PERIYAR UNIVERSITY

SYLLABUS FOR

M.Sc ZOOLOGY

DEGREE OF MASTER OF SCIENCE

CHOICE BASED CREDIT SYSTEM

(For candidates admitted in the college affiliated to Periyar University from 2020 – 2021 onwards)
REGULATIONS

1. AIM & SCOPE
   - To educate knowledge across different area of Zoology.
   - The topics included in different units of different papers would enable the students to develop technical skills in zoological and applied branches.
   - Skill based subjects like poultry science, sericulture, diary science and fisheries have been included in order to provide opportunities in employment and research in government and private organizations.
   - Practical's include in a syllabus will improve skills like drawing, observation, laboratory instruments handling and its techniques.

2. ELIGIBILITY: Candidates who have passed the three year B.Sc., Examination with zoology will be eligible for admission to this course.

3. DURATION OF THE COURSE: The course for the degree of master of science shall consist of two years divided into four semesters, over a total of 2200 marks. Each semester consist of 90 working days.

4. PASSING MINIMUM: The candidate shall be declared to have, passed the examination if he/she secured not less than 50 marks.

5. A candidate shall eligible for appearing examination provided he/she secures percentage of attendance as specified by the university.

6. Examination (Theory and Practical) would be held for completion of curriculum at the end of the each semester.

7. A candidate should obtain at least 50% in each of the theory and practical course to qualify in each semester.
DISTRIBUTION OF MARKS: THEORY

University examination = 75 marks
Internal assessment = 25 marks

INTERNAL ASSESSMENT STRUCTURE:

Test = 10 marks
Attendance = 05 marks
Seminar = 05 marks
Assignments = 05 marks

Passing minimum for Internal Assessment = 12 marks
Passing minimum of University examinations = 38 marks

DISTRIBUTION OF MARKS: PRACTICALS

University examinations = 60 marks
Internal Assessment = 40 marks

INTERNAL ASSESSMENT STRUCTURE:

Practical Attendance = 10 marks
Practical Performance = 20 marks
Record Work = 10 marks

Passing minimum for internal assessment = 20 marks
Passing minimum for University examinations = 30 marks

DISTRIBUTION OF MARKS: DISSERTATION

Internal assessment = 20 marks
Viva – voce = 20 marks
Project Report = 60 marks
M.Sc DEGREE EXAMINATION - THEORY

ZOOOLOGY

Time: 3 Hrs

PART A (15 X 1 = 15 marks)

Answer ALL questions. All questions carry equal marks.

PART B (2 X 5 = 10 marks)

Answer any TWO questions. Each answer should not exceed 300 words.

PART C (5 X 10 = 50 marks)

Answer ALL questions choosing either ‘a’ or ‘b’. Each answer should not exceed 1200 words.
Course Scheme and Scheme of Examination for M.Sc., Zoology Course  
(Academic Year 2020-2021 onwards)

Semester - I

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I – Internal Examiner mark; E – External Examiner mark,
SEMESTER - I
CORE PAPER 1
STRUCTURE AND FUNCTION OF INVERTEBRATES
(20PZC01)

Teaching Hours: 6 hrs/week Credit Point: 5

Course Objectives:

- To gain knowledge about Zoological nomenclature and Animal taxonomy.
- To study the external morphology, physiology and affinity of Invertebrate with minor phyla.
- To understand the functional behaviour of protozoan to metazoans.
- Gain Knowledge about parasitic invertebrates, its larval stages and their mode of transmission from one stage to another.

UNIT-I


UNIT-II


Nutrition and Digestion: Patterns of Feeding and digestion in Lower Metazoan – Filter feeding in Polychaeta, Mollusca and Echinodermata.

UNIT – III

Respiration: Organs of Respiration – Gills, Lungs and Trachea – Respiratory Pigments – Mechanism of Respiration.

UNIT – IV


UNIT – V

Invertebrate Larvae: Larval forms of free living Invertebrates - Larval forms of Parasites - Strategies and Evolutionary significance of Larval Forms - Minor Phyla (Structural Features and Affinities) – Concept and Significance – Organization and General Characters.

Suggested Reading Materials


Course Outcomes (CO):

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

CO1: Classify the Animal species based on the Characteristics features.

CO2: Know the locomotion, feeding and digestion of all Invertebrates.

CO3: Know the structure and function of Respiratory and Excretory organs of Invertebrates.

CO4: Learn about the function of nervous system of Non-Chordates.

CO5: Gain Knowledge about various larval forms of Invertebrates.
CORE PAPER 2

COMPARATIVE ANATOMY OF CHORDATES

(20PZC02)

Teaching Hours: 6 hrs /week
Credit Point: 5

Course Objectives:

- Students will gain knowledge about the external characteristic features of Vertebrates in a detailed manner.
- Study the structure and function of integuments and its derivatives from Fishes to Mammals.
- Able to compare the structural modification of various organ systems in all Vertebrates – Evolution.
- Gain knowledge about evolution of Nervous co-ordination and Sense organs of various Classes of Chordates.

UNIT – I


UNIT – II


UNIT – III


UNIT – IV

UNIT –V


Suggested Reading Materials


Course Outcomes (CO):

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

CO1: Classify the animal species based on the characteristics features into classes.

CO2: Know about the integuments and its derivates in the vertebrates.

CO3: Able to compare the structure and function of various systems in vertebrates.

CO4: Learn about the skeletal arrangements in the chordates.

CO5: Gain Knowledge about various types of sense organs in the vertebrates.
CORE PAPER -3
CELL BIOLOGY AND MOLECULAR BIOLOGY
(20PZC03)

Teaching Hours: 6 hrs /week Credit Point: 5

Course Objectives:

- Provide relevant knowledge about the function of various cell internal organelles
- Acquire advanced knowledge of cell membranes in transportation of matters in and out
- To study the principles of cell communication and adhesion.
- To study the oncogenes, cellular morphology and ageing of cells.

UNIT – I

Introduction – Experimental systems in cell biology


UNIT – II

Cytoskeleton


UNIT – III

Cell - Cell adhesion and cell cycle

UNIT – IV

Genomic organization


UNIT – V

Intracellular protein traffic


Suggested Reading Materials:


Course Outcomes:

On successful completion of the course the students can able to

CO1: The graduate will able to explain the functional eukaryotic cell at molecular level.

CO2: The students can explain briefly about the cytoskeleton system of a cell and its function.

CO3: The students can briefly describe the cell adhesion and its communications.

CO4: Graduate can describe the functions of nucleus which control the cell.

CO5: The student will able to perform the techniques employed by the cell organelles.
ELECTIVE PAPER – 1
MICROBIOLOGY (20PZE01)

Teaching Hours: 4hrs / week Credit Point: 3

Course Objectives:

- Key features of the structure and classification of bacteria, virus and fungi.
- Knowledge on lab cultivation, media and staining methods.
- To study the microorganism in related to human health aspects.
- To know the application of microorganism in Industrial and Dairy usage.
- To Under Stand the application of microorganisms in soil and aquatic as bio-fertilizer and bio-pesticides.

UNIT – I

Introduction to Microbiology–Structure classification of virus, bacteria and fungi.

UNIT – II


UNIT – III


UNIT – IV

Industrial and Dairy Microbiology – Definition of fermentation, Microbes producing antibiotics – Penicillin, Streptomycin – Probiotics – Role of micro organisms in production of cheese and curd.
UNIT – V

Aquatic Microbiology – Microbial assessment for water quality, Microbial characters of sewage, microbial treatment of wastewater.


Suggested Reading Materials

2. Ghulam Hussan Dar, Soil Microbiology and Biochemistry, New Age Internationals, New Delhi.

Course Outcomes

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

CO1: To student will able identify microorganisms in our environment and classify them.

CO2: The student will acquire knowledge about how to culture different microbes.

CO3: The graduate can understand the pathogenic microbes and their control measures.

CO4: Gain knowledge about microbes in food industries, developing antibiotics from microbes.

CO5: Understand the application of microbial technology in the production of bio-fertilizers and bio-pesticides.
ELECTIVE PAPER–2
VERMICULTURE (20PZE02)

Teaching Hours: 4hrs / week Credit Point: 3

Course Objectives:

- To impart a detailed knowledge on vermiculture technology.
- To highlight the benefits of Eco-friendly agriculture by way of organic farming.
- To utilizing the byproducts of vermiculture.
- To create knowledge and avenues for self-employment.

UNIT - I


UNIT - II


UNIT - III

Types of vermicomposting – Worm casts – General problems in production of vermicompost - Physical, Chemical and Biological properties of vermicompost– Effects of vermicompost on soil properties - Vermiwash and their applications

UNIT - IV


UNIT - V

Small Scale (or) Indoor vermicomposting unit – Large scale or Outdoor vermicomposting unit. Vermicompost – Quality and Economics - Application of vermicomposting in agriculture and horticultural practices- Prospects of vermiculture as a self-employment venture Uses of earthworms in food and medicine – Ayurvedic and Unani.
Suggested Reading Materials

4. NIIR Board, The complete Technology Book on Vermiculture and Vermicompost.

Course Outcomes:

On successful completion of the course the student can able to

CO1: Gain knowledge about types of earthworms and life history of composting earthworms native and exotic.

CO2: Get adequate knowledge about various organic waste materials used to prepare vermicompost and how to overcome the problems during culture period.

CO3: Able explain the nutrients present in vermicompost and vermiwash, how it can be applied to the field.

CO4: The student will get knowledge to explain how vermicompost is important in Organic farming.

CO5: Gain knowledge about various types of composting methods, application mode and usage of earthworms in Ayurvedic and Unani medicinal practices.
MAJOR PRACTICAL – I

Structure and function of Invertebrates, Comparative Anatomy of Chordates, Cell and Molecular Biology
(20PZP01)

Practical Hours – 5 Credit Point: 4

**Major:**
- Dissection of Nervous system of Prawn.
- Micrometry – Simple measurement of Cell (Occular / Stage Micrometer)
- Onion Root Tip – Mitosis (Any one stage)
- Giant Chromosomes in Salivary gland of Chironomous Larva.
- Preparation of Microscopic slide – Microtome (Demo only)

**Minor:**
- Mouth parts of Insects – Mosquito, Honey Bee, Cockroach
- Body setae of Earthworms
- Placoid Scales in Shark

**Spotters:**
- Protozoans – Entamoeba histolytica, Trypanosoma gambiensis, Leismania donavonii
- Helminthes – Ascaris sp., Taenia sp., Filarial worm, Fasciola sp.,
- Identification and Study of Nauplius larva, Zoea larva, Bipinnaria larva.
- Microtome – Knife, Embedding block, L Block, Hot Plate, Cuppling jars.
SEMESTER - II
CORE PAPER - 4: GENETICS (20PZC04)

Teaching Hours: 5 hrs /week Credit Point: 5

Course Objective:

- To acquire basic knowledge about Mendelian principles about Genetics.
- To provide knowledge in structure and function of genes and mapping techniques.
- To study DNA and gain knowledge in Human Genome Project.
- To gain the graduates about various mutagens, a chromosomal aberration happens due to sudden changes.

UNIT – I

UNIT – II

UNIT – III

UNIT – IV
Mutation: Types, causes and detection, Mutant types – Lethal, Conditional, Biochemical, Loss of function, Gain of function, Germinal Verses Somatic mutants, Insertional mutagenesis.

Structural and Numerical Alternations of Chromosomes: Deletion, Duplication, Inversion, Translocation, Ploidy and their genetic implications.
Recombination: Homologous and Non-homologous recombination including Transposition.


UNIT – V


Molecular Population Genetics: Patterns and Change in Nucleotide and Amino acid sequences.

Suggested Reading Materials

3. Snustad and Simmons, Principles of Genetics, John Wiley and sons, Inc

Course Out comes:

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

CO1: The Students will able to knowing and understanding the organization and functions of genetic materials in biosphere.

CO2: Graduates can able to explain type gene mapping techniques.

CO3: Students can develop knowledge on karyotyping and human genome project.

CO4: The students can explain the modification happens by mutation at gene level, chromosomal changes by various factors.

CO5: Graduates can evaluate the functions of nucleotides and amino acid changed in population genetics.
CORE PAPER – 5

IMMUNOLOGY (20PZC05)

Teaching Hours: 5hrs / week  Credit Point: 5

Course Objectives:

- To study the Innate and acquired immunity.
- To understand areas of immunity- antigens and antibodies.
- To study the host defense mechanism- Immunoglobulins.
- To acquire knowledge about immunological response in related to infection.

UNIT – I


UNIT - II


UNIT – III


UNIT – IV

UNIT – V


Suggested Reading Materials

1. Kuby. Immunology, W.H. Freeman. USA.

Course Out comes:

On successful completion of the course the candidate will able to

The student can able to explain the immune system present in animal body and how it works against the pathogens / antigens.

CO1: Develop the immune system against pathogens.

CO2: Raise the monoclonal antibodies for the infections.

CO3: Easily understand the immune system and mode of action against infection.

CO4: The candidate can explain how immunological response activated against infection.

CO5: The student can describe briefly about the hypersensitivity response activated.
CORE PAPER – 6
BIOCHEMISTRY (20PZC06)

Teaching Hours: 5hrs/week. Credit Point: 5

Course Objective:

- To Study the function and structure biomolecules.
- To understand the various types of enzymes and its role in living cells/ organsystems.
- To study the structure and function of proteins, carbohydrates, lipids, vitamins in living organisms.

UNIT – I
Structure of atoms, molecules and chemical bonds. Principles of biophysical chemistry- pH, Buffer, Reaction kinetics, Thermodynamics, Colligative properties.

UNIT – II
Stabilizing interactions – Vander Waals, Electrostatic, Hydrogen bonding, Hydrophobic interactions, etc., Composition, nature of bonds / linkages, Structure of bio-molecules (Carbohydrates, Lipids, Proteins, Vitamins and Nucleic acids).

UNIT – III
Conformation of proteins – Ramachandran Plot, Primary, Secondary, Tertiary and Quaternary Structures, domains, motifs and folds.
Principles of Catalysis, Classification of enzymes and enzyme kinetics, enzyme regulation, inhibitors of enzymes – mechanism of enzyme catalysis, Isozymes.

UNIT – IV

UNIT- V
Bioenergetics – Metabolism of aminoacids, carbohydrates (Glycolysis), lipids, nucleotides and vitamins, Oxidative phosphorylation, Coupled reaction, Group transfer, Biological energy transducers.
Suggested Reading Materials

3. Cooper, T.G. Tools of Biochemistry.
5. Hawk. Practical Physiological Chemistry.

Course Outcomes:

On successful completion of the course the student will able to

CO1: Understand the chemical structure and function of various bio-molecules.

CO2: Learn about theories on Bio-molecules.

CO3: Easily explain enzymes and their role in living organism.

CO4: Learn about the conformation structure of proteins, lipids and nucleic acids.

CO5: Explain the metabolism of carbohydrates, proteins, lipids, vitamins and nucleic acids.
ELECTIVE PAPER – 3
POULTRY SCIENCE (20PZE03)

Teaching Hours: 4 hr/ week       Credit Point: 3

Course objectives

- To provide self employment opportunities and knowledge for students.
- To understand poultry industry based on the past, present and emphasis of future growth
- To make the students to develop knowledge on the history and the role of poultry in rural development and its structure.
- Students can learn the methods of rearing, breeding and production of poultry and marketing.

Unit – 1

History, Scope and importance of poultry farming – Poultry development in India – present status and future prospectus of poultry industry- Role of government/ private agencies in poultry development.

UNIT-II

Poultry Housing – Basic principles and location for construction - Types: backyard system, semi-intensive system, intensive system – cage, deep litter and slat system, floor space, lighting and watering.

UNIT III


UNIT-IV

Poultry nutrition – Feed ingredients and formulation – Types of feed: mash, pellet - Feeding methods - Poultry diseases and vaccination.

Unit V

Role of government and non-governmental agencies in promoting poultry entrepreneurship in India - objectives and functions –NABARD- Role of commercial banks.
Suggested Reading Materials

5. Hurd, L.M, Modern Poultry Farming, IBDC Publishers
8. Hand Book of Poultry Farming and Feed Formulations, Engineers India Research Institute Board.
11. Jull, M.A. Successful Poultry Management, Biotec Books Publisher.

Course Outcomes:

On successful completion of the course the students can able to

CO1: The graduate can explain the scope and future prospectus of poultry industry.

CO2: The student can brief about the daily work in poultry farm activities.

CO3: He will neatly explain the brooders, breeding methods and vaccinations in poultry farms.

CO4: The students are exposed to prepare poultry feed using different ingredients and symptoms of various diseases that affects poultry farms.

CO5: The graduate gain knowledge about getting bank and government funds regarding poultry farms.
ELECTIVE PAPER – 4

AQUACULTURE (20PZE04)

Teaching Hours: 4 hr/ week

Credit Point: 3

Course Objectives:

- To provide self employment opportunities and knowledge for students.
- To learn the techniques of breeding, culturing, and marketing of aquatic animals.
- To explore the aquatic resources of the edible and economically important organisms.
- To understand the fish feed formulation techniques
- To learn the scope and importance of aquaculture

UNIT –I

Introduction to Aquaculture – Principle, Scope, Importance and needs of aquaculture - National and International status of aquaculture - Environmental problems caused by aquaculture.

UNIT – II

Site selection for aquaculture practices - Fish pond construction, Types of fish culture - Monoculture, Polyculture, Pen culture, Cage culture, Integrated fish farming, Brackish water prawn culture and Marine culture.

UNIT – III

Fish and prawn feed requirements and formulation of artificial feed – Live feed culture - Probiotics in aquaculture feed.

UNIT – IV

Common diseases of aquaculture: bacterial, fungal and viral infections - Fish diseases and Treatments - Host, pathogen and environment interaction.

UNIT - V

Suggested Reading Materials
12. Sinha, V.R.P. Fisheries research planning and management in developing countries, International books and periodicals services (IBS), New Delhi.

Course Outcomes:
On successful completion of the course the students are able to
CO1: Explain briefly the importance of aquaculture and its scopes.
CO2: The student can clearly know which type of culture and which aquatic organisms are suitable for culture in his locality.
CO3: The student can gain knowledge about probiotics, and live feed culture techniques.
CO4: The graduate can easily identify the symptoms of bacterial, viral and fungal diseases to culture fishes and its remedial measures.
CO5: The graduate can guide farmers to get loans from nationalized banks for fish farming.
MAJOR PRACTICAL – II
Genetics, Immunology and Biochemistry
(20PZP02)

Practical Hours: 5hr/ week Credit Point: 4

Major:
Quantitative estimation of proteins, carbohydrate and lipids from animal tissues.
Enzyme kinetics – Influence of pH, temperature, substrate concentration and enzyme concentration on human salivary amylase activity.
Qualitative analysis of urine for proteins, glucose, acetone and ketone bodies.
Estimation of haemoglobin and ESR- Erythrocyte Sedimentation Rate.
Blood clotting time – bleeding time
Buccal smear – Barr bodies.
Demonstration of Amino acids in the body fluid of an insect (Cockroach/ grasshopper) using paper chromatography.

Minor:
Genetic and immunological basis of human blood grouping (A, B, AB and O).
Identification of mutant wings/eyes in drosophila.
Identification of lymphoid organs of Rat/ Mouse.
Demonstration – Culture of bacteria, Preparation of smear, Simple staining and gram staining.

Spotters:
Human karyotype, Down syndrome, Klinefelters syndrome, Turners syndrome.
NON-MAJOR COURSE -1

FISHERY BIOLOGY (20PZNM01)

Teaching Hours: 4 hrs/ week  Credit Point: 3

Course Objectives:

- To learn the importance of aquaculture in nutritional and economical level.
- To learn about techniques in pond construction, farming managements, etc.,
- To explore the knowledge about rearing aquatic organisms in ponds.
- To gain knowledge about the infections and their remedial measures.

UNIT – I

Introduction - Importance of inland fisheries, Principles and aim of fish culture. Types of fish culture – Monoculture, Polyculture, Race way culture, Pen culture, Cage culture, Raft culture, Paddy cum fish culture, Integrated farming, Corporate farming.

UNIT – II

Site selection for fish farm, Pond construction, Pond preparation, Types of ponds in a typical fish farm, Water quality management, Feeding and types of feeds – Natural and artificial feed.

UNIT – III

Selection of cultivable species, Seed selection, Seed transportation techniques, Acclimatization of seeds to pond water, Routine farm activities, Harvesting methods.

UNIT – IV

Mariculture, Types of cultivable shrimps - Shrimp hatcheries, Transportation techniques of post larvae, Stocking types and rearing methods, Natural and artificial feeds, Shrimp harvesting methods.

UNIT – V

Fish diseases – bacterial, fungal and viral infections and their remedial methods. Post harvesting methods and types of fish processing methods.
Suggested Reading Materials

2. Kamaleswar Pandey and Shukla, J.P. Fish and fisheries, Rastogi publications, Meerut.

Course Outcomes:

On successful completion of the course the student will gain

CO1: Easy to get employment / self-employment opportunities in fish farms.
CO2: Able to design and construct aqua farms and know farm managements.
CO3: Learn knowledge how to select cultivable species, rearing and harvesting techniques.
CO4: Gain knowledge about hatchery operations and its managements.
CO5: Understand the fish diseases and its remedial methods.
NON-MAJOR COURSE - 2

NURTRITION AND DIETETICS (20PZNM02)

Teaching Hours: 4 hrs / week  
Credit Point: 3

Course Objectives:

- To gain knowledge regarding various types of food sources.
- To understand nutritive value of food materials, balanced diet and deficiency of vitamins in food.
- Able to identify the nutritious food sources in relation to infectious diseases.
- Gain knowledge to understand principles in relation to diet therapy for Acute, chronic infections and diet requirement for pregnant women.

UNIT - I

Introduction - Food as a source of nutrition, intake and its regulations, Food and future, Food production and population

UNIT – II

Balanced Diet, Nutritive value of some common food, Diet in nutritional deficiency diseases, Malnutrition, Vitamin deficiency, etc

UNIT – III

Obesity and under weight, Diabetes mellitus - Diet in infectious diseases, Typhoid, Tuberculosis, Malaria and Pneumonia

UNIT – IV

Nutrition during pregnancy, Diet for allergy, common food allergies, Dietetic treatment. Nutrition for different age group

UNIT – V

Nutrition for heart patients – Coronary heart diseases, Atherosclerosis, Congestive heart failure, Hypertension – Sodium restricted diets
Suggested Reading Materials


Course Outcomes:

On successful completion of the course the student able to

CO1: Gain knowledge about nutritional classification various food sources and their nutritive values.

CO2: Able to understand balanced diet and diet for malnutrition, vitamin deficiency persons.

CO3: Understand the nutritional requirement for various disease infected patients.

CO4: Students can understand the principle of nutrition for pregnant women.

CO5: Gain knowledge regarding diet for heart, coronary, hypertension patients.
SEMESTER - III

CORE PAPER- 7

COMPARATIVE ANIMAL PHYSIOLOGY (20PZC07)

Teaching Hours: 5hrs / week Credit Point: 5

Course Objectives:

- To understand the physiological functions of animal parts in related to its habitat.
- To study the osmoregulatory mechanism of animals.
- To understand the respiratory physiology of both terrestrial and aquatic forms.
- To know the excretory and endocrine system in the animals.
- To learn the neuromuscular coordination in animals.

UNIT – I

Adaptation – levels of adaptation – mechanism of adaptation – significance of body size – adaptation, acclimation and acclimatization – concepts of homeostasis.


Stress physiology – basic concept of environmental stress and strain; concept of elastic and plastic strain, stress resistance, stress avoidance and stress and stress tolerance.

UNIT – II

Endothermic and Physiological mechanisms of regulation of body temperature – Physiological adaptation to osmotic and ionic stress; mechanism of cell volume regulation- Osmoregulation in aquatic and terrestrial environments.

UNIT – III


UNIT – IV

Excretory physiology – Excretory organs – Mechanisms of excretion - physiology – Adaptations of excretion to environment – excretory products – synthesis and elimination
Endocrine glands – Feedback regulation – Pituitary – Gonadal axis – Role of reproductive hormones – gamete formation; Fertilization; Embryonic development; parturition; lactation; neuro-endocrine regulation.

**UNIT – V**

Structure of neurons, Physiology of neurons – action potential – nerve impulse transmission – neurotransmitters – mechanism of neural transmission – neurodegenerative diseases

Muscle physiology – muscle contraction - theories – molecular mechanism of muscle contraction.

**Suggested Reading Materials**


**Course Outcomes:**

On successful completion of the course the student will able to

CO1: Adaptive nature of animals in related to their habitat.

CO2: Osmoregulatory behaviour of animals in relation to stress, changes in environmental conditions.

CO3: Basic mechanism of respiratory organs

CO4: Learn about the excretory and endocrine system in animals.

CO5: Understand the neuromuscular interactions in animals.
CORE PAPER – 8

DEVELOPMENTAL BIOLOGY (20PZC08)

Teaching Hours: 5hrs/ week
Credit Point: 5

Course Objectives:

- To understand the basic concepts of developmental biology.
- To learn the cellular and tissue level events happens in gametogenesis.
- To acquire basic knowledge on organogenesis in related to development and differentiation.
- To understand the regeneration in development of immune system in vertebrates.
- To gain knowledge about various modern reproductive techniques in related to male and female infertility.

UNIT – I

Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenic in analysis of development.

UNIT – II

Gametogenesis - Fertilization and early development: Production of gametes, cell surface molecules in sperm- egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, Gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry.

UNIT – III

Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in *Dictyostelium*; axes and pattern formation in Drosophila, amphibian and chick; organogenesis-vulva formation in *Caenorhabditis elegans*, eye lens induction, limb development in amphibia and regeneration in vertebrates; differentiation of neurons, post embryonic development – larval formation, metamorphosis; environmental regulation of normal development; sex determination.

UNIT – IV

Neoteny: Occurrence and significance – regeneration; regenerative capacity in the animal kingdom – factors influencing regeneration – stimulation and suppression – polarity and gradients – development of immune system in vertebrates.
UNIT – V


Suggested Reading Materials

1. Balinsky. Introduction to embryology.
2. Grant. Biology of developing system.

Course Outcomes:

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

CO1: Understand the cellular and molecular level developments of organisms.

CO2: Students will gain knowledge on gametogenesis and embryological development.

CO3: Students will acquire knowledge about organ formation and their development during embryology.

CO4: Know various stages of regeneration mechanism happen in embryo and adults.

CO5: To understand the modern embryological techniques in related to male and female infertility.
Teaching Hours: 5 hrs/week
Credit Point: 5

Course Objectives:

The students gain knowledge on

- Identifying research problem and the basic methods of experimentation
- Methods of preparation of articles and its publication ethics
- Instrumentation and its applications in research work.
- Statistical packages and their application

**Unit - I**

Scope – Identification and selection of research problem – Methods of literature collection: online, Internet and website, reviews, monographs and abstract services - Experimental approach - Designing of methodology – Planning and execution of investigations – Methods of editing and abstracting, Preparation of manuscript and proof reading – Research ethics - Plagiarism - Thesis writing.

**UNIT - II**

Preparation and presentation of research papers for journals - Refereed journals - Symposia and conferences– Impact factor – H-index – Citation index – Patents, Copyright – Preparation of research proposals - Funding agencies: TNSCST, UGC, DST, DBT, ICMR and CSIR.

**Unit - III**

Microscopy: Principles and applications - Phase contrast microscope, Electron microscopy: SEM, TEM, Chromatography: Principles and Applications - TLC, HPLC, Electrophoresis: Principles and Applications – Agarose Gel and SDS-PAGE

**UNIT - IV**

Tracer techniques: Radiation measuring devices – Geiger Muller counter, Scintillation Counter - Principles and Applications. Spectroscopy: UV-Vis, FTIR, NMR, – Principles and applications.
Unit - V

Statistical methods and application:– Test of significance – Student’s ‘t’ test, Chi – Square test, ‘F’ test – ANOVA – one way, two way and multiple way – Correlation - regressions. SPSS Package - Statistical analysis using Microsoft EXCEL program

Suggested Reading Materials


Course Outcomes:

On successful completion of the course the student will able to

CO1: Choose the appropriate research design and develop research hypothesis for a research work.

CO2: Develops the ability to apply methods to present, prepare research article for publications.

CO3: Student can acquire knowledge to handle various instruments in related to his research work.

CO4: Gain knowledge regarding tracer techniques.

CO5: Develops appropriate statistical methods required for research work design.
ELECTIVE PAPER 5
ENTOMOLOGY (20PZE05)

Teaching Hours: 4hrs/ week  Credit Point: 3

Course Objectives:

- To study the external morphology, anatomy, physiology and behaviour of insects and their position in animal kingdom by studying their taxonomic characters up to order.
- To know about the economic entomology and special adaptation of insects

UNIT - I
Taxonomy: Basics of insect classification. Classification up to order – Key characteristics of insects orders with common south Indian examples.

UNIT - II

UNIT - III
UNIT - IV

Sericulture: History of Sericulture, Life cycles of Mulberry and Non-mulberry, Silkworms, Rearing technology of mulberry silkworm, Diseases and pests of mulberry silkworm, Moriculture and cultural practices, Diseases and pests of mulberry.
Apiculture: The honey bee, Social organization of honey bees, Life history of honey bees, Methods of bee keeping.
Lac culture: Lac insect- Taxonomy, distribution and life history, Host plants and lac insects, Strains of lac insect and their propogation.

UNIT - V


Suggested Reading Materials
13. Imms A.D. – A General Text Book of Entomology 2 vol

Course Outcomes:

On successful completion of the course the student can able to

CO1: Classify the insects up to order level.
CO2: Explain the morphology and system of insects.
CO3: Understand the various internal systems of the insects.
CO4: Students can acquire knowledge about Sericulture, Apiculture and Lac culture techniques.
CO5: Briefly gain knowledge on pest and its management methods.
Course Objectives:

- Recognize significant morphological characteristics for identification of parasites to taxonomic group and the life history stage.
- Present the life history of the parasitic group as well as that of genera or species including:
  - The infective agent for each host and their means of invasion
  - Each host in the life cycle and type of development, multiplication, etc., which occurs in each host
  - Movement routes and sites of development within hosts, free living stages.
- Understand the treatment, prevention, and control of the parasitic genera and species presented.

UNIT - I
Introduction to parasites of man: Scope and definition of parasites/parasitology – Classification of parasites, types of hosts, inter relationship between host and parasite. Responses and hosts to parasitic infection, mode of transmission of parasite, host specificity and parasitic adaptation.

UNIT - II

UNIT - III
UNIT - IV

Vectors - definition, types of vector. Arthropod vector of medical and veterinary parasitic diseases and their importance – Sand flies (Leishmaniasis); Mosquitoes (Dengue and Malaria); Tse Tse fly (Trypanosomiasis) and Rat flea (Flea borne typhus). Ticks and mites diseases & different methods of vector control measures.

UNIT - V


Suggested Reading Materials

5. Wyler D. J., Eds. W. H. Freeman, NY, Modern Parasitology, Cellular immunological & Immunological aspects,
9. Ramnik Sood, Parasitology, C.B.S. Publisher, New Delhi.
10. K.D. Chaterjee, Parasitology, Medical Publisher Calcutta.
Course Outcomes:

On successful completion of the course the student can able to

CO1: Describe the morphology and classification of parasites of medical importance.

CO2: Acquire knowledge about the life history, mode of transmission, and pathogenesis of various human parasites.

CO3: Explain the parasitic mode of infection by trematodes and nematodes.

CO4: Gain knowledge about many vector borne infections in Human beings.

CO5: Outline the treatments for various parasitic infections, prevention and control measures.
MAJOR PRACTICAL – III
VComparative Animal Physiology, Developmental Biology, Research Methodology
(20PZP03)

Practical Hours: 5hr/ week Credit Point: 4

Major:
Determination of Salt loss and Salt gain in Fish / Crab.
Determination of Respiratory Quotient in aquatic animal in relation to Light (Fish /crab).
Blastoderm Mounting of Chick embryo.
Problems related to Mean, Standard Deviation, Chi-square test.

Minor:
Types of Placenta.
Estimation of Haemoglobin using Sahli haemocytometer.
Application of Sphygmomanometer/ Kymograph.
Qualitative analysis of Excretory products.

Spotters:
Developmental Stages of Frog – Egg, Cleavage (2 cell, 4 cell, 8 cell, Morula), Blastula, Gastrula.
Developmental Stages of Chick – Egg, 24 hrs embryo, 48 hrs embryo, 72hrs embryo, 96hrs embryo.
Types of Placenta (Images/ Photograph)
Simple Muscle Twitch, Summation, Treppe, Tetanus - Kymographic recordings.
Spectrophotometer, pH meter, Phase contrast Microscope.
NON-MAJOR COURSE – 2
DAIRY SCIENCE (20PZNM03)

Teaching Hours: 3hrs / week
Credit Point: 3

Course Objectives:

- To acquire knowledge about milk formation and components.
- To explain the production of milk and pre-treatment of milk and importance of UHT and Pasteurization processes.
- To depict the detection of adulternants in milk.
- To gain knowledge on dairy processing, sterilized milk and fermented milk products.

UNIT – I
Introduction to livestock products technology, Distinguishing characteristics of Indian and exotic breeds of dairy animals and their performance. Types of livestock farming, dairy farming systems, Traditional systems of cattle keeping. General dairy farm practices- identification, dehorning, castration, exercising, grooming, weighing. Care of animals at calving and management of neonates.

UNIT – II
Common disease problems in dairy animals, their prevention and control management of lactating and dry cows and buffaloes. Methods of milking, milking procedure and practices for quality milk production. Systems of housing dairy animals and maintenance of hygiene and sanitation at dairy farm premises.

UNIT - III
Composition of Milk, Food and Nutritive value of milk, Physicochemical characteristics and factors affecting milk, Production collection, testing quality, cooling, storage, and transportation of liquid milks. Receiving and quality assessing of liquid milk in dairy industry for detection of adulteration, decision for acceptance / rejection, and determination of price of the milk. Elementary knowledge about indigenous and modern dairy products.
UNIT – IV
Milk processing operations - Reception, Chilling, Clarification and Storage, Thermal Processing of Milk; Standardization and /or processing (pasteurization, homogenization, sterilization and UHT processing), storage, packaging and distribution of liquid milk. Classification of Milk - Standardized Milk, Toned, Doubled Toned, Reconstituted, Recombined, Flavored Milk.

UNIT – V
Milk quality control: sanitation in the dairy plant, dairy equipment maintenance and waste disposal, Dairy development; major aided dairy projects; public sector milk supply schemes; co-operative dairy organizations.

Suggested Reading Materials


Course Outcome

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

CO1: Understand the processes related to storage, processing and milk products.

CO2: To perceive the different properties of milk and milk products.

CO3: The students will gain knowledge regarding various processing of milk and varieties of milk products.

CO4: The student can acquire hygiene and sanitation practices in utensils and machineries in dairy industry.
NONMAJOR COURSE -2
INSECT PEST MANAGEMENT (20PZNM04)

Teaching Hours: 3hrs / week  Credit Point: 3

Course Objectives:

- Gain knowledge about various pests and their status.
- Mode of pest migration and damages caused by them in agroecosystem.
- Various types of control measures and their application methods.
- Latest trend of pest management applied in the present situation.

UNIT – I

Pest - Definition and its ecology, Pest status – factors responsible for achieving the status of pest, Pest complex and carrying capacity, Pest surveillance and sampling.

UNIT – II

Population dynamics of pests in agro-ecosystem, Pest population and size, factors responsible for population fluctuation. Pests of cereals, Pulse crops, Cotton, Vegetables, Oil seeds, Fruit crops, Sugarcane and grains.

UNIT – III

Locust – different species, phase transition, periodicity, migration, biology and control measures. Integrated Pest Management (IPM) – History, different phases of pest control, Quarantine, Physical, and Chemical, Biological control, Genetic and biotechnological methods of control.

UNIT- IV

Definition of pesticides, brief history, pesticides registration, pesticide industries and markets. Dose - response relationship; mode of action of insecticide, carcinogenic, mutagenic and teratogenic effects and evaluation of toxicity. Group characteristics of insecticide, structure and function of organochlorine, organophosphorus, carbamate, pyrethrod, other plant origin as well as bio-insecticides, neo -nicotinoids and nitrogenous insecticides, fumigants.

UNIT – V

Pheromones – production and their use in pest control, Management of plants resistance to Insects, Transgenic plants. Bacillus thuriengensis (Bt) and its mode of action on insect, different species of Bt sub species, Resistance management of Bt crops.
Suggested Reading Materials

2. Schoon hoven, L. M., van Loon, J.A. and Dicke, M., Insect plant biology, Publisher Oxford University Press, USA
3. Jolivet, P., Interrelationship between insects and plants, CRC Press, USA
5. Pedigo, L. P. Entomology & Pest management, Prentice hall, New Jersey, USA
6. Norris, Caswell-Chen and Kogan, Concepts of IPM, Prentice-Hall, USA
7. Agricultural insect pests of the tropics and their control, Hill, D. S., Cambridge University Press, UK
8. Whitford, F., The Complete Book of pesticide management, Wiley Inter science, John Wiley and Sons, UK
9. Hodgson, E and Kuhr, R. J., Safer insecticides, Marcel Dekker Inc., New York, USA
13. Mullen, G. and Durden, L, Medical and Veterinary Entomology Academic Press, USA
14. Kettle, D. S, Medical and veterinary entomology, Cabi Press, USA

Course Outcomes:

CO1: Create awareness about pest, its surveillance and sampling methods.
CO2: Gain knowledge about pests in agro-ecosystem.
CO3: Understand the role of IPM in sustainable agriculture as the future of modern plant protection.
CO4: Learn about the use of different pest control methods.
CO5: Gain knowledge on latest pest control measure by pheromones and BT crops.
SEMESTER - IV

CORE PAPER- 10

ENVIRONMENTAL BIOLOGY (20PZC10)

Teaching Hours: 5hrs / week Credit Point: 5

Course Objectives:

- To introduce specific examples and cases, and explain how chemical, biological and molecular sciences can apply to identify and address issues of environmental concerns.
- To understand the nature of environmental influences on individual organisms, their populations, and communities, on eco scopes and ultimately at the level of the biosphere.
- To describe behavioral and physiological mechanisms by which organisms interact with other organisms and with their physical environment.
- To study biotic and abiotic factors that influences the dynamics of populations.
- To explain the biogeochemistry, energy flow, or biodiversity of ecosystems responds to climate change or another disturbance.

UNIT – I

The environment - physical environment, biotic environment – abiotic and biotic interactions.

Habitat and Niches: Concept of habitat and niche, niche width and overlap; fundamental and realized niche, resources partitioning, Character displacement.

UNIT – II

Population Ecology: Characteristics of population, Population growth curves, Population regulation, Life history and strategies (r and k selection); Concept of metapopulation – demes and dispersal, Interdemic extinctions, age structured population.

Species Interactions: Types of interactions, Inter specific competition, Herbivory, Carnivory, Pollination, Symbiosis.

UNIT – III

Community Ecology: Nature of communities, Community structure and attributes; Levels of species diversity and its measurement, edges and ecotones. Ecological Succession: Types, mechanisms, changes involved in succession, concept of climax.
UNIT – IV

Ecology of Ecosystem: Ecosystem structure – function, energy flow and mineral cycling (C, N, P); Primary production and decomposition; Structure and function of some Indian ecosystems; Terrestrial (Forest, Grassland) and Aquatic (Freshwater, Marine and Estuarine).

Biogeography: Major terrestrial biomes, Theory of Island bio-geography; Biogeographical zones of India.

UNIT-V

Applied Ecology: Environmental pollution and Bioremediation; Global Environmental Changes; Biodiversity – Status, monitoring and documentation; Major drivers of biodiversity change; Biodiversity management approaches.

Conservation Biology: Principles of conservation, Major approaches to management, Indian case studies on conservation/ management strategy (Project Tiger, Biosphere reserves).

Suggested Reading Materials

Course Outcomes

On successful completion of the course the students can able to

CO1: An Environmental biology will be able to recognize the physical, chemical, and biological components of the earth's systems and show how they function.

CO2: Environmental Biology shall demonstrate the scientific method and quantitative techniques to describe, monitor and understand environmental systems.

CO3: Students will apply knowledge of the sciences within an interdisciplinary context in solving environmental issues such as environmental health, food and agriculture, energy, waste and pollution, climate change, population, resource management, and loss of biodiversity.

CO4: Students will carry out an applied research project in the natural sciences.
CORE PAPER -11
EVOLUTION (20PZC11)

Teaching Hours: 5hrs/ week Credit Point: 5

Course Objectives:

- The course will give the student knowledge about evolutionary processes and skills in evolutionary analysis
- To study molecular evolution and the history of life
- To emphasize the historical nature of evolutionary biology and the evolutionary concepts.

UNIT – I


UNIT – II


UNIT – III

Molecular phylogenetics: Construction of phylogenetic tree, Phylogenetic inference – Distance methods, Parsimony methods, Maximum like hood method, Immunological techniques.

UNIT – IV

Amino acid sequences and phylogeny – Nucleic acid phylogeny – DNA - DNA hybridizations, Restriction enzyme sites, Nucleotide sequence comparisons and homologies – Molecular clocks.

UNIT – V

Suggested Reading Materials


Course Outcomes:

CO1: Students learn how evolution is the central theoretical explanation for all of life, for all its diversity of form and function.

CO2: Students learn that evolution is a significant part of understanding who we are as humans.

CO3: Students learn practical skills like constructing phylogenetic trees.

CO4: Describe the molecular methods to study genetic variation within and between species.
MAJOR PRACTICAL – IV
ENVIRONMENTAL BIOLOGY AND EVOLUTION (20PZP04)

Practical Hours: 5 hrs/ week
Credit Point: 4

Major:
Hydro-biological studies of water samples Fresh water/ Effluent / Sewage with special reference to Oxygen, CO₂ and Salinity.
Identification of any five Zooplanktons – (Fresh water or Marine)

Minor:
Study of Fossils – Trilobites, Archeopteryx
Living fossils – Peripatus, Limulus.
Animal Associations – Parasitism, Commensalism, Mutualism

Spotters:
Secchi disc, Maximum and Minimum Thermometer, Hygrometer, Rain gauge,
Field trip Report on Ecological aspect – Sandy, Muddy and Rocky shores