in the light of Hardy – Weinberg law based on ABO blood groups
5. Random genetic drift – using colour beads.
6. Demonstration of density dependent selection in animal population using beads.

Genetics and Evolution

1. Syndromes
2. Inborn errors of metabolism.
3. Sex-linked inheritance
4. Construction of phylogenetic tree.
5. Colouration: Chamaeleon, Lycodon
6. Mimicry: Phyllium, Stick insect

III SEMESTER			
DSC7	**IMMUNOLOGY**		**18PCZO31**
Hrs / Week :5	**Hrs / Sem : 75**	**Hrs/ Unit : 15**	**Credit:4**

Objectives: To understand the fundamental aspects of infective organisms and the potential of the living systems to resist infections.

UNIT I: INTRODUCTION, HISTORY AND TYPES OF IMMUNITY, CELLS AND ORGANS OF THE IMMUNE SYSTEM

Introduction: History,**Types of Immunity: Innate Immunity** – physical, mechanical, biochemical, cellular, genetic and other factors. **Acquired immunity:** Natural and artificial active immunity – natural and artificial passive immunity – adoptive immunity. **Cells of immune system:** Lymphoid lineage – T cells and its types – B cells and its types – Null cells and its types. **Myeloid lineage:** eosinophil, basophil, neutrophil, mast cell, antigen presenting cells, platelets, monocytes and macrophages. **Organs of immune system:** Primary lymphoid organs – thymus – bone marrow- bursa of Fabricius – Secondary lymphoid organs – lymph node spleen, Payer's patches (GALT), tonsils (MALT), appendix.

UNIT II: IMMUNE RESPONSE

Humoral immune response: Primary and secondary humoral immune response – importance of B cells in humoral immune response (antibody formation) – factors influencing antibody formation. **Cell mediated immune response**: cells involved in the cell mediated immune response – cytokines and their actions –**Hypersensitivity reaction:** Factors causing hypersensitivity – types of hypersensitivity – type I, II, III, IV and V – hypersensitivity reactions. **Complement system:** Classical and alternate pathways of complement system – biological functions of complement system

UNIT III: ANTIGENS AND ANTIBODIES

Antigens: Types of antigens – chemical nature of antigen – essential factors for antigenicity. **Antibodies**: antibodies and immunoglobulins – structure of immunoglobulin – types of immunoglobulin – biological

properties of immunoglobulins G, M, A, D, and E – monoclonal and polyclonal antibodies.

Antigens and antibody reactions**:** Salient features and mechanism of immune complex.

UNIT IV: CLINICAL IMMUNOLOGY

Transplantation immunology: Major histocompatibility complex – structure of MHC molecule. **Transplantation**: classification of grafts – mechanism of graft rejection – graft versus host reaction – immuno suppressive therapy during transplantation. **Tumour immunology**: properties of tumourcells –tumour antigens – immune response to tumour – immune surveillance – immuno diagnosis of tumour – immuno therapy of tumourTumour vaccines.

UNIT V: DISEASES

Auto immune diseases: characteristics– causes and classification of auto immune diseases – treatment of auto immune diseases. **Immune response to infectious diseases:** Protozoan parasite (malaria) – bacterial disease (Tuberculosis) – viral disease (HIV) – ELISA and Western Blot. **Immuno therapy:** Immunization and immunization schedule – vaccines – attenuated vaccine – killed vaccine – recombinant vaccine – vector vaccine – DNA vaccine – anti-idiotype vaccine – multivalent sub units vaccines.

REFERENCE BOOKS:

1. Janis Kuby, Immunology, 1999. W.H. Freeman and company, New York,
2. Klaus D. Elgert, Immunology: Understanding the Immune System. 2009.2nd Edition, Wiley-Blackwell Publishers Co.
3. R. M. Coleman, M. F. Lombard, R. E. S. Cord. Fundamental Immunology, 2000 2nd edition, W. C. Brown Publishers, USA.
4. I. M. Roitt. Essential Immunology. 1998. ELBS Publication.
5. Donald M. Weir and John Stewart. Immunology, 2001. 9th edition. ELBS Publication.
6. C. V. Rao 2004. An introduction to immunology. Narosa Publishing House.
7. Aruna Bhatia. Manual of Practical Immunology. 2006. Palani Paramount Publications, Palani
8. Talwar, G. P. A handbook of Practical Immunology. 2000. Vikas Publication House Ltd. New Delhi.
9. Hudson, L. and Hay, F. Practical Immunology, 2001. 3rd edition, Blackwell Scientific Publication.
10. Abul K. Abbas, Andrew H. H. Lichtman, and Shiv Pillai,Cellular and Molecular Immunology, 8th Edition. Elsevier science.

III SEMESTER			
DSC 8	**BIOSTATISTICS AND BIOINFORMATICS**		**18PCZO32**
Hrs / Week : 5	**Hrs / Sem : 75**	**Hrs/ Unit : 15**	**Credits : 4**

Objectives: To acquire knowledge on the mathematical principles governing biological systems and statistical analysis of biological data.

UNIT I: TYPES OF DATA AND MEASURES OF CENTRAL TENDENCY

Types of biological data – Ratio scale, interval scale, ordinal scale, nominal scale – sample and population, statistical symbols and terms, types of mean- Arithmetic mean, harmonic mean, geometric mean, median, mode– frequency distribution .

UNIT II: MEASURES OF DISPERSION AND TEST FOR SIGNIFICANCE

Comparing two means, Measures of dispersion: standard deviation, coefficient of variation, mean deviation, variance, Theoretical probability-distribution-normal, binomial and poisson – skewness and kurtosis, standard error – student's 't' distribution: Chi-square analysis – test for goodness of fit – test for independence – types of errors- α and β.

UNIT III: DATA TRANSFORMATION AND ANOVA

Correlation-kinds, properties, methods-Karl Pearson's, Rank, Regression analysis-simple, linear and non-linear regression and testing its significance. Analysis of variance – one-way, two-way, 'F' test.

UNIT IV: INTRODUCTION AND BIOINFORMATICS RESOURCES

Knowledge of various databases and bioinformatic tools: Nucleic acid sequence database- Gen bank, EMBL and DDBJ, Protein sequence data base. Swiss prot, TrEMBL, PIR, PDB, Genome data base- NCBI, EBI, TIGR, SANGER other database of patterns.

UNIT V: SEQUENCE ANALYSIS

Pairwise sequence alignment – local vs. global alignment – dot matrix analysis – substitution matrices –multiple sequence alignment - dynamic programming Bayesian methods – BLAST – FASTA- machine learning – neural networks – statistical methods – Hidden Markov models – Homology Modeling.

REFERENCE BOOKS:

1. Bailey, N. T. J. 1997. Statistical methods in Biology (3rd edition). Cam. University Press, New York.
2. Sokal, R. and James, F. 1973. Introduction to Biostatistics. W H. Freeman and Company Ltd., Tokyo, Japan.
3. Snedecor, G. W. and Cochran, W. G. Statistical methods. Affiliated East-West Press, New Delhi.
4. Zar, J.H. 2003. Biostatistical Analysis, Person Edition Asia, New Delhi.
5. Cantor,C.R and Smith, C.L 1999."Geneomics", John Wiley & Sons.
6. Pennington,S.R. and Dunn, M.J. 2002,"Proteomics: from Protein Sequence to Function", viva books publishers,
7. Liebler, D.L. 2002, Introduction to Proteomics : Tools for the new Biology, Humana press.
8. Sokal, R.R and Rohlf, F.J. 2000. Biometry. Freeman, SanFrancisco.

III SEMESTER			
DSC 9	**ANIMAL BIOTECHNOLOGY**		**18PCZO33**
Hrs / Week : 5	**Hrs / Sem : 75**	**Hrs/ Unit : 15**	**Credit: 4**

Objective: To gain knowledge on recombinant DNA technology, gene transfer and transgenecity and its applications

UNIT I: BIOTECHNOLOGICAL TOOLS AND TECHNIQUES

Definition - principles and methods of recombinant DNA technology – exonuclease, endonuclease -Source of Gene, genomic, cDNA libraries – rDNA strategy, selection, insertion, culture, recovery, screening; Insertional, blotting, PCR, DNA sequences. Plasmids -pBR322, Ti plasmid, bacteriophage, M13, cosmids, phasmids, yeast shuttle vectors, transposons, bacterial artificial chromosome.

UNIT II: DNA TECHNIQUES

Gene and gene function - gene transfer system - transgenic animals - production and application - animal bioreactors - targeted gene transfer; genome maps and human genome project - molecular markers – Restriction Fragment Length Polymorphism (RFLP) - Randomly Amplified Polymorphic DNA (RAPD) - Variable Number of Tandem Repeats (VNTR) - Short Tandem Repeats (STR), chromosome jumping - chromosome walking - DNA finger printing – DNA chip technology – biosensors and their applications.

UNIT III: GENETIC ENGINEERING FOR HUMAN WELFARE

Animal cell and tissue culture - mammalian cell lines and their characters - media for the cultivation of mammalian cells - large scale cultivation of mammalian cells - cell culture products - organ culture technique - Somatic cell fusion and hybridoma technology - monoclonal antibodies production and applications - disease prevention, disease diagnosis and disease treatment - drug designing and drug delivery systems - gene therapy – pharmacogenetics and pharmacogenomics. *In vitro* fertilization and embryo transfer.

UNIT IV: BIOTECHNOLOGY AND INDUSTRY

Industrial microbiology - isolation and screening of micro organisms - strain improvement - bioreactor - downstream processing - practical applications – antibiotic synthesis - Single Cell Proteins (SCP) and myco protein - production and application. Enzyme technology – immobilization of enzyme and its uses. Bioethics.

UNIT V: ENVIRONMENTAL BIOTECHNOLOGY

Bioenergy – Biofuels - Biodiesel - Biogas production technology - biogas from waste water .Biopesticide, biofertilizer. Genetically Engineered Microbes (GEMS) - bioremediation, bioremediation for marine oil spills - types of bioremediation, bioleaching; microbial degradation of xenobiotics. Short account on Synthetic biology

REFERENCE BOOKS:

1. Dubey R.C. Text book of biotechnology, 2012. S.Chand & company Limited, New Delhi.
2. Gupta .P.K. Biotechnology and Genomics.2013. Rastogi Publications, Meerut.
3. Atherly, Girton and McDonald, The Science of Genetics 1999. Harcourt College Publications.
4. Singh.B.D. Genetic Engineering and Animal Biotechnology,2005. Kalyani Publishers, Chennai – 17.
5. Kingsman,S.M and Kingsman.A.J. Genetic Engineering: An Introduction to Gene Analysis and Exploitation in Eukaryotes.1988. Blackwell Science Inc Publications.
6. M. W. Strickberger. 2005. Genetics.3rd Edition, Prentice-Hall, India
7. Bruce Alberts,AlexanderJohnson,JulianLewis,MartinRaff,KeithRoberts,Peter Walter. Molecular Biology of the Cell.5th Edition,2007. Garland Science.

III SEMESTER			
DSE 3A	**SERICULTURE**		**18PEZO3A**
Hrs / week : 4	**Hrs / Sem : 60**	**Hrs/ Unit : 12**	**Credits : 4**

Objectives: To understand the various aspects of sericulture and to adopt and encourage the students for self employment.

UNIT I - INTRODUCTION

Importance of Sericulture - Sericulture industry in India and Tamilnadu - Sericulture as a cottage industry - Role of central silk board, research institutes, National silk seed organization -Moriculture – Mulberry varieties, Artificial seed preparation - Morphology of Mulberry plant, package of practices for mulberry cultivation, harvesting and Preservation .

UNIT II - DISEASES OF MULBERRY

Diseases of mulberry - fungal diseases – (root&shoot diseases - Bacterial diseases (Tukra) - leaf blight disease, rot disease - Viral diseases – mulberry leaf mosaic disease, dwarf disease - Deficiency diseases – nitrogen deficiency, Phosphorus deficiency, magnesium deficiency and calcium deficiency symptoms and control measures of any three major pests.

UNIT III - LIFE CYCLE

Classification of mulberry and non mulberry silk worm - habit and habitat - voltinism, races - life cycle of mulberry and non mulberry silk worm - structure of egg, larva, pupa, and adult, sexual dimorphism of larva and pupa, fine structure of silk gland.

UNIT IV - SILK WORM REARING

Rearing of silk worm : Selection and Construction of Rearing house, rearing appliances, rearing operation - disinfection –egg incubation-brushing - maintenance of optimum conditions - Feeding - Bed cleaning - spacing - Chawki rearing - Rearing of late age larva – Shelf ,Shoot rearing – Cocoon Production, harvesting and marketing - Characteristics of cocoons - defective cocoons. reeling techniques- lacing, skinning, twisting and re reeling.

UNIT V - SILKWORM DISEASES

Diseases of silk worm: Protozoan – Pebrine, Viral – Flacherie, Gattine, Bacterial – Septicemia, sotto, Fungal - Muscardine, Pests –Uzi fly, Silk reeling; cocoon stifling - storage of cocoons, cocoon boiling and deflossing, - Process of reeling - different methods, Raw silk and marketing.

REFERENCE BOOKS:

1. Dandin, S. B. , Jayant Jayaswal and K. Giridhas, Hand Book of Sericulture Technologies, 2000 Central Silk Board, Madivala, Bangalore - 68.
2. Ganga, G. and SulochanaChetty.I - An Introduction to Sericulture. 1991. Oxford & IBH Publishing Company Private Ltd .New Delhi .
3. Ganga, G.- Comprehensive Sericulture, Vol. I, Moriculture, 2003, Science Publishers.U.S..
4. Ganga, G .Comprehensive Sericulture, Vol. II, Silk worm Rearing and Silk Reeling, 2004. India Book House Private Ltd.
5. Kesary, M . and M .Johnson, Sericulture , Department of Zoology, N. M. Christian College, Marthandam - 629 165 .

III SEMESTER			
DSE 3B	**APICULTURE**		**18PEZO3B**
Hrs / Week : 4	**Hrs / Sem : 60**	**Hrs/ Unit : 12**	**Credits: 4**

Objective: To provide knowledge on apiculture, maintaining bee hives, problems and prospects.

UNIT I

Definition, scope, honey bee- classification of bees- rock bee, Indian bee, littlebee and dammer bee – their identification and habits – choice of species in apiculture.Bee colony – distinctive features and identification of queen, drones and workers, functions of the members. - Anatomy and organ system of honey bee. - Development of honey bee – egg, larva and pupa – time taken for the development of queen, drone and worker, life history of *Apisseranaindica*.

UNIT II

Apiculture techniques, arranging an apiary position – space, acquiring bees – care of newly captured colonies – handling the bees. - Bee keeping – primitive methods – modern methods. The bee hive and its architecture – different kinds of cells – burr comb. - Different types of hives – their identification, artificial hives their advantages – parts of artificial hive – other appliances used in apiaries.

UNIT III

Honey bee products. - Honey – extraction of honey – preservation and storage of honey – properties, chemical composition, nutritive value, medicinal values – honey as daily food. - Bee wax – production – method of extraction – characteristics and uses. - Bee venom – methods of extraction of venom – composition of venom – curative value

UNIT IV

Enemies of bees – greater wax moth, lesser wax moth, ants wasps, lice, beetles and birds and their control.

Diseases of bees – adult and brood diseases – prevention and control measures.

UNIT V

Swarming – prevention and control. - Robbing and fighting – prevention and control. - Uniting stocks – different methods - Queen rearing and introduction - Supersedure - Foraging - Inter- relationship of plants and bees.

REFERENCE BOOKS :

1. Abrol, D.P.-Bees and Bee keeping in India. Kalyani Publishers, B.1/1292, Rajinder Nagar , Ludhiana- 141 008.
2. Abrol, D.P.Honey bee Diseases and their Management , Kalyani Publishers, B.1/1292, Rajinder nagar , Ludhiana- 141 008. .
3. Johnson, J. and I. Jeyachandra- Apiculture –Dept. of Zoology, N.M. Christian College, Marthandam.- 629 165.
4. Cherian MC and Ramachandran, Bee keeping in South India
5. Sharma P.L.& Singh S.-Hand book of Bee Keeping, Printing and stationary, Chandigarh.

III SEMESTER		
P-V	**CORE ZOOLOGY PRACTICALS-V**	**18PCZO3P1**
Hrs / Week :4	**Hrs / Sem :60**	**Credits :2**

IMMUNOLOGY PRACTICAL

1. Antigen antibody interaction *in vitro* - ABO typing, Rh typing.
2. Radio immuno assay
3. ELISA (Demonstration).
4. Rocket immuno Electrophoresis
5. Testing For Typhoid Antigens By Widal Test
6. Dissection of lymphoid organs in fish.
7. Total Counting of WBC - differential count in a blood sample.
8. Isolation of Monocytes From Blood
9. Visit to Medical microbiology laboratory and submission of report (compulsory).

MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

1. Primary Lymphoid organs
2. 2.Secondary Lymphoid organs
3. 3.Blood grouping
4. 4.Monoclonal antibodies
5. 5.Flow cytometer
6. 6.Elisa titre plate
7. Vortex Mixer
8. 8.Primary & Secondary immunization
9. Agglutination
10. Immunoglobulin types
11. Natural Killer Cell
12. Macrophages

III SEMESTER		
P-VI	**CORE ZOOLOGY PRACTICALS-VI**	**18PCZO3P2**
Hrs / Week :4	**Hrs / Sem :60**	**Credits :2**

BIOSTATISTICS AND BIOINFORMATICS AND ANIMAL BIOTECHNOLOGY PRACTICALS

Biostatistics and Bioinformatics

1. Statistical analysis of mean, median and mode, variance, SD, SE, coefficient of variation using neem leaves.
2. Calculation of correlation coefficient – length and width of leaves
3. Calculation of correlation coefficient – height and weight of students in the class.
4. Calculation of regression co-efficient using length and width of leaves.
5. Study of probability using coin toss.
6. Test of significance (student's t-test)
7. Processing data with statistical package. (SPSS) (Demonstration).
8. PubMed, NCBI, EMBL, SWISS-PROT – printout

Biostatistics and Bioinformatics

1. 1.Uniprot
2. 2.Protein Data Bank
3. 3.Genbank
4. 4.Use of BLAST, FASTA (Nucleic Acids & Protiens)
5. Use of EMBOSS
6. Molecular Modelling
7. Homology Modelling – Swiss modeller

Animal Biotechnology

1. Isolation of DNA and RNA by centrifugation.
2. Separation of DNA by Agarose gel electrophoresis and PAGE for protein.
3. Visit to biotechnology Laboratory and Research institution. Report the visits in the observation note book.

Spotters

a) pBR 322
b) CaMV
c) c) Restriction enzymes
d) Recombinant DNA
e) Electroporation Unit
f) Stem cells
g) Dolly
h) Animal cloning
i) Transgenesis
j) Gene knock out
k) k)protoplast fusion

IV - SEMESTER			
DSC 10	**MICROBIOLOGY**		**18PCZO41**
Hrs / Week: 5	**Hrs / Sem : 75**	**Hrs/ Unit : 15**	**Credits : 4**

Objective: To impart knowledge on classification, characteristics and significance of microorganisms.

UNIT I: CLASSIFICATION OF MICROBES

History and scope of microbiology- Classification of Bacteria, fungi, protozoa and virus – Morphology, fine structure and function of bacteria, Virus and fungi. Isolation pure culture techniques, identification and maintenance of microbes.

UNIT II: MICROBIAL GROWTH

Requirements for growth – Physical and culture characteristics. Culture media
curve, measurement of microbial growth, growth curve and growth kinetics. microbial control – physical and chemical methods.

UNIT III : MICROBIAL GENETICS

Structure and function of genetic material – Transfer of genetic information – Transformation, Transfection, Conjugation, retro transfer. Transduction and Genetic recombination. Regulation of gene expression in bacteria.

UNIT IV: MICROBIAL DISEASES

Protozoan diseases - Plasmodium, Entamoeba. Fungal diseases – Mycotoxicorins, Aspergillosis and Permatomycotes. Bacterial diseases – Meningitis, Cholera, Typhoid, Gonorrhea and Syphilis. Viral diseases – Polio, Hepatitis B, Rabies and AIDS – Mode of transmission, diagnosis and treatment. Types of vaccines.

UNIT V: APPLIED MICROBIOLOGY

Fermentation – Definition and types. Bioconversion – Bio remediation – Industrial production of penicillin, ethanol. Vitamin B12 – Citric acid and glutamic acid production.

REFERENCE BOOKS:

1. R. C. Dubey and D. K. Maheshwari, A textbook of microbiology,2009. S. Chand & Company, New Delhi.
2. Prescott, Harley and Klein, Microbiology, 2004.6th Edition, McGraw-Hill Higher Education,, New York.
3. Pelzar, Chan and Krieg, Microbiology,1998, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4. R. Y. Stainer, J. L. Ingraham, M. L. Wheelis and P. R. Painter, General microbiology,2007, Macmillan India Ltd.
5. S.S. Purohit, Microbiology: Fundamentals and applications, 2002,Agro Bios,6th revised Edition,India.
6. N. Kannan, Laboratory manual in General Microbiology,2002, Palani Paramount Publications.
7. J. Cappuccino and N. Sherman, Microbiology: A laboratory manual,2013, Pearson Benjamin Cummings, 10th Edition.

IV SEMESTER			
DSC 11	**AQUACULTURE**		**18PCZO42**
Hrs / Week :5	**Hrs / Sem : 75**	**Hrs/ Unit : 15**	**Credit : 4**

Objective: To understand the significance of aquaculture practice and its management.

UNIT I:INTRODUCTION

History and scope of aquaculture, Importance and need for aquaculture – Indian and Global Scenario of aquaculture –Types of aquaculture-culture systems; Pond culture, Cage culture, raft Culture and Pen culture marine aquaculture; Integrated farming.

UNIT II:CULTURE SYSTEM AND CULTIVABLE SPECIES

Selection of suitable site for aquaculture – Design and construction of culture ponds – Preparation and management of culture ponds - Hatchery and Nursery ponds.

Taxonomy and Characteristics of cultivable fish species – Criteria for the selection of cultivable species –Brooders - Brood stock management-Induced breeding in fin fish (hypophysation) and shell fish (eye stalk ablation).

UNITIII: FEED AND NUTRITION

Nutritional requirement of cultivable fishes - Live feed culture (Microalgal culture, culture of Artemia, Rotifer and copepods) – significance of live feed culture– Bioencapsulation - Artificial feed - Types of Artificial feed, Medicated feed - FCR–Feeding strategies and feed dispersion and Management.

UNIT IV: FISH DISEASES IN AQUACULTURE

Bacterial, viral, fungal and parasitic diseases in fin and shell fishes – Diagnostics –Prophylactic measures - molecular diagnosis Treatment measures – Predators – Harvesting methods .

UNITV: POST HARVEST TECHNOLOGY

Principle methods of fish preservation and processing in India-physical and chemical methods - freezing, canning, pickling, smoking, Transport of fish and its products - types of fish spoilage- causative factors.

REFERENCE BOOKS:

1. N. M. Chakrabarti, 1998, Biology, Culture and production of Indian major carps, Narendra Publishing House .
2. 2.Balugut, E.A. 1989. Aquaculture system and practices. A selected review publishing House, New Delhi.
3. T.V.R. Pillay, 1992, Aquaculture and the environment, Fishing News Books.
4. Michael, B.N. and Singholka, B. 1985. Freshwater Prawn Farming. A manual of culture of Macrobrachiumrosenbergii. Daya Publishing House, New Delhi.
5. Pillai, TVR. and M. N. Kutty., 2005. Aquaculture: Principles and Practices, Wiley Blackwell.
6. Bose, A.N., Yang, C.T., and Misra, A. 1991. Coastal Aquaculture Engineering. Oxford and IBH Publishing Co., PVt. Ltd., New Delhi.
7. Sinha, V.R.P. 1993. A Compendium of Aquaculture Technologies for Developing Countries. Center for Science and Technology and Oxford and IBH Publishing Co., Pvt., Ltd., New Delhi. 6. Robert R. Stickney., 2009. Aquaculture: An Introductory Text, CAB International Publishers.
8. 8.V. G. Jhingran, 1991, Fish and fisheries of India, Hindustan Publishing Corp.
9. T.K. Govindan, 1985, Fish processing technology, Oxford and IBH publishing Co. Pvt. Ltd.

IV SEMESTER		
DSC -12	**PROJECT**	**18PCZO43**
Hrs / Week :8	**Hrs / Sem : 120**	**Credit :8**

Objective:

Every PG student is required to prepare the project subject related – based on the guidelines of his/her project guide.

The following are the guidelines to be adhered to

- The project should be an individual one
- The language for the project is **English**
- The Minimum number of pages should be **60**
- Project observations, suggestions and conclusion shall be formed aspart of the project.
- The Project will be evaluated both by the Internal as well as External Examiner each for 100 marks. The distribution of mark should be **60 marks for the Project Report and 40 marks for the Viva-voce Examination**. The Division of marks for the Project Report is as mentioned below:

Particulars	Internal Examiner	External Examiner
Wording of Title	5	5
Objectives/ Formulation including Hypothesis	5	5
Review of Literature	10	10
Relevance of Project to Social Needs	5	5
Methodology/ Technique/ Procedure Adopted	20	20
Summary/ Findings/ Conclusion/Future recommendations.	5	5
Bibliography/ Annexure/ Foot notes	10	10
Total	**60**	**60**

The average mark of Internal and External Examiner is considered as marks of Dissertation report

IV SEMESTER			
DSE 4A	**ENTOMOLOGY**		**18PEZO4A**
Hrs / Week : 4	**Hrs / Sem : 60**	**Hrs/ Unit : 12**	**Credits: 4**

Objective: To understand the aspects of insect classification, ecologyand anatomy.

UNIT I - TAXONOMY

Principles of insect classification – classification of insects up to order – key characteristics with Indian examples – coleopteran, Diptera, hemiptera, Dermoptera, and Lepidoptera.

UNIT II - STRUCTURE AND FUNCTION I

General structure of head,thorax with their appendages,abdomen. **Integumentary system:** structure and chemistry – structure and physiology of digestive system. **Respiration:** aerial and aquatic respiration – respiration in endoparasites. **Circulatory system:** structure of heart, mechanism of haemolymph circulation, haemolymph and its composition – diversity of haemocytes and their function. **Excretory system:**Malphigian tubules and their function – role of rectum in water and ion regulation.

UNIT III - STRUCTURE AND FUNCTION II

Receptors: Fine structure of compound eye, coeloconia, Johnston's organ – chordotonal organs and stridulatory organ - bioluminescence. Endocrine control of moulting and metamorphosis, vitellogenesis – mating and oviposition – oviparity, viviparity, Ovoviviparity,parthenogenesis.

UNIT IV - HARMFUL AND BENEFICIAL INSECTS

Bionomics – damage and symptoms and control measures of insect pests of economically important crops: cotton, paddy, groundnut,brinjal,coconut

Insect vectors of human diseases: Biology, mode of transmission of diseases and control – mosquito, housefly and sand fly. **Beneficial insects:** Biology, culture and economic importance of honey bees, and lac insects.

UNIT V – METHODS AND PRINCIPLES OF PEST CONTROL

Control measures: cultural, mechanical, physical, legal, chemical, biological, genetic chemosterilants, pheromones, concepts of biointegrated pest control.(BIPM) Biointensive Integrated Pest Management.

REFERENCE BOOKS:

1. Nayar, K. K., David, B. V. and Anantha Krishnan, T. N.,2004 General and applied entomology, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
2. David B. V.Ramamurthy T., 2000, Elements of economic entomology, Popular Book Depot, Chennai.
3. D. P. Ambrose, 2004, The insects: Structure, function and biodiversity, Kalyani Publishers, Ludhiana,
4. Rathnasamy, A. K.,andViswanathan,S. 1986, A handbook of medical entomology and elementary parasitology, Printers and Publishers Pvt. Ltd., Chennai.
5. Wigglesworth, V. B.1977,The principles of Insect physiology, ELBS, London.
6. Pedigo, L. P., 1996, Entomology and pest management (2nd edition) –Upper Saddle River, N. J. Prentice Hall.
7. D. P. Ambrose, 2017, The insects: beneficial and harmful aspects, Kalyani Publishers, Ludhiana.

IV SEMESTER			
DSE 4B	**POULTRY SCIENCES**		**18PEZO4B**
Hrs / Week: 4	**Hrs / Sem: 60**	**Hrs/ Unit: 12**	**Credits: 4**

Objective: To understand the more recent knowledge on poultry industry.

UNIT I

Definition, poultry in India- a survey- historical review- progress through 5 year plans. Types of poultry birds, choosing a commercial laying stock, sexing in day old chicks, poultry housing – general principles of building poultry house, deep litter system – principles of built up litter system, droppings pit- feeders and waters-nest boxes. Laying cages, Californian cages, management of cage birds.

UNIT II

Poultry manure-volume, composition and values, nutritional content of ages. Managements of chicks, growers, layers and broilers. Lighting for chicks, growers, layers and broilers. Summer and winter managements.

UNIT III

Debeaking, forced moulting, poultry nutrition- energy – gross energy, digestible energy and metabolizable energy, fibre level in poultry feeds, protein and amino acid requirements for chicks, growers, layers and broilers – symptoms of excessive dietary levels and deficiency. Brief account of carbohydrates and fats as energy sources – essential fatty acids – deficiency symptoms – requirements of vitamins and inorganic minerals for chicks, growers and layers – deficiency symptoms – supplementation of vitamins and minerals in poultry feed.

UNIT IV

Non-nutritive feed additives- merits and demerits of additives – feed stuffs for poultry – south Indian feed ingredients and agro- industrial by products in relation to M.E. level, protein level, amino acid level, minerals (C and P) and fibre contents.

UNIT V

Causes, symptoms, transmission, treatment, and management of the following diseases: New CASTLE disease, fowl pox, laryngobronchitis, Avian leucosis complex and Gumboro disease. Pullorum, fowl cholera, mycoplasmosis and coccidosis and lice. Avian flu virus H5B virus.

TEXT BOOK

Poultry Keeping – M.R. Gnanamani

REFERENCE BOOKS

1. The Rearing of Pullets – Bulletin No. 54, Her majesty's stationary office, London.
2. Intensive Poultry Managements for egg production. Bulletin No. 152. Her majesty's stationary office, London.
3. M.L.Scott et al., Nutrition of the Chicken
4. Biester, Diseases of Poultry – Oxford and IBH

IV SEMESTER		
P-VII	**CORE ZOOLOGY PRACTICALS-VII**	**18PCZO4P1**
Hrs / Week : 4	**Hrs / Sem : 60**	**Credits : 2**

MICROBIOLOGY PRACTICALS

1. Preparation of culture media for micro organisms-liquid, semisolid and solid
2. Counting of viable cells (CFU/ ml) by serial dilution and spread plate or pour plate.
3. Differential staining and capsular staining.
4. Simple and gram staining.
5. Preservation & maintenance of culture
6. Test for antibiotic sensitivity- Well diffusion method and Kirby - Bauer method
7. Isolation of nitrogen fixing symbiotic bacteria from root nodule. (Rhizobium).

MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

1. Autoclave
2. Colony counting chamber
3. Laminar airflow
4. Identification of gram positive and gram negative bacteria.
5. Diseases - Protozoan, viral and fungal (any two from each)

IV SEMESTER		
P-VIII	**CORE ZOOLOGY PRACTICALS-VIII**	**18PCZO4P2**
Hrs / Week : 4	**Hrs / Sem : 60**	**Credits : 2**

AquaculturePractical

1. Morphometry of a pond.
2. Estimation of hydrobiological parameters- temperature, pH, conductivity, salinity, and dissolved oxygen
3. Identification of eggs, spawn, fry and fingerlings of any one cultivable fish
4. Length-weight relationship of fish.
5. Identification of sex in fishes.
6. Determination of age and growth in fishes.
7. Collection and identification of aquatic weeds
8. Formulation and preparation of artificial fish food for Indian major carps
9. Visit to a coastal/ aquaculture research centre and submit report.

MUSEUM SPECIMENS, SLIDES, MODELS AND CHARTS

Fish diseases

1. 1.White spot
2. Costiasis
3. Anchor worm
4. Limnaea
5. Taxonomic description of fishes – **Indian major carps:** Catlacatla, Labeorohita, Cirrihinusmrigala. **Exotic carp:** Cyprinuscarpio, **Silver carp:**Hypophthalmichthys molitrix. **Cat fishes:**Clariusbatrachus, Heteropneustes fossilis

IDC SUBJECTS OFFERED BY DEPARTMENT OF ZOOLOGY TO OTHER MAJOR STUDENTS			
II SEMESTER			
IDC – I	**MUSHROOM CULTURE**		**18PIZO21**
Hrs / Week :3	**Hrs/ Unit :9**	**Hrs / Sem :45**	**Credit: 3**

Objective: To understand the importance of mushroom cultivation and its preventive measures.

UNIT I

Introduction to mushroom – Importance of mushroom and nutritive value – Lifecycle of mushroom.

UNIT II

Identification of mushroom – Edible and poisonous mushrooms – Mushroom growth and Environment – Types of Mushrooms (Button mushroom and oyster mushroom).

UNIT III

Mushroom cultivation techniques: Culture media preparation – Selection of mushrooms to be cultivated – Production of the culture or starter – Preparation of spawn – preparation of the compost – Spawning.

UNIT IV

Major pests: Insect Pest (Ex: Sciarid), Mite Pest (Ex: Red pepper mite), Viral (Ex: Mycovirus), Bacterial (Ex: Pseudomanas), fungal (Ex: Trichoderma). Mushroom insects diseases – Prevention and Control measures.

UNIT V

Harvesting, post harvesting technology, Preservation: Short term storage & Long term storage. Marketing and Economics of Mushroom culture.

REFERENCE BOOKS

1. V.N.Pathak, Nagendra Yadav &Maneesha Gaur, "Mushroom Production and Processing Technology", Published by Agrobios (India), Chopasani Road, Jodhpur – 342 002.
2. Bahl N., (1984), "Handbook of Mushroom", Oxford IBH, New Delhi 123p.
3. Garcha H.S. (1984), "A manual of Mushroom Growing", PAU Publications,Ludhiana, 54p.
4. Marimuthu,T. Krishnamoorthy, A.S., and Jeyarajan.R, (1991), "Oyster Mushroom Production", Glimpses of Mushroom Research in Tamilnadu Agricultural University, TNAU Publishers, Coimbatore.
5. Kapoor, J.N. (1989), "Mushroom Cultivation", ICAR Publication, New Delhi

III SEMESTER			
IDC - 2	**POULTRY AND DAIRY SCIENCE**		**18PIZO31**
Hrs / Week :3	**Hrs / Sem :45**	**Hrs/ Unit : 9**	**Credits :3**

Objectives: To acquire more recent knowledge on Modern Poultry and Dairy Science Technology on self employment opportunity.

UNIT – I

External morphology of a fowl, Classification of fowls based on their Use. Nutritive value of meat and egg, Meat type – Broilers,Egg type- White Leghorn, Dual purpose Varieties, Game and Ornamental purpose Varieties

UNIT-II

Management of Broilers and Egg Layers – Housing and Equipment, Brooding, feeding and health care Poultry diseases- prevention and control (any five), Vaccination

UNIT-III

Dairy breeds of India : Cattle and Buffaloes, Native and Exotic Breeds Nutritive value of Milk and meat , Milk synthesis and Secretion, Composition of Milk. Artificial Insemination Programme, Merits and Demerits of Inbreeding and Outbreeding

UNIT-IV

Farm Management : Housing and Equipments of dairy forms- Feed, Care and Management of adult and newborn calves, Live Stock diseases and Management

UNIT-V

Storage and Marketing of Poultry and Dairy Products, Role of Govt. and Co operative Societies in Production and Marketing. Progressive plans to promote Poultry and Dairy technology as a Self employment Venture.

REFERENCE BOOKS

1. Gopalakrishnan C.A and G.Murley Mohan Lal 1997,Livestock and Poultry enterprises for rural development, Vikash, New Delhi.
2. Gnaanamani M.R., 1998 Modern aspects of commercial poultry keeping, Giri.
3. Chauhan H.V.S. and S.Roy, Poultry diseases, diagnosis and treatment New Age International, 1996.
4. . G.C. Banerjee – A Text book of Animal Husbandry – Oxford & IBH Publication, New Delhi.
5. GH Schmidt; T.D. Van Vleck, - Principles of Dairy science – Surget Pvt. Ltd., 1982.