POOMPUHAR COLLEGE (AUTONOMOUS)

(*Of the Tamil Nadu H.R & C.E Department*)
(*Accredited B^{+} by NAAC*)
MELAIYUR 609 107

PG AND RESEARCH DEPARTMENT OF ZOOLOGY

M.Sc. SYLLABUS

(FROM THE ACADEMIC YEAR 2022- 2023 ONWARDS)

OUTCOME BASED EDUCATION

Post Graduate

Programme Outcomes:

PO1: Disciplinary Knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO2: Critical Thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

PO3: Problem Solving: Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's earning to real life situations.

PO4: Analytical & Scientific Reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples and addressing opposing viewpoints. Ability to analyze, interpret and draw conclusions from quantitative / qualitative data; and critically evaluate ideas, evidence, and experiences from an open minded and reasoned perspective.

PO6: Self-directed & Lifelong Learning: Ability to work independently, identify and manage a project. Ability to acquire knowledge and skills, including "learning how to learn", through self-placed and self-directed learning aimed at personal development, meeting economic, social and cultural objectives.

Programme Specific Outcomes:

PSO1 – Placement:
To prepare the students who will demonstrate respectful engagement with others' ideas, behaviors, beliefs and apply diverse frames of reference to decisions and actions.

PSO 2 - Entrepreneur:
To create effective entrepreneurs by enhancing their critical thinking, problem solving, decision making and leadership skill that will facilitate startups and high potential organizations

PSO3 – Research and Development:
Design and implement HR systems and practices grounded in research that comply with employment laws, leading the organization towards growth and development.

PSO4 – Contribution to Business World:
To produce employable, ethical and innovative professionals to sustain in the dynamic business world.

PSO 5 – Contribution to the Society:
To contribute to the development of the society by collaborating with stakeholders for mutual benefit

Semester - I

Semester	CODE NO : 22AU:P08M1	L	T	P	C
I	STRUCTURE AND FUNCTIONS OF INVERTEBRATES AND VERTEBRATES	4	0	0	3

Learning Objective (LO):

LO1	To understand the Structure and Functions of invertebrates and vertebrates
LO2	To understand the organs of respiration and excretion and their functioning in invertebrates.
LO3	To analyses the nervous systems of various groups in invertebrates
LO4	To evaluate the larval forms of invertebrates to acquire knowledge on various organ system of vertebrates

UNIT-I: Respiration and Excretion of Invertebrates

Organs of respiration: gills, lungs and trachea–Respiratory pigments– Mechanism of respiration – Excretion – Organs of excretion: coelom, coelomoducts, nephridia and Malphigiantubules–Mechanisms of excretion– Excretion and osmoregulation.

UNIT-II: Nervous System of Invertebrates

Primitive nervous system: Coelenterata and Echinodermata — Advanced nervoussystem: Annelida, Arthropoda (crustacean and insecta) and Mollusca (Cephalopoda) –Trends in neural evolution.

UNIT-III: Invertebrata larvae

Larval forms of free living invertebrates – Larval forms of parasites – Strategies and evolutionary significance of larval forms – Minor Phyla – Concept and significance –Organization and general characters.

UNIT-IV : Skin and Skeletal System of Vertebrates

General structure and functions of skin and its derivatives — glands, scales, horns, claws, nail, hooves, feather and hairs. Skeletal elements of the

body — account of jaw suspensorium, vertebral column–limbs and girdles.

UNIT-V: Respiratory system and Nervous system of Vertebrates

Respiratory system–characters of respiratory tissue–Internal and external respiration comparative account of respiratory organ. Nervous system – Anatomy of the brainand spinal cord in relation to their functions — Nerves - Cranial — peripheral and autonomous nervous system.

Course Outcomes(CO)

At the end of the course, the student will be able to

CO1	**Understand the morphological features and physiological functions like Respiration, reproduction and nervous system of invertebrates and Vertebrates**
CO2	**Understand the various salient features of higher invertebrates and Vertebrates**
CO3	**Differentiate the patterns of functioning of various organ systems in invertebrates and vertebrates**
CO4	**Know the structural organization and functioning of various organs in invertebrates and vertebrates.**

TEXT BOOKS

1. Arumugam,N.,T.Murugan,B.RamanathanandM.G.Ragunathan.(2019).*A Text Book of Invertebrates,* Saras Publications, Nagercoil, TamilNadu.
2. Wells,H.G.(2018).*Text Book of Biology,Part1:Vertebrata,* Createspace Publishing Company, USA.
3. Ekambaranatha Ayyar,M.(1973). *A Manual of Zoology –Part I, Invertebrata*.S.Viswanathan(Printersand Publishers)Pvt.,Ltd.Madras.
4. EkambaranathaAyyar,M.(1973).*A Manual of Zoology Part –II: Chordata*. S.Vishvanathan Printers and Publishers, Pvt.Ltd., Madras.
5. Jordon,E.L.andP.SVerma,(2015). *Invertebrate Zoology*. S.ChandandCo.Ltd.,New Delhi.
6. Jordan,E.L.andP.SVerma,(2017). *Chordate Zoology and Elements of Animal Physiology,* S.Chand &Co.,Ltd.,NewDelhi.
7. Saxena,R.K.andS. Saxena.(2015). *Comparative Anatomy of Vertebrates*, M.V.Learning,UK.

REFERENCE BOOKS

1) Arumugam,N.(2014). *Animal diversity Volume-1–Invertebrata.*SarasPublication,Nagercoil, TamilNadu.
2) Arumugam,N.(2014). *Animal diversity Volume-2–Chordata*. Saras Publication,Nagercoil, TamilNadu.

3) BarringtonE.J.W.(2012). *Invertebrate structure and function.* Affiliated East West Press Pvt.Ltd., NewDelhi.

4) Richard C. Brusca, Wendy Moore and Stephen M. Shuster. (2016).
Invertebrates. Oxford University Press, USA.
Kent,G.C.(2015).*Comparative Anatomy of the Vertebrates*. McGrawHill, NewYork, USA.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	2	3	3
CO2	3	3	2	2	3
CO3	3	2	3	2	3
CO4	3	2	3	2	3
CO5	3	2	3	2	3

*3 - Strong; 2 - Medium; 1– Low

Semester	CODE NO: 22AU:P08M2	L	T	P	C
I	DEVELOPMENTAL BIOLOGY	4	0	0	3

Learning Objective (LO):

LO1	**To understand the various concepts of development**
LO2	**To study gametogenesis and process of fertilization**
LO3	**To learn the processes of embryogenesis, organ formation and differentiation**
LO4	**To analyse the embryonic induction and teratogenesis**
LO5	**To critically explore assisted reproductive technologies for human welfare**

UNIT-I: Introduction to Embryology

Scope of embryology. Gametogenesis — spermatogenesis, oogenesis and egg membranes. Fertilization - mechanism of fertilization, capacitation, acrosomal reaction, cortical reaction and significance of fertilization. Cleavage – cleavage in frog and chick. Gastrulation — gastrulation in frog and chick. Fate map of amphibians.

UNIT-II: Embryonic adaptations and Parthenogenesis.

Foetal membranes and their functions – Implantation – types and mechanism of implantation. placentation - placenta, structure, types and physiology of placenta. Parthenogenesis – types, mode of action of agents in artificial parthenogenesis –significance of parthenogenesis.

UNIT-III: Organogenesis and Differentiation

Organogenesis - development of brain, eye and heart of mammals (Rabbit). Differentiation, types, chemical basis, selective action of genes, changing pattern of protein synthesis and sequence of gene action in development — stem cells, role of micro environments in differentiation.

UNIT-IV: Embryonic induction and Teratogenesis

Embryonic induction - types, embryonic induction in amphibians, reptiles, birds and mammals.Neural induction, gene activation, mechanism of neural induction and chemical basis of neural induction. Teratogenesis - genetic

teratogenesis - in human beings and animals, teratogenic agents and mechanism of teratogenesis.

UNIT-V: Reproductive Technology for Human Welfare

Causes of impotency and sterility in the male ─ causes of sterility in the female ─Treatment of sterility – Artificial insemination in human beings - Infertility in men and women.

Course Outcomes(CO)

At the end of the course, the student will be able to

CO1	**Acquire knowledge on reproduction and development**
CO2	**Understand process of fertilization**
CO3	**Understand the whole process of embryogenesis**
CO4	**Acquisition of skills in common methods and practices followed indevelopmental biology related laboratory activities and Take up jobs in fertility clinics and research labs**

TEXTBOOKS

1. Verma,P.S.andV.K.Agarwal.(2017). *Chordate Embryology (Developmental Biology),* S.Chandand Co.,New Delhi.
2. Arora, P.Mohan,(2014). *Embryology*, Himalaya publishing House, New Delhi.
3. Arumugam,N.(2014).*A Text Book of Embryology (Developmental Biology),* Saras Publications, Nagercoil,TamilNadu.
4. Balinsky,B.I.(2012). *An Introduction to embryology*, 4thEdition, Saunder‟s College Publishing Ltd, NewYork
5. Philip Grant (1977). *Biology of development systems,* University of Oregon
6. Berrill,N.J.,andG.Karp.(1978).*DevelopmentBiology*,Tata Mc Graw Hill Publishing Co.,Ltd, New Delhi.

REFERENCEBOOKS

1) Madhavan K.S. (2018). *Developmental Biology.* Arjun Publishing House.
2) Subhadra Devi,V.(2018). *Inderbir Singh's Human Embryology,* Jaypee Brothers Medical Publishers, New Delhi.
3) BerryA.K.(2016). *An Introduction to Embryology*. Emkay Publications, New Delhi.
4) Lewis Wolpert, Cheryll Tickle and Alfonso Martinez Arias. (2015). *Principles of Development*. Oxford University Press, USA.
5) JainP.C.(2013).*Elements of Developmental Biology*.Vishal Publishing Co., Punjab.
6) Carlson, B.M. (2014).*Pattens foundations of Embryology,* Mc Graw Hill

7) SastryK.V.andVinitaShukal.(2012). *Developmental Biology*. Rastogi Publication, Meerut,UttarPradesh.

Outcome Mapping

COs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
CO2	3	3	3	3	3
CO3	3	2	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	2	3

*3 - strong; 2 - Medium; 1 – Low

Semester	CODE NO : 22AU:P08M3	L	T	P	C
I	CELL AND MOLECULAR BIOLOGY	4	0	0	3

Learning Objective (LO):

LO1	To understand the molecular basis of cell structure and functions
LO2	To learn the structure and functions of various organization and cell membrane.
LO3	To learn bioenergetics and biogenesis
LO4	To learn structure and replication of DNA
LO5	To learn various molecular techniques

UNIT-I: Cell structure and Cell membrane

Cell Structure: Introduction – Structural organization of prokaryotic and eukaryotic cells; structural differences of prokaryotic and eukaryotic cells.

Cell membrane: Ultra structure of plasma membrane – chemical composition of cell membrane, lipid bilayer – unit membrane concept – Fluid mosaic model; Functions of Plasma membrane; membrane transport - cell adhesion – cell recognition.

UNIT-II: Organelles of Endo membrane

Golgi apparatus & secretion: Ultra structure – chemical composition - origin of golgi complex-process and mechanism of secretion–Type of secretion– Function of Golgi apparatus.

Lysosome: Characteristics of lysosomal membrane and enzymes - Polymorphism of lysosome –functions of lysosome.

Endoplasmic reticulum and ribosomes: morphology and functions of endoplasmic reticulum - Structure of ribosomes and rRNAs - Organization of ribosomes — Role of ribosomes in protein synthesis.

UNIT-III: Organelles of Bio energetic & Biogenesis

Organelles of Bioenergetics: Mitochondria - Ultra structure - respiratory chain complex; chemical composition and enzyme distribution–role in metabolism for cellular energetic

-Anaerobic glycolysis, Pasteur effect-Krebscycle–Formation of ATP.Chemical and conformation coupling hypothesis; shuttle system — Glycero phosphate.

Organelle of Biogenesis: Chloroplast — Ultra structure - photochemical reaction in biogenesis-Lightre action and Darkre action–Role of CO_2 and H_2O in photosynthesis

– „Z" scheme.

UNIT -IV: DNA Structure and Replication

Structure, Chemical composition - Types and their importance - Properties of DNA –De narturation, Re naturation and Hybridization.

DNA replication: Prokaryotic and eukaryotic DNA replication – Semi – conservative replication mechanism, enzymes and necessary proteins origin, initiation, Termination –DNA polymerase, telomerease and mode of action– replication factors.

UNIT-V: RNAs Structure and Transcription

Structural features of RNAs: Structure of rRNA in prokaryotes and eukaryotes —structure of tRNA and anti codon features — structure of mRNA in prokaryotes and eukaryotes.

Transcription and processing of RNA: Genetic code – Prokaryotic and eukaryotic transcription – RNA polymerases, general and specific transcription factors – regulatory elements – mechanism of transcription. Post transcriptional modifications. Translation –Prokaryotic and eukaryotic translation - mechanism of initiation, elongation and termination – regulation of translation. Post translational modifications.

Course Outcomes(CO)

At the end of the course, the student will be able to

CO1	**Acquire knowledge on cellular structure and functions.**
CO2	**Understand the process of energetic and genesis in cells**
CO3	**Interpret the structural and functional significances of DNA and RNA**
CO4	**Take up jobs in molecular biology labs and clinical labs**

TEXTBOOKS

1. De Robertis E.D.D and De.Robertis E.M.F.(2017). *Cell and Molecular Biology.* Lippincott Williams & Wilkins, USA.
2. Pollard,T.D., W.C.Earnshaw,J.L. Schwartz and G.Johnson. (2017). *CellBiology,*

3. Verma P.S. and V.K. Agarwal, (2015): *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology*, S.Chand and Company, New Delhi.
4. Gupta.P.K.,(2003). *Cell and Molecular Biology*, Rastogi Publication, Meerut, India.
5. Lodish.H,Berk.A,Zipursky.SL,Matiudaira.P,Baltimore.D and Darnell J. (2000). *Molecular Biology of the cell,* W.H.Freeman and company, NewYork.
6. Lewin, B. (2000). *Gene VII,* Oxford University Press, London.

REFERENCEBOOKS

1) Verma P.S. and V.K. Agarwal. (2016). *Cell Biology*. S.Chand & Co., New Delhi.
2) Arnold Berk, Chris A. Kaiserand Harvey Ledish. (2016). *Molecular Cell Biology*. W H Freeman, USA.
3) Malathi, V. (2012). *Essentials of Biology*. Pearson Education, Chennai, India.
4) Bruce Alberts, Alexander D. Johnson and Julian Lewis. (2014). *Molecular Biology of the Cell*. W.W. Norton & Co., USA.
5) Geoffrey M.Cooper and Robert E. Hausman. (2013). *The Cell: A Molecular Approach*. Sinauer Associates Inc., USA.

Outcome Mapping

COs	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3
CO2	3	3	3	3	3
CO3	3	3	2	3	3
CO4	2	2	1	2	1
CO5	3	3	2	1	3

*3 - Strong; 2 -Medium; 1-Low

Semester	CODE NO: 22AU:P08M4P	L	T	P	C
I	Core Practical I Covering – Structure and functions of invertebrate and vertebrate and Developmental Biology, Cell and Molecular Biology	12	0	0	6

Course Objective:

1	Understand the structure and functions of various systems in animals
2	Learn the adaptive features of different groups of animals. Learn the mounting techniques
3	Acquire strong knowledge on the animal skeletal system
4	Acquire knowledge to differentiate the cells of various living organisms and become aware of physiological processes of cells e.g. cell divisions, various stages of fertilization and embryo development.
5	Understand the structure and functions of various systems in animals

STRUCTURE AND FUNCTIONS OF INVERTEBRATES AND VERTEBRATES NCTIONS OF INVERTEBRATES AND VERTEBRATES

Dissection of Cockroach–Digestive and Nervous system, Dissection of Prawn -Nervous system and mounting of appendages.
Dissection of Fish—Nervous system, Respiratory system and Digestive system.

1.Observation and Classification of the following Specimens by giving reasons:Paramecium, Sycon, Obelia, *Taeniasolium*, Neries, Prawn, Freshwater mussel, Amphioxus, Hyla, Calotes, Rat.
2.Study of Adaptations to the mode of life:Trypanosoma, Corals, Ascaris,
3.Biological Significance of the following forms:Peripatus, Seaanemone, Anabas, Arius, Exocoetus, Eel, Amblystoma, Woodpecker, Ant eater, Lingula, Sagitta and Phoronis.
4.Relate structure and function of the following forms: Taenia, Scolex, Nereis - Parapodium, Ctenoid and Quill feather of pigeon.

DEVELOPEMENTAL BIOLOGY

Demonstration of male and female reproductive system in mammals (rat)-specimens
Dissection and mounting of chick blastoderm to identify different stages in chick development.
Observation of early development of frog–two celled stage, 4celled stage, 8celled stage

and sixteen celled stage, blastula, gastrula and yolkplug stage.

Spotters

Regeneration in amphibian–frog tadpole.
Observation of metamorphosis in insects.
Observation of different types of placenta–slides.
Analysis of excretory products–chick embryo.
Histology of mammalian testis and ovary–slides.
Observation of uterine cycles in mammals–slides.

CELL AND MOLECULAR BIOLOGY

1. Light Microscope–components, use and principles.
2. Squash Preparation different stages of mitosis in onion root tips
3. Squash preparation of different stages of meiosis in grasshopper testis
4. Mounting of polytene chromosomes from salivary gland of Chironomus larva
5. Study of Micrometry: a) Camera lucida, b) Stage micrometer, c) Ocular micrometer
6. Identification of drumstick chromosome from human blood smear preparation
7. Identification of Barr body from buccal smear preparation

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Understand the morphological features and physiological functions like Respiration, reproduction and nervous system of invertebrates and Vertebrates.
2. Understand the various salient features of higher invertebrates and Vertebrates.
3. Differentiate the patterns of functioning of various organ systems in invertebrates and vertebrates.
4. Know the structural organization and functioning of various organs in invertebrates and vertebrates.
5. Understand the different stages of blastula, gastrula and yolk plug stage.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

CORE ELECTIVE – I PUBLIC HEALTH AND HYGIENE

CODE: 22AU:PO8E1

Learning Objective (LO):

1. To learn important vector borne diseases of human being
2. To understand diseases caused by protozoans
3. To acquire knowledge in diseases caused by helminthes
4. To learn common air, food and water borne disease

UNIT-I: Introduction to Important Diseases to Human Beings

Mosquito borne diseases — malaria, filariasis and chikungunya — symptoms and treatments. Morphology, life cycle and control measures of vector mosquitoes-Anopheles, Culex and Aedes species and vector management.

UNIT-II: Vector borne Diseases to Human Beings

Vector borne diseases — Kala - azar, typhoid, amoebic dysentery, cholera and sleeping sickness - Symptoms and treatments - Morphology, life cycle and control measures of sand flies, House flies and Tse tse fly.

UNIT-III: Protozoan Diseases to Human Beings

Protozoan diseases – Trypanosomiasis, Leishmaniasis and Trichomoniasis symptoms and treatments - Morphology, life cycle and control measures of Trypanosoma, Leishmania and Trichomona.

UNIT-IV: Helminthes Diseases to Human Beings

Helminthes diseases - Taeniasis, Schistosomiasis and Ascariasis — symptoms and treatments-Morphology, life cycle and control measures of Taenia solium, Schistosoma and Ascaris.

UNIT-V: Air, Food and Waterborne diseases

Air borne diseases: Tuberculosis, Diphtheria and pneumonia. Food and water borne diseases: sources of water pollutants – cholera, botulism, shogellosis and typhoid fever. Cancer–sources, different types of tumors and treatment.

Course Outcomes (CO)

1. At the end of the course, the student will be able to
2. Analyse various common vectors and diseases, causing
3. Impart skills the general Public for public health and hygiene
4. Work in clinical labs

5. Take up research on issues related to public health and hygiene

TEXTBOOKS

1. Rathinasamy G.K., (1974). *A Hand book of Medical Entomology and Elementary Parastitology*.Viswanathan Printers and Publication Pvt., Ltd., Chennai
2. Dubey,R.C. and D.K.Maheswari, (2005). *A text book of Microbiology*, S.Chand & Company Ltd., NewDelhi.
3. Gupta,P.K and V.Rampraksh, (1985). *Advance in Toxicology and Environmental Health*. Jagmender Book Agency, NewDelhi
4. Jordon, E. L. and P. S. Verma, (2005), "*Invertebrate Zoology*", S. Chand &Company Ltd., New Delhi.
5. Parthiban, M. and B. Vasantharaj David, (2007)." *Manual of Household & Public Health pests and theircontrol*", Namrutha Publications, Chennai.

REFERENCEBOOKS

1) Mark F.Wiser. (2012). *Protozoa and Human Disease*. Garland Science, New York, United States.
2) Burton J.Bogitsh, Clint E.Carter and Thomas N.Oeltmann. (2012). *Human Parasitology*. Academic Press, USA.
3) Ruth Leventhal. (2011). *Medical Parasitology*. F.A. Davis Company, USA.
4) Sudhir R.Wagh and Vishnu K. Deshmukh. (2015). *Medical Entomology*. Success Publications, Tiruchirappalli, TamilNadu.
5) Kenrad E. Nelson and Carolyn Williams. (2013). *Infectious Disease Epidemiology*. Jones and Bartlett Publishers, USA.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

OPEN ELECTIVE – I POULTRY FARMING

CODE: 22AU: P08OE1

Learning Objectives:

1. The main aim is to give information about the poultry and its importance. It gives an idea for the self- employment opportunities to the students.

2. To understand the poultry industry based on the past, present and emphasis of future growth.

3. To understand with different systems of rearing commercial layers and broilers production and efficiently marketing.

4. Teaching about nutrient requirements of poultry and factors influencing the same, imparting knowledge of different types of feeds and feeding methods.

5. To understand the clear knowledge about the common diseases affecting them and their control measure.

UNIT I Scope and classification

Introduction to poultry science –Origin and history of poultry species: Chicken, turkey, duck and quail - Classification of Poultry - broiler, layer and breeder– Scope of the poultry - Brooding and rearing – Natural and artificial brooding Development of Poultry Industry in India

UNIT II Layer production

Selection of site and location of layer farm –lay out of the farm – Systems of housing – types of roofs and materials- trusses for poultry houses – Design of different Poultry Houses for large and medium size layer farms – Cages and modified cages for egg type birds – Layer farm equipments -Management of layers during peak egg production and maintaining- Economic traits of egg-type chicken and their standardization- Packaging and transportation of eggs.

UNIT III Broiler production

Systems of rearing broilers – Location, layout and design of Broiler houses – Broiler farm equipment– Lighting for broilers – Environmentally controlled broiler houses and their management- Economic traits of meat – type chicken and their standardization - Systems of Integration in broiler production and marketing –transport of broilers– Different ways of marketing of broilers– Organic broiler meat production.

UNIT IV Poultry nutrition and feeding

Poultry feed management – Principles of feeding- Nutrient requirements for different stages of layers and broilers- Macro and micro-nutrients-Feed formulation and Methods of feeding-Factors influencing the feed consumption in birds - Commonly occurring anti nutrients and toxicants in poultry feed ingredients - Nutritional and metabolic disorders in poultry.

UNIT V Disease and vaccination

Common Bacterial, Fungal and Viral infective diseases-Protozoan and Parasitic diseases - Preventive measures -Diagnosis- vaccination- treatment and control measures.

Course Outcome

1. The Students will have knowledge about the Prospects of Poultry Industry.
2. The Students will have knowledge about the commercial layer production systems, housing and equipments.
3. The Students will have Knowledge about the commercial broiler production systems, housing and equipments.
4. The Students will have Knowledge about the poultry nutrients and feeding of poultry farming.
5. Students will get knowledge about a common diseases and disorders of poultry, diagnosis, vaccination, prevention, control and treatment.

Text Books

1. Babu, M. and Lurthu Reetha, T. 2011. A Handbook on Poultry farming. Tamilnadu Veterinary and Animal Sciences University and Nehru Memorial College, Tiruchy.
2. Bell D. Donald and Weaver D. William Jr., 2007. Commercial Chicken Meat and Egg Production. 5th Edition. Springer India Pvt. Ltd., Noida.
3. Hurd M. Louis, 2003. Modern Poultry Farming. 1st Edition. International Book Distributing Company, Lucknow
4. Mahajan Naresh, 2015. Poultry Nutrition and Management. 1st Edition. Anmol Publications Pvt. Ltd., New Delhi.
5. Narahari D., and Kumararaj R., 2008. Handbook of Applied Broiler Production. 1st Edition. Poultry Punch Publication (I) Pvt. Ltd., New Delhi, India.
6. Prasab Sushil, 2012. Handbook of Poultry Production. 1st Edition. Enkay Publishing House, New Delhi.
7. Reddy Ramasubba V., and Bhosale T. Dinesh, 2004. Handbook of Poultry Nutrition. 1st Edition. International Book Distribution Co., Lucknow, India.
8. Saif., Y. M., et al., 2013. Diseases of Poultry. 12th Edition. Blackwell Publishing, USA.
9. Tomar, B.S. and Singh, N. 2007. A Text Book of Applied Zoology. Emkay Publications, Delhi.
10. Vegad J. L., 2004. Poultry Diseases: a guide for farmers and poultry professionals. 2nd Edition. International Book Distributing Co., Lucknow, UPOutcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

Semester -II

Semester	CODE NO : 22AU: P08M5	L	T	P	C
II	ANIMAL PHYSIOLOGY	4	0	0	3

Learning Objective (LO):

LO1	To learn the significance of food and physiology diagram
LO2	To understand the significance of excretory and osmoregulation system.
LO3	To study the functioning of cardio vascular system
LO4	To study respiratory and nervous systems including various receptors

UNIT-I: Food and Digestion

Composition of food - classification of nutritive substances - comparative physiology of digestion - digestion in mammals - digestive enzymes – absorption - hormonal control of digestion—BMR—BMI.

UNIT-II: Excretion and Osmoregulation

Excretion- Nitrogenous wastes and their formation –Patterns of Excretion in different animal groups – Mammalian excretory system – structure and functions of vertebrate kidney-Mechanism of urine formation – Acid-base balance – electrolyte balance –Hormonal control of kidney function in mammal. General concepts of osmoregulation – osmoregulation in vertebrates.

UNIT-III: Circulation

Major types of body fluids - circulation of body fluids and their regulations – Composition of blood—blood groups—clotting mechanism—buffer system of blood- Circulation of blood in vertebrates - Open and Closed circulatory systems — Arthropod heart —Chambered hearts and booster pumps. Structure of mammalian heart, origin, conduction and regulations of heartbeat—cardiac cycle and ECG.

UNIT-IV: Respiration

Respiration in vertebrate – Respiratory organs and their ventilation – Integumentary respiration – bronchial respiration – lung respiration – mechanism of respiration invertebrates – Regulation of breathing - Neural and chemical regulation – Transport of Oxygen-Respiratory pigments–Bohr‟s effect– Transport of CO_2–Haldane‟s effect.

UNIT-V: Nervous system, Muscle and Sense organs

Nervous System: Structure of neuron - Transmission of nerve impulse —

axonal transmission - theories of excitation - synaptic transmission – nervous system (central &Peripheral)- neuro endocrine system – hormones and their functions.

Muscle: Types and Structure – chemical composition— mechanism of muscle contraction.

SenseOrgans: Mechanoreceptors — chemoreceptors – photoreceptors — phonoreceptors – equilibrium receptor-Bioluminescence.

CourseOutcomes (CO)

At the end of the course, the student will be able to

CO1	**Understand the normal physiological functions and necessity to maintain a healthy Life**
CO2	**Get an opportunity to understand various factors that could lead to altered physiological functions and there by health problems**
CO3	**Perform various physiological experiments and observations**
CO4	**Take up jobs in clinical lab sand research institutes**

TEXTBOOKS

1. Arumugam, N. and A. Mariakuttikan.(2017). *Animal Physiology,* Saras Publications, Nagercoil, Tamil Nadu.
2. Rastogi, S.C. (2016). *Essentials of Animal Physiology,* New Age Internati
3. Verma,P.S., B.S.Tyagi and V.K. Agarwal, (2015). *Animal Physiology.* S.Chand & Company Ltd, New Delhi.
4. WilliamS.Hoar,(1966). *General and Comparative Physiology*. Prentice Hall of India, NewDelhi.
5. Wilson.A, (1979). *Principles of Animal Physiology*. Macmillan Publishing Co.,Inc. New York.
6. Leon Goldstein, (1977). *Introduction to Comparative Physiology*. Holt, Rinehartand Winston, NewYork.
7. Prosser,L.andA.Brown,(1965). *Comparative Physiology*. Saunders Company, London.

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1) Mohan P. Arora. (2018). *Animal Physiology*. Himalaya Publishing House Pvt. Ltd., New Delhi.
2) Tomar, B.S. and Neera Singh. (2016). *Animal Physiology*. Pragati Prakashan, Meerut, UttarPradesh.
3) Sobti, R.C.(2011).*Animal Physiology*. Narosa Publishing House, NewDelhi.
4) Sandeep Saxena.(2012). *Animal Physiology*. Oxford University Press, USA.
5) Arumugam,N.(2014). *Animal Physiology*. Saras publications. Nagercoil,

Tamilnadu

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

Semester	CODE NO : 22AU:P08M6	L	T	P	C

II	**GENETICS**	**4**	**0**	**0**	**3**

Learning Objective (LO):

LO1	To learn the fundamental concepts of genetics
LO2	To study human health related genetic problems, qualitative and quantitative traits and population genetics
LO3	To learn the structure of genes and their regulation
LO4	To acquire skills in chromosomal alterations, gene mutations and cancer.
LO5	To learn application of genetics concepts in microbial genetics and genetic engineering.

UNIT-I: Principles and Concepts of Gene and Gene mapping

Mendelian principles: Law of Dominance, Law of Segregation and Law of Independent assortment; extensions of laws of inheritance principles: Gene Interactions, dominant epistasis, Pleiotrophy: Penetrance and expressivity. Linkage and crossing over ―concept, theories and example - linkage maps (X chromosome) gene mapping in drosophila, Coincidence and Interference – multiple allele – ABO and Rh blood group in man.

UNIT-II: Quantitative, Population and Human Genetics

Polygenic inheritance: concept, mode of inheritance of skin colour in man– heritability and its measurements - normal karyotypes – Syndromes related to numerical variations of chromosomes – pedigree analysis – genetic counseling, Hardy-Weinberg law of genetic equilibrium.

UNIT-III: Fine Structure of Gene and Regulation of Gene action

Fine structure of gene - regulation of gene action - "Lac and His" operon system-genes and metabolism –inborn errors of carbohydrate, proteins and lipid metabolism in man. One gene one enzyme concept–One gene one polypeptide concept.

UNIT-IV: Chromosomal Alterations, Gene Mutation and Oncogenes

Chromosomal aberrations – types and causes – point mutation – mutagens-chemical mutagens–molecular mechanism of gene mutation, mutant types – lethal, conditional biochemical loss of function–oncogene and cancer.

UNIT-V: Microbial Genetics and Genetic Engineering

Microbial genetics: Methods of genetic transduction – sex – duction – genetic

engineering
- restriction enzymes – recombinant DNA techniques – applications of recombinant DNA technology.

Course Outcomes (CO)

At the end of the course, the student will be able to

CO1	**Interpret phenotypic expressions based on genotype**
CO2	**Understand and interpret genetically linked diseases**
CO3	**Perform blood group analysis and test metabolic disorders**
CO4	**Working in clinical laboratories and take up researches**

TEXTBOOKS

1. Snustad, D.P. and M. J.Simmons. (2017). *Principles of Genetics,* John Wiley & Sons Inc., India.
2. Verma P.S. and V.K. Agarwal, (2015): *Cell Biology, Genetics, MolecularBiology, Evolution and Ecology*, S.Chand and Company, New Delhi.
3. Jocelyn E. Krebs, ElliottS. Goldstein and Stephen T. Kilpatrick. (2015). *Lewins's Genes XI,* Jones and Bartlett Publishers, Inc., USA.
4. KarvitaB.Aluwalia,(1991).,,*Genetics'*,WileyEasternLtd.,NewDelhi.
5. Robert H. Tamirin, (2004). *'Principles ofGenetics'*Tata McGraw -Hill Publishing Company Ltd. New Delhi.
6. Sarin,C.,(1990).,,*Genetics'*.TataMc Graw-Hill Publishing Co.Ltd, NewDelhi.

REFERENCE BOOKS

1) Gangane S.D. (2017). *Human Genetics*. Elsevier, India.
2) Robert Tamarin. (2017). *Principles of Genetics.*Mc Graw Hill, New York, USA.
3) James D. Watson, A. Baker Tania and P.Bell Stephen. (2017). *Molecular Biology of the Gene*. Pearson, UK.
4) Weaver, R.F. and P.W. Hedrick. (2015). *Genetics*, Brown (William C.) Co., U.S.
5) William S. Klug, Michael R.Cummings and Chariotte A.Spencer. (2016). *Concept of Genetics.* Pearson, UK.
6) Peter D. Snustad and Michael J. Simmons. (2011). *Genetics*. John Wiley Sons, India.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

Semester	CODE NO : 22AU:P08M7	L	T	P	C
II	IMMUNOLOGY& BIOTECHNOLOGY	4	0	0	

Learning Objectives

LO1	To develop awareness regarding the molecules, cells and organ involved in immune system and their significances in up keeping the organism
LO2	To learn the various types of antigen and antibody and interaction
LO3	To gain knowledge regarding the application of immunological techniques
LO4	To learn the basic concepts in biotechnology
LO5	To learn the various techniques used in biotechnology

UNIT – I: Cells and Organs of Immune System

Introduction- immunity- types-innate, acquired. Cells of the Immune system ; Haematopoietic stem cells- Myeloid and lymphoid progenitors and their derivatives – mononuclear phagocytes and granulocytic cells(Monocytes, Th Cells, Tc cells, B Cells, NK cells, mast cells, dendritic cells, neutrophils, eosinophils, basophils) and their immunological significance. Primary lymphoid organs: thymus, bone marrow and bursa of Fabricious. Secondary lymphoid organs: lymph nodes, spleen and MALT.

UNIT - II: Antigen and Antibody

Immunogen and Antigen; Definition - Properties of Immunogen: Immunogenicity, antigenicity, allergenicity and tolerogenicity. Factors affecting immunogenicity: foreignness, molecular size, chemical composition & heterogenecity. Antibody - Structure of immunoglobulin, Classes of immunoglobulin (IgG, IgM, IgA, IgE, IgD), Monoclonal and polyclonal antibodies.

UNIT – III: Antigen – Antibody Interactions & Immuno techniques

Salient features of Antigen and Antibody interaction- Detection of Antigen and Antibody interaction-Precipitin reaction, Agglutination reaction – haem agglutination -Radial immune diffusion, double immune diffusion. Radio Immuno assay (RIA). Enzyme linked Immuno sorbant Assay (ELISA).

UNIT - IV: Biotechnology

Definition – Scope – Achievements of Biotechnology – Enzymes in genetic engineering - Restriction Enzymes, DNA ligase, DNA polymerase of Cloning vectors – Plasmids- cloning vector based on E. coli PBR 322 -Bacteriophage, Cosmids, Yeast plasmids - Genomic DNA libraries, cDNA libraries.

UNIT - V: Techniques in Biotechnology

Southern blotting, Northern blotting, Western blotting, In-situ hybridization, DNA sequencing, PCR, DNA finger printing, DNA probes, site – directed mutagenesis, particle gun, microinjection, electroporation.

Course Outcomes (CO)

At the end of the course, the student will be able to

CO1	Analyze the various immunological issues
CO2	Apply immunological procedures for various immunological testing procedures
CO3	Master the theoretical knowledge in various field of biotechnology
CO4	Perform various experiments related to biotechnology
CO5	Master the practical knowledge in the field of biotechnology

Text Book & Reference Book

1. Roitt,I.M.1994. *Essential Immunology*. Blackwell Scientific, Oxford
2. Richard A.Goldsby, Thomas T.Kindt and Barbara A. Osborne. 2000. *Kuby Immunology*.Freeman and Co., New York
3. Stites,D.P.,Terr,A.I. and Parsloio,T.G. 1997.*Medical Immunology*. Prentice Hall, New Jersey
4. Paul,W.E.M.1989. *Fundamentals of Immunobiology*. Raven Press, New York
5. Champion,M.D. and Cooke,A.1987.Advanced Immunology. J.B.Lippincott Ltd., Philadelphia
6. Purohit, S.S. and S.K.Mathur. 1999. *Biotechnology Fundamentals and Application*. Agro Botanica, New Delhi.
7. Alan Scragg. 1999. *Environmental Biotechnoogy*, Longman Publication.
8. R.C.Dubey 2001 *A text book of biotechnology*. Rajendra Ravindra Printer. New Delhi.
9. T.A. Brown 2004 . *Gene cloning and DNA analysis.* Blackwell Science, Osney Mead, Oxford.
10. Dawson, M.T., Powell .R, and Gannon, F. 1996. *Gene Technology*. Bios Scientific Publishers.
11. Chopra, V.L. and Nanin, A.1992. *Genetic Engineering and Biotechnology*. Oxford and I BH Publishing Co., New Delhi.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

Semester	CODE NO : 22AU:P08M8P	L	T	P	C
II	Core Practical II Covering – Animal Physiology, Genetics, Immunology and Biotecnology	12	0	0	6

Course Objective :

1	Acquire strong knowledge on the animal skeletal system
2	Understand and observe as well as correctly identify different cell types, cellular structures using different microscopic techniques.
3	Develop handling - skills through the wet-lab course.
4	Learn the method of culturing of *Drosophila* and identification of their wild and mutant strains
5	Acquire skills to perform human karyotyping and chromosome mapping to identify abnormalities

ANIMAL PHYSIOLOGY

1. Effect of enzyme concentration on the activity of salivary amylase
2. Effect of substrate concentration on the activity of salivary amylase
3. Effect of pH concentration on the activity of salivary amylase
4. Oxygen consumption of fish.-Unit metabolism
5. Effect of thyroxin on the respiratory metabolism of fish.
6. Counting of blood cells (RBC and WBC).
7. Quantitative estimation of haemoglobin.
8. Quantitative estimation of proteins.
9. Biochemical analysis of protein, Carbohydrates and Lipids (Qualitative).

GENETICS

1. Experiments on Mendelian inheritance
2. Experiments on polygenic inheritance
3. Human traits survey and data collection
4. Gene frequency calculations in population - Autosomal, multiple alleles and sex linked genes.
5. Testing the significance of genetic data - Chi-square test.
6. Human pedigree construction to study the inheritance of autosomal character.
7. Human pedigree for sex linked character and counseling
8. Culturing and maintenance of Drosophila in lab - Demonstration.
9. Identification of sex and mutant characters in *Drosophila*
10. Karyotyping of normal man using metaphase chromosomal plate.
11. Identification of human syndromes from karyotyping

IMMUNOLOGY

1. Preparation of antigen and raising of antibody – RBC Proteins.
2. Determination of human blood group by heamagglutination test and assessment of specificity
   Of antigen-antibody reaction.
3. Cell imprinting of lymphoid organ.

BIOTECHNOLOGY

1. Isolation of DNA in human blood serum.
2. Isolation of DNA in human Saliva.
3. Single cell Protein, Bio-reactor, plasmid Pbr322 and PCR.

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Interpret the quantitative of estimation of carbohydrates, protein and lipid.
2. Understand and interpret genetically linked diseases
3. Perform blood group analysis and test metabolic disorders Working in clinical laboratories and take up researches
4. Understand the cell imprinting lymphoid organ.
5. Understand the isolation of DNA method.

Outcome Mapping

COs	PO1	PO2	PO3	PO4	PO5
CO1	3	2	3	3	3
CO2	3	3	3	3	3
CO3	3	3	2	3	3
CO4	2	2	1	2	1
CO5	3	3	2	1	3

*3 - Strong; 2 -Medium; 1-Low

CORE ELECTIVE – II
VERMITECHNOLOGY

CODE: 22AU:P08E2

Learning Objective (LO):

To understand the knowledge of Earthworms and their biological diversity and importance
To gain the principals and applications of vermitechnology and their application techniques
To identify the different methods of Composts and their benefits in agriculture fields
To understand the significant of vermitechnology and their impacts.

UNIT - I

Earthworms and their environment, diversity, distribution and biology.

The nature of earthworms soil environment – basic environmental requirements.

Food and digestive capabilities, respiratory requirements and adaptation.

Systematic affinities and evolutionary descent, Families, genera and species.

Geographical distribution - Life style, behaviour patterns, water relationships, regeneration and transpiration.

UNIT - II

Role of earthworms in soil structure, fertility and productivity.

Earthworms burrows and casts.

Effect earthworms in soil structure – carbon, nitrogen and phosphorous, Transformations.

Earthworms as bio indicators of soil types.

Effect of earthworms on plant productivity.

Earthworms in land amelioration and reclamation.

Earthworms as indicators of environmental contamination.

UNIT - III

Earthworms in organic waste management.

Management of sewage sludge by earthworms.

Management of animal, vegetable and industrial organic waste by earthworms.

Earthworm composts as plant growth media and its marketing.

The use of earthworm as food protein source for animals

Engineering of waste management.

Role of earthworms in processing organic wastes applied to agricultural and other land

UNIT – IV

Effects of agricultural practices and chemicals on earthworms.

The effects of cultivation.

The effects of cropping.

The effects of fertilizers, Chemicals and Radio isotopes.

UNIT - V

Earthworms and microorganisms and field sampling methods.

The effects of earthworms on the number, biomass and activity of microorganisms.

Importance of microorganisms as food for earthworms.

Dispersal of microorganisms earthworms.

Role of intestinal microbes of earthworms on the decomposition of organic wastes.

Course Outcomes (CO)

At the end of the course, the student will be able to:
1. Gained the theoretical as well as practical knowledge in the field of and Vermiculture practices.
2. Interpret the Modern concepts and their application
3. Appreciate the biological – soil elements in the behavior of various Earthworm Composts and their significance

4. Understand the impact of soil reclamations in various case studies.

REFERENCES:

1. Edwards, C.A & P.J Bohlen, 1996. Biology and ecology of earthworms III Edn. Chapman & Hall N.Y.U.S.A.
2. Edwards, C.A & J.R Lofty Vermicology – The Biology of earthworm, 1997 Chapman & Hall Publications N.Y.U.S.A.
3. Lee, K.E. 1985. Earthworms their ecology and relationships.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

Semester	CODE NO : 22AU:P08M9	L	T	P	C
III	EVOLUTION	4	0	0	3

LearningObjective (LO):

LO1	To gain awareness about the origin of life
LO2	To understand the roles of variations, polymorphisms, and polyploidy in evolution
LO3	To familiarize the role of isolation and speciation in evolution
LO4	To understand the various types of adaptation sand mimicry
LO5	To learn the evolution of mankind

UNIT-I: Origin

1 Environment:-nature and origin of life – proteins nucleic acids – Container membrane– Molecular interactions – Pool origin–Volcanic origin - Metaoric origin–Chemical Evolution.

Theories

2. The ories of organic evolution: Lamarck‟s Evolutionary propositions – Critical analysis of Lamarck‟sprepositions – Neo – Lamarckism..

3. Theory of natural selection: Darwin –Wallace theory of natural selection – Critical analysis of Darwinism – Neo – Darwinism - Modern synthetic theory.

Natural Selection and process:

4. Process of evolutionary change: Two – Step process Random mating –the Hardy–Weinberg Law and its Application – Migration - Random. Genetic Drift – founder effect and bottle necks – Genetic Assimilation–Genetic Homeostasis.

5. The concept of natural selection - Darwinism Fitness – Selection against recessive homozygotes - selection against dominants and selection without dominance. Selection and mutation— Estimation of mutation rates – selection agains the toro zygotes- Frequency – Dependent selection.

UNIT-II: Mechanism

1. Variation and evolution

Basic units of variability — effect and types. Genetic mutations – chromosomal rearrangements – change in chromosome number, chromosome segregation and recombination – crossingover – mutation and its role in evolution.

The mechanism of natural selection by internal characters - selection by

environmental factors.

Direction of selection–centripetal selection – Centrifugal selection.

2. Polymorphism and evolution

Transient polymorphism and industrial melanism - Balanced and neutral polymorphism- genetic polymorphism- chromosomal polymorphism- criticism of the polymorphism concept – Evolutionary significance of polymorphism

3. Polyploidy and evolution

Polyploidy in animal and plants - types of polyploids - direct effect of Polyploidy - origin of polyploidy and the origin of higher categories in plants— practical significance.

UNIT-III: Isolation and evolution

1. Premating isolation mechanism–Geographical-Ecological seasonal-ethological –physiological and mechanical isolation.

2. Post mating isolation mechanism - Gametic — zygotic mortality - hybrid in viability-hybrid break down – genetic basis of reproductive isolation - origin – significance.

Speciation and evolution

3. Species concept - morphological – Genetic - Sterility based – Biological – sibling concepts –Monotypic and polytypic–Sub-species categories.

4. Types of speciation: Mechanism of speciation – allopatric speciation sympatric– speciation-quantum evolution-evolutionary significance.

UNIT-IV: Adaptation Mimicry and colouration

1. Mimicry–Protective–aggressive-conscious sound and scent mimicry -Batesianand Mullerian mimicry- Experimental proof of mimicry – evolution of mimicry-significance.

2. Colouration: Chemical colours - physical colours - indifferent colours – valuable colours–Symoathetic-cryptic and conceling colouration – standard faunal colours— warning or revealing colours — mimetic colouration — confusing and sexual colouration.

UNIT-V: Trend sandrated

Evolutionary trends: Phylogenetic patterns, - Micro, macro and mega evolution - adaptive radiation trend — convergent - parallel — orthogenetic - non adaptive and interactive trends in evolution.

Evolutionary rates: Morphological rate of evolution- Taxonomic rate- Molecular rate – the role of extinction in macroevolution – measuring of extinct ion rate.

Mankind evolution

Past evolution: Fossil history of mankind - primate, apes - Hominid evolution, early and

middle phase of hominid ancestor – the earliest humans; towards modern human; modern humans.

Present evolution: Cultural and social evolution of hominids.

Future evolution: Biological future of mankind - positive and negative eugenics – mankind and the organic world evolution–biochemical evolution.

CourseOutcomes(CO)

At the end of the course, the student will be able to

CO1	**Analyse the evolutionary history of biological organisms**
CO2	**Critically assess the evolutionary relationship among various phyla**
CO3	**Identify the role of natural selection in the survival of the species**
CO4	**Understand the various mechanisms involved in evolution.**

Textbook:

1. Carl T. Bergstrom, and Lee Alan Dugatkin, (2016). *Evolution (Second Edition),* W.W.Norton and company, New York, USA.
2. Hall, B. K. and B. Hallgrimson. (2014). *Strickbergers Evolution,* Jones and Bartlett Publishersltd., NewDelhi.
3. Arumugam,N. (2014). *Organic Evolution*. Saras Publication. Nagercoil, Tamil Nadu.
4. Verma P.S. and V. K. Agarwal, (2015). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology,* S. Chand and Company, NewDelhi.
5. Verma P.S. and V.K. Agarwal, (2007). *Evolution*, S.Chand and Company, New Delhi.

Reference:

1. Darwin, C. The Origin of species, Te. Pup. Desmond Morries, (1990). *Animal Watching* (FieldGuide), Crown Pup Co., London.
2. Dobzhansky,T.(1951), *Genetics and the origin of species,* Columbia University Press, USA.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 – Low

Semester	CODE NO: 22AU:P08M10	L	T	P	C
III	ENVIRONMENT AND BIODIVERSITY CONSERVATION	4	0	0	3

COURSE OBJECTIVES

1) To gain awareness about the basic concepts of environment and ecology
1) To create a mindset for conservation of biodiversity
2) To familiarize the concept of environmental impact assessment
3) To understand the significance of natural resources and sustainable development
4) To create awareness about environmental pollution and its prevention
5) To learn the phenomenon of global warming and its prevention

UNIT-I: Basic concepts and environmental impact assessment

Concept of ecosystem, environment and biosphere. Biogeochemical cycles - carbon, nitrogen and phosphorous cycles. Environmental impact assessment (EIA): Objectives: General operational procedures and process, concerns in EIA, environmental planning and decision making. Describe properties of EIA methods. General procedures for environmental audit.

UNIT-II: Natural resource and sustainable development

Non-renewable and renewable natural resources and their conservation. Forest resources and types of forests in India. Use and overexploitation of forests. Deforestation and afforestation, land degradation, landslides, soil erosion and desertification. Food resources, world food problems, effect of modern agriculture and over grazing. Concept of sustainable development and brundt land report.

UNIT-III: Environmental pollution and disaster management

Cause, effects and remedial measures of air, water, noise, thermal, radioactive and agriculture pollution. Disasters caused by floods, earthquake and cyclones and their management. Solid waste issues and its management

UNIT-IV: Biodiversity and its conservation

Types of biodiversity, species richness and heterogeneity and significance of biodiversity. Threats to biodiversity and biodiversity crisis. Socio economic and political causes of loss of biodiversity. Conservation of biodiversity: in-situ and ex-situ conservation and biodiversity hotspots. Endangered faunal species of India

UNIT-V: Global warming and water conservation

Global warming: Concept, causes and impacts, Green house effect, Green house

gases, their sources and control measures of global warming. Acid rain and Ozone depletion. Impact of over utilization of surface and ground water. Water conservation, rain water harvesting and water shed management,

Textbooks:

1. Arumugam, N.(2019). *Ecology & Toxicology*, Saras Publications, Nagercoil,TamilNadu.
2. Prabhat Patnaik and Jayanath Bhattacharjee, (2012). *Environmental Biodiversity*, Wisdom Press, New Delhi.
3. Khitoliya,R.K. (2004). *Environmental pollution: Management and control for sustainable developments*.S.Chand&company (p) Ltd., New Delhi, India
4. Saha,T.K.(2007). *Ecology and environmental Biology*. Book sand allied(P) Ltd. Kolkata, India.

ReferenceBooks:

1. Krebs C.J. (2016). *Ecology: The experimental analysis of distribution and abundance*. Pearson India Education service (p) Ltd., New Delhi, India.
2. Arumugam,A. and. Kumaresan,V.(2016). *Environmental studies*. Saras Publication, Nagercoil, TamilNadu.
5. Mehta,M. (2010). *Understanding environmental science*. Discovery publishing house, New Delhi, India.
6. Pandy S.N.and S.P.Misra (2011). *Environment and ecology*. An eBooks Pvt. Ltd, New Delhi, India.
7. Agarwal, K.C.(1999).*EnvironmentalBiology*.AgroBotanica,NewDelhi, India.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 – Low

Semester	CODE NO : 22AU:P08M11	L	T	P	C
III	RESEARCH METHODOLOGY	4	0	0	4

COURSE OBJECTIVES

1) To gain familiarity with research and its types.
2) To learn the appropriate methods of literature collection and analysis.
3) To familiarize Instrumentation and its applications in research.
4) To inculcate interest in students to pursue research.
5) To develop the skill to write the repot writing and thesis

UNIT I: Concept and Constrains of Research

Types of research, role of literature review in research, Importance and need for scientific research and criteria for good research- defining the Hypothesis, Law, and Theory- Research Ethics: Definitions, Principles and Responsibilities, Research Misconduct: Plagiarism- Types, Checking soft wares - Fabrication, Falsification-Intellectual Property Rights- Research Report Writing: Components of a thesis, writing, editing, submitting - defending viva-voce examination

UNIT II: Research Report Writing

Preparation and presentation of oral and poster of research papers for conferences, writing abstracts, research proposal planning and writing, preparation and submission of research paper for peer reviewed journals -selection of journal- problems encountered by research in India – Funding Agencies. Good laboratory practices - Animal Ethics in Research- Rules and Regulations

UNIT III: Data and Literature Collection

Data collection methods – Data types, processing and presentation of data, meaning of primary and secondary data – Books, Journals, Reprints, CD Rom, Internet, literature survey through internet - Preparation of Index cards – Web of Science- Pubmed – Inflibnet- Medline – Agricola – Science direct – virtual sources– citation index – h-index - impact factors – Creation and usage of googlescholar account.

UNIT IV: Laboratory Techniques

ELISA and Blotting techniques - Autoradiography and its application – Radiation measuring devices – Geiger Muller counter, Scintillation counter. Microbial culture techniques and animal cell culture techniques. Normality and Molarities calculation, preparation of reagents for Biochemistry.

UNIT V: Advanced Equipments

Electron microscopy – SEM, TEM, STEM – Principles and application of TLC, HPLC, GC- MS, FT-IR – Principles and applications of Electrophoresis – 2D Electrophoresis, UV - Vis, Calorimeter – Atomic Absorption spectrophotometer – Flame photometer.

Course Outcomes (CO)

At the end of the course, the student will be able to

1.To understand and improve the art of scientific writing.
2.To analyse the raw data and its interpretation.
3.Principles and applications of reliable methods and instruments.
4.The method of publishing an article and impact factors.
5. Understand the testing of hypothesis and interprets the results

Reference Books

1. Research Methodology, Methods and Techniques - C.R.Kothari Wishwa Prakasam Publication, II Editions.
2. Research an introduction Robert Ross – Harper and Row Publications.
3. A Hand book of Methodology of Research- Rajammal P.A Devadass- Vidyalaya Press.
4. How to write and publish a scientific paper –R.A. Day- Cambridge University Press.
5. Chandler DE,RW. Robertson (2009)Bio imaging Current concepts in light and electron microscopy, Jones &Bartlet publishers, Sandburry, MA,USA.
6. Gurumani N (2008) Research Methodology for Biological Science, Mjp Publishers.
7. MJ Reily. Bioinstrumentation. CBS Publishers& Distributors ,(2019).

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

Semester	CODE NO : 22AU:P08M12P	L	T	P	C
III	PRACTICAL COVERING - EVOLUTION, ENVIRONMENT AND BIODIVERSITY CONSERVSTION AND RESEARCH METHODOLOGY	12	0	0	6

EVOLUTION

1. Genetic drift in small and large population using dummy materials
2. Sexual selection(a) Secondary sexual characters, e.g. Chimeroid fish(male), (b) Brooding organs- Sea Horse(male),(c)Special sound producing organs-scale insect(male),(d)Rhinoceros beetle(male).
3. Polymorphism- (a) Transient Polymorphism e.g. industrial melanism, (b)Neutral Polymorphism e.g. Umbonium shells,(c)Balanced Polymorphism
4. Genetic Assimilation–in Drosophila
5. Identification of male and female Drosophila
6. Mimicry and Colouration- Concealing mimicrying, e.g. Kallima butterfly, Geometrid moth, Stickinsect, Leaf insect.

   Warning mimicry-Viceroy and Monarch butterfly, Batesian and Mullerian mimicry.
7. Paleontology:Invertebrate fossil-Trilobite,VertebrateFossil-Archaeopteryx.
8. Osteology: Evolution of reptilian skull and its inter relationship
9. Evolution of mankind- similarities and differences between apes and man. Evolution of human skull.

ENVIRONMENT AND BIODIVERSITY CONSERVATION

1. Estimation of dissolved Oxygen content of water samples
2. Determination of Oxygen sag curve from river
3. Estimation of dissolved Carbon–Dioxide
4. Estimation of Hydrogen sulphide in water samples
5. Estimation of Residual chlorine in water samples
6. Estimation of total dissolved solids of water samples
7. Determination of sulphate in water samples
8. Determination of iron in water samples
9. Determination of silicate in water samples
10. Determination of nitrate/Nitrate in water samples
11. Field visits to areas of environmental and biodiversity significance
12. Behavioural changes of organisms in polluted environment
13. Food chain and bioaccumulation

COURSE OUTCOMES (CO)

At the end of the course, the student will be able to

1. Analyse and appreciate the basic ecological concepts
2. Critically assess environmental disasters and suggest counter measures
3. Develop a mind set to safeguard natural resources and take forward the concept of sustainable development
4. Understand the Environment Protect by acting against pollution,
5. Take up employment in environment related agencies and institution and Educate the public regarding the importance of rain water harvesting and water Conservation

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 – Low

CORE ELECTIVE III FISHERIES & AQUACULTURE

CODE: 22AU:P08E3

COURSE OBJECTIVES

1) To learn the principles and practices followed in Inland fisheries and aquaculture
2) To learn biology and fisheries potential of marine fisheries
3) To acquire skills in culturing finfishes
4) To develop skill on fin fish culture
5) To learn fish harvesting and post harvesting technology

UNIT-I: In land fisheries

Biology and commercial importance of major inland fishes of India: Indian major carps; air breathing fishes - Channa, Clarias, Common carp, grass carp, silver carp, trouts, mahaseer and English carp. Food and feeding habits of cultivable fishes. Age and growth determination: Scalereading, length-weight relationship.

UNIT-II: Marine Fisheries

Brief outline of inshore, coastal, offshore and deep sea fishery potential of India. Biology of commercially importance fishes: Hilsa, oil sardine, Mackeral and Bombay duck. Crustacean fisheries: prawns, shrimps and crabs. Molluscan fisheries: edible oyster, mussels and cephalopods (Sepia and Loligo)

UNIT-III: Fin Fish culture

Types of culture, types of ponds, fish pond preparation, algal bloom and its eradication. Stocking of seeds, feeding. Predators and their control. Sampling and harvesting. Transport of fish seed. Major diseases, symptoms and treatment.

UNIT-IV: Shell fish and sea weed culture

Culture of fresh water prawn — *Macrobrachium rosenbergii*. Culture of brakish water prawn *Litopenaeus vannamei*. Culture of pearl oyster (*Pinctada fucata*), green mussel (*Pernaviridis*), lobster (*Panulirus homarus*). Culture of seaweed.

UNIT-V: Harvesting and Post harvest technology and Economics of Aquaculture

Fish finding devices: Sonars and Echo sounder. Fishing gears: Nets and seines — gillnets, fyke net, pound net, dip net, casting net; hooks and lines. Fish preservation: Common principles of fish preservation and major methods of fish preservation. Fishery products and by products: Fish liver oil, fish body oil, fish meal, fish flour, fish silage, fish manure and guano, fish sausage, fish glue, isinglass, fish leather, fish macaroni. Fish and prawn economics of aquaculture – Fish and prawn marketing – process.

COURSE OUTCOMES (CO)

At the end of the course, the student will be able to

6) Understand and analyse various issues related to fisheries and aquaculture
7) Take up jobs in fisheries and aquaculture sectors
8) Start aquaculture activities on their own
9) Take up jobs in marine product export sectors and also take up research activities in various fisheries institutions and Universities
10) Acquired the knowledge about fisheries entrepreneurship

TEXT BOOKS

1. Gupta, S.K. and P.C.Gupta. (2017). *General and Applied Ichthyology (Fish&Fisheries),* S.Chand and Co., New Delhi.
2. Pillay,T.V.R.,(1995). *Aquaculture Principles and Practices*. Fishing New Books, Black well Science Ltd., Oxford.
3. Jhingran,V.J.,(1991). *Fish and Fisheries of India*. Hindustan Publishing Corporation, New Delhi.
4. Santhanam, R., Sugumaran, N. and P. Natarajan, (1997). *A Manual of Fresh Water Aquaculture*. Oxford and IBH Pub. Co., Ltd., New Delhi.
5. Biswas,K.P.(2012). *Advancement of Fish, Fisheries and Technology*, Narendra Publishing House, New Delhi.
6. Lakhsmi Prasad, T.and K. Ramasway. (2014). *Fish Processing Technology*, Crescent Publishers Corporation, New Delhi.

REFERENCE BOOKS

1) Singh B.and Dey A. (2017). *Fish and Fisheries*. Invicible Publishers, Haryana.
2) Dholakia, A.D. (2016). *Fisheries and Aquatic Resources of India,* Daya Publishing House, New Delhi.
3) Arumugam N. (2014). *Aquaculture and Fisheries*. Saras publications, Nagercoil, Tamil Nadu.
4) Vishwas B.Sakhare. (2013). *In land Fisheries*. Daya Publishing House, New Delhi.
5) Pillay T.V.R. and M. N. Kutty. (2011). *Aquaculture:Principles and Practices.* Wiley India Pvt. Ltd.
6) Rajendra Kumar Rath.(2011). *Freshwater Aquaculture*. Scientific Publishers, Jodhpur.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

OPEN ELECTIVE II DAIRY FARMING

22AU:P08OE2

COURSE OBJECTIVES

At the end of the course, the student will be able to:

1. Learned about dairy farming and dairy breeds
2. Learned on cattle feed and nutritional requirements of cattles
3. Gained knowledge about techniques of producing quality milk

Unit-I

Feeding and Nutrition: Structure of digestive system, physiology of digestion - Animal Nutrition: Common cattle feed -Green fodder, Classification of feeds and fodder used in dairy animals (Grass fodder – Cereal fodder and legume fodder – Concentrates (energy and protein) Roughages (Dry and succulent). Conservation of fodder – Hay, Silage, Straw- Stover. Methods of making hay and silage - Ration - Its computation and qualities. Computation of a balanced ration.

Unit-II

Feeding and Nutrition: Structure of digestive system, physiology of digestion - Animal Nutrition: Common cattle feed -Green fodder, Classification of feeds and fodder used in dairy animals (Grass fodder – Cereal fodder and legume fodder – Concentrates (energy and protein) Roughages (Dry and succulent). Conservation of fodder – Hay, Silage, Straw- Stover. Methods of making hay and silage - Ration - Its computation and qualities. Computation of a balanced ration.

Unit-III

Dairy Management : Housing and equipments for dairy cows - Feeding and management of pregnant cows, young calves - Techniques of producing quality milk- Artificial insemination- Semen collection, storage & insemination Techniques. Systems of breeding -Hybrid vigour - Grading, Pure breeding – Merits and demerits of inbreeding and out breeding.

Unit- IV

Milk chemistry: Composition of Milk and nutritive values. Techniques to detect milk adultration. Spoilage of milk-causes and prevention. Pasteurization of milk-principle and methods. Equipments and efficiency- testing and cleaning and sanitation. Preparation of Curd, Butter and Ghee. Role of co-operative societies in milk production and Marketing.

Unit-V

Live stock diseases, symptoms, causes and control measures: Viral diseases - Rinderpest, Foot and mouth disease and cow pox. Bacterial diseases – Mastitis, Anthrax, Tuberculosis, Haemorrhagic septicaemia and Brucellosis. Metabolic diseases - Milk fever and blot. External and internal parasites of cattles and their control measures.

Course Outcomes (CO)

At the end of the course, the student will be able to

1. Learned concept of dairy by products and marketing techniques
2. Understand the livestock diseases and control measures
3. Knowledge gained about Composition of Milk and nutritive values
4. Livestock diseases, symptoms, causes and control measures Developed the skill as entrepreneurship

References:

1. Banerjee. G. C., 2007. A Text book of Animal husbandry, Oxford & IBH Publication. New Delhi.
2.Sasting. N.S.R and C. K. Thamas. 1976.Farm animal management, Vikas Publishing House P. Ltd.
3.Shukla, G.S and V. B. Upadhayay., 2000. Economic Zoology. Rastogi publications.
4. Jayasuryaet al., 2013. Economic Zoology. Saras Publications Page. 249-284.
5. Sachetic. A. K., 1989. Animal Reproduction and Artificial insemination, NCERT publications.
6.Makkar. H. P. S, and K.Becker 1990.Hand book of Animal Husbandry, NDRI publications.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 – Low

Semester	CODE NO : 22AU:M13	L	T	P	C
IV	BIOCHEMISTRY	4	0	0	4

COURSE OBJECTIVES

1. To learn classification and metabolism of carbohydrates
2. To understand the structure and metabolism of protein
3. To learn the structure and functions of lipids
4. To acquire knowledge about various enzymes and hormones and their actions
5. To acquire knowledge about the significance of vitamins

UNIT-I: Buffers and Carbohydrate.

i). pH and buffers—Water, carbon dioxide and oxygen, properties, outlines of Biochemical energies.

ii). Carbohydrates: Methods of study of intermediary metabolism of Carbohydrates;

A general account of classification— Structure and properties of mono and polysaccharides - metabolism of carbohydrates, glycolysis, Citric acid cycle, Gluco neo genesis – defect in carbohydrate metabolism.

UNIT-II : Proteins:

Classification and isolation – The fundamental physiochemical principles and structure of amino acids, peptides and proteins - protein metabolism – Metabolism of amino acids in general.

UNIT-III: Lipids:

Classification of lipids – Structure and chemistry of single and compound lipids; metabolism of fats and fatty acids – Defects in lipid metabolism.

UNIT-IV: Enzymes and Hormones

i) Enzymes: Classification – Enzyme kinetics – Effects of substrate concentration – Inhibition and mechanism of enzyme action - Co-enzymes.

ii) Hormones: Classification, biosynthesis and function – Pancreatic and thyroid hormones.

UNIT-V: Nucleic acids and Vitamins

Composition and structure of nucleic acids: RNA and DNA-Major pathways in the synthesis of RNA and DNA.

Vitamins – occurrence – grouping – deficiency diseases.

COURSE OUTCOMES

At the end of the course, the student will be able to

1.Understand various micro and macro molecules and their significance

2.Discriminate various metabolic disorders

3.Take up jobs in clinical labs

4.Analyze biological samples of bio-chemical importance

4.Understand the metabolism of macromolecules

Textbooks

1. Vasudevan, D.M.,S. Sreekumari and Kannan Vaidyanathan.(2019). *Text book Of Biochemistry For Medical Students*, Jaypee Brothers Medical Publishers, New Delhi.
2. Victor W. Rodwell (2018). *Harper's Illustrated Biochemistry*, McGraw-Hill Education.
3. Satyanarayana, U and U. Chakrapani. (2017). *Biochemistry*, Elsevier New Delhi.
4. Annie Raglandand N. Arumugam. (2015). *Biochemistry and Biophysics*, Saras Publications, Nagercoil, Tamil Nadu.
5. Agarwal, R.A., AnilK.; Srivastavaand Kaushal Kumar, (2014). *Animal Physiology and Biochemistry*. S. Chand and Company. New Delhi
6. Sastry, K.V.(2011). *Animal Physiology and Biochemistry*. Rastogi Publications, Meerut. New Delhi.

References

1. Segal, I.H (2015). *Biochemical Calculations*, John Wiley and Sons
2. Creighton,T.E. (2012). *Protein Structure and Molecular properties* , W. H. Freeman & Co.
3. Nelson, D.L. and M. M. Cox. (2013). *Lehninger principles of Biochemistry*, W. H. Freeman.
4. Firley, Jems, L. and Gardon L. Kilgour.(1971). *Essentials of Biological chemistry*, Affiliated East West press, London.
5. Voet, D. and J. G.Voet. (2005). *Biochemistry* John Wiley & Sons.
6. Freifelder, D.(2007). *Physical Biochemistry* W. H. Freeman & Co.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 – Low

Semester	CODE NO :22AU:P08M14	L	T	P	C
IV	WILDLIFE BIOLOGY & ANIMAL BEHAVIOUR	4	0	0	4

COURSE OBJECTIVES

1.To understand the concept wildlife and wildlife resources.

2.To investigate the techniques associated with wildlife and habitat assessment and usage of field equipments.

3.To evaluate the behavior of different wild animals and understand the significances of various behaviours.

4.To identify conflicts associated with wildlife and reasons and mitigation measures

To explore different conservation measures for various wildlife problems

UNIT - I: Wildlife & India: Definition of Wildlife: Causes of wildlife depletion; Economic importance of wildlife; need for wildlife conservation; Taxonomy & Identifying Characters of Fishes, Amphibians, Reptiles, Birds (up to orders) and mammals (upto family) with examples; rare, endangered, threatened and endemic species of fishes, amphibians, reptiles, birds and mammals in India- India as a mega wildlife diversity country.

UNIT - II: Wildlife Management Techniques: Vegetative analyses – Point Centered Quadrat, Quadrat, Strip transect; Animal Census: total counts - sample counts – Basic concepts and applications - Direct count (transect methods, Point counts); Indirect count (Call count, track and signs, pellet count, pugmark) - Identifying animals based on indirect signs – Capture - Recapture techniques; Field Equipments: binoculars, cameras, altimeter, pedometer, field compass. Sound recording & Media players:

UNIT - III: Wildlife Conservation; Habitat manipulation: food, water, shade improvement; impact and removal of invasive alien species; Making observations and records: field notes & datasheets; Planning wildlife management Investigations and projects;

Conservation Measures: in-situ conservation, Wildlife Sanctuaries, National Parks, Tiger Reserves and Biosphere reserves: Definition, formation, management and administration; Wildlife Projects-Tiger; ex-situ Conservation Zoos and Zoological Parks: Definition - Aims of Zoos- Formation and Management of Zoos and Zoological Parks

UNIT - IV: Behaviour Types and Analysis: Introduction to ethology, Principles and mechanism of animal behaviour (Ethology) - four propositions of Nikolaas Tinbergen - Adaptive values of behavior-Instinctive behaviour-classical and modern concepts-fixed action pattern and ritualization; Learning-Imprinting-habituation. Analysis of behaviour pattern - taxis, kinesis and reflexes; Biological rhythms and bird migration;

UNIT V: Behaviour of Wildlife: Origin and significance of play; Types of animal communications: Visual communication, Auditory communication chemical communications; Optimal Foraging behaviour; Social behaviour of bees and elephants. Sexual behaviour and selection, mating strategy and pattern, parental care in birds and mammals.

Course Outcome

Upon successful completion of this course the students would be able:

11) Understand the concept wildlife and wildlife resources.

12) Le Learn the techniques associated with wildlife and habitat assessment and usage of field equipments.
13) Recognize the problems and mitigations associated with wildlife conservation.
14) Perceive the behavior of different wild animals and comprehend the different conservation measures.
15) Understand the wildlife management techniques

References:

Bawa, S.K., Primack, R.B. and M. A. Oommen. 2011. Conservation biology A primer for South Asia. University Press, Hyderabad.

Dasmann, R.F. 1964, Wildlife Biology. John and Wiley and sons, New York.

Davies, N.B., Krebs, J.R. and West, S.A. 2012. An Introduction to Behavioural Ecology, 4th Edition. Wiley-Blackwell, London

Giles, R.H. Jr. (Ed) 1984. Wildlife Management Techniques, 3rd edition. The wildlife Society, Washington. D.C. Nataraj Publishers,Dehradun. India.

McFarland.D. (Ed) 1981. The Oxford companion to Animal Behaviour. Oxford University Press, New York.

Pullin, A.S. 2002. Conservation biology, Cambridge University Press, Cambridge.

Reena Mathur. 2010. Animal Behaviour. Rastogi Publications, Meerut.

Rees, P.A. 2011. An Introduction to zoo biology and management, John Wiley and Sons Ltd., West Sussex, UK.

Robinson, W. and Eric, G. Bolen, 1984. Wildlife Ecology and Management. MacMillan Publishing Co, New York.

Rodgers, W.A 1991. Techniques for Wildlife census in India – A Field manual technical Manual – TM – 2 Wildlife Institute of India, Dehradun.

Rubenstein, D.R. and Alcock, J. 2019. Animal Behaviour. 11th Edition, Sinauer Associates, Sunderland, MA

Saharia, V.B. 1998. Wildlife in India, Nataraj Publishers, Dehra Dun

Shukla, J.P. 2010. Fundamentals of Animal Behaviour. Atlantic Publishers, New Delhi.

Slater, P.J.B. 1985. An introduction to Ethology, Cambridge University Press, Cambridge.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

Semester	CODE NO : 22AU:M15P	L	T	P	C
IV	Practical Covering – BIOCHEMISTRY, WILD LIFE BIOLOGY AND ANIMAL BEHAVIOR	12	0	0	6

COURSE OBJECTIVES

1. To learn classification and metabolism of carbohydrates
2. To understand the structure and metabolism of protein
3. To learn the structure and functions of lipids
4. To acquire knowledge about various enzymes and hormones and their actions
5. To acquire knowledge about the significance of vitamins

BIOCHEMISTRY

Preparation and use of buffers.

1. Qualitative tests for carbohydrates, Amino acids, proteins lipids and nucleic acids; aminesurea; (thiourea).
2. Determination of the molecular weight of a mono carboxylic amino acid by sorenson formol titration
3. Determination of isoelectric pH of a protein.
4. Estimation of glycogen, phosphate, cholesterol and protein in tissues.
5. Determination of protein digestion by trypsin. Fractionation and estimation of serum proteins.
6. Estimation of RNA and DNA in tissues.
7. Kinetics or enzyme action-effect of substrate concentration (Calculation of M), temperature (calculation of energy of activation)
8. Enzyme concentration and pH on enzyme activity.
9. Determination of AChE activity in brain.
10. Paper chromatography of sugars and amino acids-column chromatography of separation of amino acids
10. Paper electrophoresis of proteins.
11. Colour reactions of urine composition.

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Understand various micro and macro molecules and their significance
2. Discriminate various metabolic disorders
3. Take up jobs in clinical labs
4. Analyze biological samples of bio-chemical importance
5. Understand the metabolism of macromolecules

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low

CORE ELECTIVE IV SERICULTURE

SUB CODE: 22AU:P08E4

COURSE OBJECTIVES

1) To acquire the knowledge of silkworm and their social values
2) To acquire the clear knowledge about the rearing techniques and different types of silkworm.
3) To acquire the knowledge about the importance of silk products and their marketing.
4) To acquire the clear knowledge about the silkworm enemies and diseases and their control measures.
5) To acquire the knowledge of silkworm and their social values

UNIT I

Sericulture: Definition, history and present status; silk route. Mulberry and types of non-mulberry sericulture. Commercial varieties of mulberry plants used in Sericulture in India. Requirement for Mulberry Cultivation – Soil – Climatic conditions: Temperature, photoperiod, humidity and rainfall. Mulberry management: Land preparation – Irrigation-Manuring-Propagation of mulberry plant – plantation methods. Profitable cultivation and Harvesting Diseases of mulberry – fungal, bacterial, viral and Nematode diseases. Deficiency diseases and their remedial measures.

UNIT II

Sericulture: Biology of silk worm, silk gland, cultivation of mulberry plants, rearing silkworm and uses of silk – Life cycle of Bombyx mori – Silk gland – Hormonal control of metamorphosis – silk synthesis and reproduction – Univoltine, Bivoltine and Multivoltine races – Exotic and indigenous races in India.

UNIT III

Silkworm rearing: Rearing house – CSB model. Early age and late age rearing. Rearing appliance – Mountages – types of mountages and disinfectants. Seed Collection of disease – free laying (DFLs), incubation, Hatching and Brushing. Feeding and rearing, spacing, leaning and dusting. Mounting and cocoon production: spinning of cocoons. Harvesting, preservation, assessment storage. Transportation: cocoons, record maintenance, cost of cocoon production, leaf cocoon ratio.

UNIT IV

Silkworm diseases: Etiology, Structure, Symptoms, Preventive measures and control of viral diseases – Nuclear polyhydrosis (NPV) and Cytoplasmic polyhydrosis virus (CPV). Infectious flacherie virus (FV) and Densonucleosis virus (DNV) Noesmabombycis (Pebrine disease). Bacterial diseases – Bacterial septicemia Bacterial gastroenteric disease Bacterial toxicosis. Fungal Diseases – White muscardine, Green muscardine, Yellow muscardine. Silkworm pests Tachinid Fly (Uzifly) Trycholgzabombycsis, Dermistid beetles, Dermestescadniverinus – Vertebrate and other silkworm pests and their control.

UNIT V

Silk Technology: Selection of Cocoon for reeling – Quality of cocoon. Physical and chemical properties of silk fibre. Raw materials for silk reeling-Cocoon processing- cocoon drying-stifling, cocoon sorting and preservation, deflossing. Marketing organization for cocoon and yarn – raw silk manufacture- silk by products: reeling waste and its utility in spun silk industry utility od pupae. Role of central silk board and directorate of sericulture in extension programmes-sericulture organization at state and national levels

COURSE OUTCOMES (CO)

At the end of the course, the student will be able to

6) The students will be able to understand the basic knowledge of sericulture.
7) The students will have to understand and learn the prospect of sericulture as a self-employment venture.
8) The students will the able to understand role and different types of silkworm rearing.
9) The students will the able to learn the economic importance of silkworm.
10) Acquired the knowledge about Cultivation of silkworm and become entrepreneurship

Reference Books

1. Ganga, G. and Sulochana Chetty, J. 1997. An Introduction to Sericulture. Oxford &IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Ganga, G. 2003. Comprehensive Sericulture Voll-II: Silkworm rearing and Silk Reeling. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3.Hisao Arug. 1994. Principles of Sericulture. (Translated Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Veda, K. Nagai, I. and Horikomi, M. 1997. Silkworm rearing (Translated Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
5. Otsuki, R. and Sato, S. 1997. Silkworm Egg Production (Translated Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. Eikichi Hiratsuka. 1999. Silkworm breeding (Translated Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
7.Mahadevappa, D., Halliyai, V.G., Shankar, D.G. and Bhandiwad, R., 2000. Mulberry Silk Reeling Technology. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
8. Lu Yup-Lian and Liu-Fu-an. 1991. Silkworm Diseases – Published by FAO. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Outcome Mapping

Mapping with Programme Outcomes*					
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**
CO1	3	3	3	2	3
CO2	3	2	1	3	2
CO3	2	2	1	3	1
CO4	3	3	1	3	1
CO5	3	3	2	1	2

*3 - Strong; 2 - Medium; 1 - Low