Programme Specific Outcome:

1. Gain knowledge on animal structure and function relationships, assess the evolution of various organ systems.
2. Relate normal cellular and molecular structures to their functions.
3. Understand the concept of a cell and its role in development and formation of an embryo.
4. Explain cellular processes and mechanisms that lead to physiological functions and pathological state.
5. Explain the mechanisms which underlie evolution at the molecular level.

**Scheme of Instruction & Examination**
(For students admitted from 2018-2019 & onwards)

<table>
<thead>
<tr>
<th>Part</th>
<th>Subject Code</th>
<th>Name of paper/component</th>
<th>Hours of instruction/week</th>
<th>Scheme of examination</th>
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<tr>
<td>I</td>
<td>17MZOC01</td>
<td>Functional morphology of Invertebrates</td>
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<td>I</td>
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<td>Functional morphology of vertebrates</td>
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<td>Animal Physiology and Endocrinology</td>
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<td>Developmental Zoology</td>
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<td>Environmental Biology and Toxicology (Open Book Assessment Paper)</td>
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<td>Microbiology</td>
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Total credits to earn the degree

1. Part I - 80
2. Part II
   Internship - 2
   Professional Certification course - 2
   MOOC course - 2
   CSS - 1

   Total 85 + 2

Other courses to be undergone by the students

1. Professional Certification course
2. MOOC course

Other courses offered by the department

IDC - 17MZOI01 – Introduction to animal experimentation
MDC -17MZOM01 – Conservation of fauna
Professional Certification Course – (i) 17MZOP01 - Radioecology
SEMESTER - I

17MZOC01  Functional Morphology of Invertebrates  4 Hrs / Week

Objectives:

To make students to understand
The symmetry and coelom of the invertebrates and their significance.
The functional aspects of different systems of invertebrates

Unit 1: General principles of Animal Taxonomy
Definition of taxonomy, systems of classification (artificial, natural and phylogenetic) – Systematic hierarchy. Principles of Taxonomy.- Holotype, Paratype, Nomenclature (Binomial, Trinomial); International code of Zoological nomenclature - Taxonomic procedures; new trends in taxonomy.
* General organization of Invertebrates – Grade of organization (* Protoplasmic level, Cellular level, Tissue level and organ level of organization) – Symmetry (Radial, Biradial and Bilateral) – Coelom (Acoelom, Pseudocoelom and Coelom) – Metamerism – Cephalisation. 15 hrs

Unit 2: Locomotion and feeding
Locomotion by Pseudopodia, Flagella and Cilia, Hydrostatic movement in hydra and star fish. * Feeding: Filter feeding in Polychaetes, Molluscs and Echinoderms 5 hrs

Unit 3: Respiration and circulation
Organs of respiration- Gills (Crustacea), lungs (Pila), and trachea (Insecta)– respiratory pigments
- Mechanism of respiration;

Circulation – Cyclosis (Paramecium), Diffusion (Sponge), * Open circulatory system
(cockroach) and closed circulatory system (Neries). 10 hrs

Unit 4: Nervous system and sense organs

Primitive nervous system in Coelenterata and Echinodermata; advanced nervous system in
Annelida, Arthropoda (Crustacea and Insecta) and Molluca (Cephalopoda).

*Sense organs-simple and compound eye, statocyst and osphradium, nuchal organs, tactile and
olfactory receptors * 15 hrs

Unit 5: Excretion and Reproduction

Organs of excretion - coelom, coelomoducts, nephridia, green glands and Malphigian tubules,
Mechanisms of excretion.
*Reproduction -asexual (Paramecium), alternation of generation (Obelia), sexual (Fasciola and
Nereis).
Larval forms of Crustacea and Echinodermata and their evolutionary significance. 15 hrs

* Self Study

References:

Meerut.
Ltd.,New Delhi.


FUNCTIONAL MORPHOLOGY OF VERTEBRATES

Semester I

Hours of instruction / week : 4

Subject code : 17MZOC02

No of credits : 3

Objectives:

1. Students to know the classification of vertebrates
2. Students to know the functional aspects of different systems of vertebrates in a comparative basis.

Unit 1. Outline classification of Vertebrates upto orders with examples 8 hrs
         Super class Pisces and * super class Tetrapoda -Comparative anatomy of
         Vertebrates

Unit 2. Vertebrate integument and its derivatives 10hrs
         General structure and functions of skin and * its derivatives - Glands, Scales,
         Horns, Claws, nails, hoofs, feathers and hairs

Unit 3. Circulatory and Respiratory systems in Vertebrates 15hrs
         General plan of circulation in various groups – Evolution of heart and aortic
         arches and portal systems – lymphatic systems.
         * Respiration – Internal and external respiration,
         Respiratory organs and Types of respiration – Gill, Cutaneous, Buccal,
         Pulmonary and Diaphragmatic.

Unit 4. Nervous system 15 hrs
         Comparative anatomy of the brain in relation to its functions; Nerves– cranial
         and peripheral nerves - * Autonomous nervous system

Unit 5. Urinogenital system in Vertebrate 12 hrs
         Types and Functions of Kidneys- Pro, Meso and Meta nephric kidneys
         Reproductive system, * Male and Female Gonads and Gono ducts - accessory
         reproductive glands.

* Self Study
**Course outcomes:**

1. Understand the basic principles of vertebrate classification identify and describe the salient features of major vertebrate groups.
2. Explore the role of integument and its derivatives in major vertebrate groups.
3. Assess the evolution and ecological adaptations of respiratory organs from fish to mammal.
4. Understand the evolution of circulatory and excretory system and assess their evolutionary significance.
5. Summarize the reproductive system including accessory reproductive glands and their functions

**Reference books:**


**Text books:**

Objectives

To understand the structural and functional aspects of the cell.

To understand the molecular mechanism of cell functioning

Unit 1 Membrane structure and cell signaling


Cell surface receptors- types- G proteins coupled receptors- ion channel receptors- Tyrosine linked receptors- receptors with intrinsic enzymatic activity- MAP – kinase pathway- second messengers-CAMP – signaling plasma membrane to nucleus. 15 hrs

Unit 2 Endoplasmic reticulum and protein synthesis


Ribosome – ultra structure- chemical composition and organization- high resolution structure –function- ribosome as a ribozyme – peptidyl transferase. 16 hrs

Unit 3 Cell division and control

*Mitosis and meiosis –central cell cycle control system- cell cycle check points- cyclin and cyclin dependent kinases –control of cell cycle. 17 hrs

Unit 4 Transcription and translation


Unit 5 Regulation of gene expression

Regulation of gene expression in prokaryotes – Operon model in prokaryotes – Lac operon hypothesis – types of control of Operons - *Regulation of gene expression in Eukaryotes- Genomic level-Transcription level-Processing of RNA transcript-Transport of RNA out of nucleus-Translation of mRNA. 15 hrs

* Self study
References

Semester – I

17MZOC04  Genetics  4 Hrs/Week

Objectives
To facilitate the students
➢ To understand the basic principles of Genetics
➢ To know about the applied aspects of Genetics

Unit – 1 : Mendelian Genetics

*Mendelian laws of inheritance – Interaction of genes – Quantitative inheritance – Complementary, Supplementary, Epistatic, Lethal and cumulative genes - Multiple alleles and isoalleles – ABO blood group and Rh factor. 10 hrs

Unit – 2 : Classical Genetics

Linkage – crossing over – chromosome mapping – Sex linked, sex influenced and sex limited traits – sex determination - * Extra nuclear inheritance – Shell coiling in snails, inheritance of kappa particles in Paramecium, Sigma particles in Drosophila. 12 hrs

Unit – 3 : Human Genetics

Human chromosomes- Classification and Identification – Lyons hypothesis – Barr body and heterochromatin- Autosomal and sex chromosomal abnormalities in man – Amniocentesis-Chromosomal aberrations - Pedigree charts – *Eugenics and genetic counseling - Human genome projects. 13hrs

Unit – 4 : Population and Applied Genetics

Gene pool and gene frequencies – equilibrium of gene frequencies – Hardy- Weinberg equilibrium – changes in gene frequencies

Unit - 5 : Microbial Genetics

Transformation - Transduction - Specialized and generalized - Conjugation – F+ X F- mating, Hfr conjugation, F′ conjugation, Transposons- Discovery, Characteristics, types of transposable elements - Ac and Dc elements, Retrotransposons, IS elements*. 12hrs

* Self Study
References

Invertebrates and vertebrates

Invertebrates:

1. Simulated animal dissections available on invertebrates 3 h
2. Five representative organisms for each phylum 6 h
4. Larval forms 3 h

Vertebrates

1. Simulated animal dissections of shark and frog 8 h
2. Five representative organisms for each class 8 h

Field Visit 14 h

Visit to Gass Museum
Visit to Nilgiri Biosphere
Visit to Salim Ali Centre for Ornithology
Visit to Silent valley

The candidate should submit a certified bonafide record of practical work done during the semester at the time of practical examination
Semester I

17MZOC06 Practical II 5hrs / week

(Cell biology, Molecular biology and Genetics)

Cell and Molecular biology

1. Slides on tissues – Epithelial, connective, bone, muscular and germ cells  5h
2. Preparation of Squamous epithelial cells  5h
3. Cell size determination using micrometer  5h
4. Mitosis in onion root tips  5h
5. Meiosis in cockroach testis  5h
6. Giant chromosome in Chironomous larva  5h
7. Separation of lymphocytes using histopaque  5h
8. Haemolysis  5h
9. Isolation and estimation of DNA from onion  5h
10. Isolation of plasmid DNA from bacteria  5h
11. Restriction endonuclease digestion of DNA  5h
12. Examination of prepared slides of tissues using microtome  5h

Genetics

13. Culture of Drosophila  5h
14. Identification of phenotypic traits in Drosophila  5h
15. Study of various genetic traits in man  5h

The candidate should submit a certified bonafide record of practical work done during the semester at the time of practical examination
BIOCHEMISTRY

Semester II

Hours of instruction / week : 4

Subject code : 17MZOC07

No of credits : 3

Objectives :

1. To understand the chemical basis of life.
2. To study the structure and biological significance of biomolecules
3. To study the metabolism of biomolecules and disorders of metabolism.

Unit 1. **Introduction**- Chemical bonds- Functional groups - pH - Buffers 8 hrs


Unit 2. **Carbohydrate chemistry and metabolism** 12 Hrs

  **Carbohydrate chemistry** - Classification, Monosaccharides - structure, isomerism, properties – Disaccharides- Polysaccharides- Homo and Hetero polysaccharides

  **Metabolism** – Introduction - glycolysis, TCA Cycle - gluconeogenesis, glycogenesis, glycogenolysis, HMP shunt, Uronicacid pathway.

  Biological Oxidation - Electron Transport Chain – Oxidative Phosphorylation

Unit 3. **Amino acid and protein chemistry** 12 hrs

  **Amino acid Chemistry** - Amino acid structure, Classification – Properties

  **Metabolism** - Transamination, deamination, decarboxylation, urea cycle, catabolism of phenylalanine, tryptophan, tyrosine - inborn errors of metabolism.

  **Protein chemistry** - Classification – Bonds related to protein structure – Levels of protein structure – Denaturation

  **Enzymes** – **Nomenclature – Classification - Mechanism of enzyme action,**

  **enzyme kinetics - Factors affecting enzyme action**

Unit 4. **Lipid chemistry and Metabolism** 15 hrs

  **Lipid chemistry** – Classification – structure and functions of fatty acids - Triacylglycerols - Phospholipids –Glycolipids – Lipoproteins - Steroids.

  **Metabolism** - Biosynthesis of fatty acids - β oxidation of fatty acids-
ketogenesis - cholesterol metabolism.

Unit 5. **Nucleotide chemistry and metabolism** 13 hrs

**Chemistry** – Purine and Pyrimidines Nucleotides

**Metabolism** - Biosynthesis - catabolism of purine and pyrimidine nucleotides - Disorders of nucleotide metabolism.

**Course outcomes:**
1. Gain knowledge on the basic structure and functions of biomolecules
2. Understand the metabolic pathways and their regulatory mechanisms
3. Apprehend the special properties of water and the influence of aqueous environment on the behavior of biological macromolecules
4. Acquire fundamental knowledge on enzymes and enzyme kinetics
5. Understand the physical and the chemical properties of organic functional groups and chemical bonding of molecules

**Text books:**

**Reference books:**
Objectives
To enable the students to
- Understand the functions of various systems of animal body with special reference to mammals
- Know about the role of various hormones in coordination of activities of biological systems in animals.

Unit-1: Digestive system, Circulatory and Excretory system
14 Hrs

Unit-2: Respiratory, Nervous and muscular system
Respiratory pigments-Blood gas transport-Respiratory quotient.
Structure and functions of Nervous tissue-Reflex action- Conduction of nerve impulse- Autonomic nervous system, *Morphology and physiology of sense organs - Properties and mechanism of contraction of muscles -Biochemistry of muscles - Neuro muscular junction
12 Hrs

Unit –3: Communication and Animal behavior
Bioluminescence-Pheromones -Biological rhythm-Circadian and Circannual rhythm- *Orientation and navigation
14 Hrs

Unit-4: Endocrine glands
Structure and functions of endocrine glands in Mammals – Pituitary - hypothalamus-Thyroid - Parathyroid – Pancreas - *Adrenal and Prostaglandins
10 Hrs

Unit–5: Hormonal Control
Ovarian cycle, Menstrual cycle and Physiology of pregnancy, Hormonal control of Gastric metabolism
Neuroendocrine systems in Crustacea and Insecta - *Hormone Analogue and its applications-
Genetic disorders due to hormonal imbalance  

References
Semester II
17MZOC09 Developmental Biology 4 hrs/week

Objectives

- To enable the students
- To understand the basic principles of growth and development
- To understand the general concept of ontogeny development
- To understand the application of Developmental Zoology.

Unit I: Spermatogenesis and Oogenesis


Process of Oogenesis – * Development during Oogenesis- Vitellogenesis- egg maturation – egg cortex organization of the egg

12 hrs

Unit II: Fertilization, cleavage and Gastrulation

Mechanism of fertilization – Biochemical aspects of cleavage –Molecular changes during cleavage – * Morphogenetic movements - Cell adhesion molecules and pattern formation.

12 hrs

Unit III: Nucleus and cytoplasm in development

Nuclear control of development - Enucleation experiments -

*Nuclear transplantation - Cytoplasmic determinants – Cytoplasmic control of nucleus during development.

12 hrs

Unit IV: Induction competence and differentiation

12 hrs

**Unit V: Metamorphosis, Regeneration and Human development**


* Birth defects and Test tube baby.

12 hrs

* Self study

**References:**


Semester -II

17BZOC10 Bioinformatics (3 Hrs/ week)

Objectives:

1. To study the fundamentals of bioinformatics principles,
2. To understand the practical applications of bioinformatics tools

Unit-I Biological databases

History and scope-biological databases - sequence and structure databases - Nucleotide sequence databases - protein databases – specialized databases. – 5 h

Unit-II Sequence analysis

Need for sequence analysis – pairwise alignment – dot plot – global and local alignment algorithms – substitution matrices; PAM and BLOSUM-Database similarity searches, FASTA and BLAST– Multiple alignment – Clustal – phylogenetic tree construction – PHYLIP. – 10h

Unit-III Protein structure prediction and homology modeling

Secondary structure prediction of protein- Chou – Fasman method – nearest neighborhood method - Protein folding – tertiary structure prediction, Homology modeling – threading – Ab initio methods – 10h

Unit IV Molecular visualization tools

3D structural analysis of biomolecules – obtaining atom co-ordinate files from databases – Molecular Visualization Tools- Rasmol –Commandline window - 10h

Unit V Molecular modeling and drug designing

Introduction to the concepts of molecular modeling – molecular structure and internal energy – Drug designing – *finding new drug targets to treat diseases – novel drug design – drug-receptor interactions – docking - 10 h
• Self study

Reference Books

Practicals III

BIOCHEMISTRY, ANIMAL PHYSIOLOGY, ENDOCRINOLOGY AND DEVELOPMENTAL BIOLOGY

Semester II

Hours of instruction / week: 5

Subject code: 17MZOC11

Objectives:

1. Able to demonstrate an understanding of fundamental biochemical principles
2. To understand the general concept of endocrine glands
3. To understand the application of Developmental Zoology.

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<th>I. Biological Chemistry</th>
<th>Estimation of protein in fish sample</th>
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<td>Estimation of carbohydrates in fish sample</td>
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<td>Estimation of fat in fish sample</td>
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<td>Salivary amylase activity in relation to pH</td>
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<th>II. Animal Physiology &amp; Endocrinology</th>
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<tr>
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<td>Preparation of haemin crystals</td>
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<td>Preparation of human blood smear</td>
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<td>Enumeration of RBC and WBC using haemocytometer</td>
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<td>Excretory products of animals</td>
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<td>Effect of salinity on the metabolic rate of fish</td>
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<td>Effect of thyroxine on the oxygen consumption fish</td>
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<p>| III. Developmental Biology | Slides on Frog Embryology – T.S. of ovary, Cleavage - 2 cell, 4 cell, 8 cell and 32 cell stages, Blastula, Gastrula – yolk plug stage – Neural plate – Neural fold – Neural tube | 15 hrs |</p>
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<td>Tadpole – 4mm, 7mm and 10mm</td>
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<td>Slides on chick embryology – Hen’s egg – 18h, 24h, 36h, 48h, 72h and 96h of chick embryo</td>
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<td>Chick embryo whole mounting</td>
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<td>Induced breeding in fish</td>
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The candidate should submit a certified bonafide record of practical work done during the semester at the time of practical examination.
SEMESTER-III

17MZOC13 Environmental Biology and Toxicology (4hrs/week)
(Open book assessment paper)

Objectives

- To understand the various factors of environment
- To know about the strategies for disaster management
- To learn about the implications of environment on human health and social issues
- To have knowledge about environmental toxicants and their hazards

UNIT I

Introduction to Environmental Studies and Biodiversity

Definition – Types of environment – Natural resources- forest, water, mineral, food and energy.

Biodiversity: Classification – Values of biodiversity – Biodiversity at global level, Hot spots, Biogeographical classification of India, India mega biodiversity Nation- endangered and endemic species of India-Threats of biodiversity & Conservation. (12hrs)

UNIT-II


Disaster management – Definition, Flood, Earth quake, Tsunami, Cyclone and Land slide. (12hrs)

UNIT – III

Social Issues and Environment  Sustainable development- Urban problem related to energy – Water management and conservation, Resettlement and rehabilitation of people, Environmental ethics, Climate change, Wasteland reclamation, Consumerism, Environmental Protection Acts. (12hrs)

UNIT IV

Environmental Toxicants and Health hazards  Survey of environmental toxicants – pesticides, automobile emissions, heavy metals, fertilizers, food additives, radio active substances, accumulation of toxic residues in organisms — routes of entry, absorption, distribution, excretion and biotransformation of toxicants, mode of action, dose response relationship, teratogens, carcinogens, mutagens, safety evaluation of toxicants, role of LC$_{50}$
UNIT-V

Case studies: *In situ* and *Ex situ* conservation of Indian animals: Population management - Project Tiger and Elephant - Captive breeding programme- Public participation in conservation – Paching of wild animals – Man animal conflict

Cauvery Water dispute - Heavy metals in water and soil, Bioaccumulation of toxicants, Mining and quarring in India - Survey of food additives – Pesticides in soft drinks - - Fuel conservation

REFERENCES


Semester III
17MZOC14 MICROBIOLOGY (4 Hrs / Week)

Objectives:
To enable the students to gain knowledge about the applications of microbes and its significance in various fields.

Unit 1: Introduction to Microbiology

History - Scope of Microbiology*- Classification of microorganisms - Two, three and five kingdom classification - Structure and outline classification of bacteria, fungi and virus. - 12 hrs

Unit 2: Methods in Microbiology

Media - Types and preparation of culture media –Methods of growing microbes - Cultivation of aerobes and anaerobes – methods of isolation and maintenance of pure culture – Identification of bacteria - physical and chemical methods of sterilization

Microbial Growth - Growth curve of bacteria - Factors affecting growth - Measurements of microbial growth* - 12 hrs

Unit 3: Food and Dairy Microbiology

Food Microbiology - Microbial flora of foods - Biochemical changes - Food spoilage – Spoilage of meat, fish, egg, vegetables - Food poisoning- Food preservation - Prevention of spoilage. Fermented food - Soy Sauce and Wine*

Dairy Microbiology - Classification of microorganisms of milk - bacteriological examination of milk - preservation of milk - Milk borne diseases* - 12 hrs

Unit 4: Industrial and Environmental Microbiology

Industrial Microbiology - Basic functions – Construction of fermentor - Types - Operation of fermenter - Criteria for microbial selection - Production of Beer and citric acid

Environmental Microbiology - Water purification - MPN and Membrane filter techniques – Small scale and large scale sewage treatment- Bioremediation of effluents using microbes* - 12hrs

Unit 5: Medical Microbiology

Fungal diseases- Mycoses, mycotoxicoses, Superficial mycoses – Tinea versicolor and Dermatophytosis, Subcutaneous mycoses – Sporotrichosis, Systemic mycoses – Candida aisis and Aspergillosis
**Bacterial diseases** - Tuberculosis, diptheria, meningitis, whooping cough, diarrhea, typhoid, pertussis, pneumonia, tetanus, anthrax, gonorrhea, syphilis, leprosy

**Viral diseases** – Common cold, influenza, measles, mumps, rubella, small pox, dengue fever, polio, viral hepatitis, rabies, AIDS.*

* Self study

**Reference Books:**


Objectives

To make the students acquaint with the immune system of our body

UNIT 1:

History of immunology - Immunity- types, cells and organs of immune system, myeloid cells and lymphoid cells, primary and secondary lymphoid organs, differentiation of B and T cells
Mechanism of innate immunity and characteristics of acquired immunity 12 hours

UNIT 2:

Antigen- essential features, epitopes, classes of antigens, antibody - immunoglobulin structure, classes, allotypes and idiotypes , biological properties, isotypes switching and generation of antibody diversity, antigen antibody interaction- affinity, avidity, cross reactivity, precipitation and agglutination reaction, radio immuno assay, ELISA, immuno fluorescence 12 hours

UNIT 3:

MHC- general organization and inheritance, MHC genes and molecules, activation of CD4+ and CD8+ T cells, B cell activation, cytokines, complement-classical and alternative pathways, biological activity of compliment components 12 hours

UNIT 4:

Immune response- humoral and cell mediated, regulation of immune response-immunologic tolerance regulation, hypersensitivity reaction- type 1, type 2, type 3 and type 4 reactions, immuno deficiency diseases- phagocytic- humoral, cell mediated immunity 12 hours

UNIT 5:

Transplantation immunology - immunologic bases of graft rejection, clinical manifestations of graft rejection, tissue typing, immuno suppressive therapy, tumour immunology- tumour antigen, immunity against cancer, cancer immuno therapy, auto immunity- organ specific and systemic auto immune diseases, immuno prophylaxis- active immunization- recent approaches to vaccine production- passive immunization 12 hours
References:
SEMESTER III

17MZOC16 BIOTECHNOLOGY (4 Hrs/ Week)

Objectives:

- To enable the student to learn the recent advances in Biotechnology.
- To learn the application of r-DNA technology.
- To learn the various techniques employed.

Unit-1:

Introduction – Scope and importance of biotechnology

Enzymes in genetic engineering- Exonucleases, Endonucleases, Restriction Endonuclease and it’s types (self study), S1 Nuclease, DNA ligase, Alkaline phosphatase, Reverse transcriptase, DNA Polymerase, Methyl transferase, Polynucleotide kinase, Terminal transferase. (12hours)

Unit -2:

Vectors in gene cloning - Plasmids, Bacteriophages, Cosmids, Phagemids, Yeast artificial chromosomes, Bacterial artificial chromosomes, expression vectors, shuttle vectors, Transposons.

Preparation of rDNA and its introduction into host cells - Transformation, conjugation, electroporation, microinjection, transduction, direct gene transfer, agroinfection, liposome fusion, biolistics (self study) (12hours)

Unit -3:

Identification of recombinants: Restriction enzyme analysis, Southern blotting, Northern blotting, In-situ hybridisation, DNA Sequencing, PCR, DNA Probes, RFLP, RAPD (Self study). (12hours)

Unit -4:

Unit -5:

**Applications of biotechnology in human welfare** - Tissue plasminogen activator, Erythropoietin, interferon’s- recombinant vaccines- Monoclonal antibodies - Transgenic animals- Genetically Modified Microorganisms (GEMOs ) –Gene Therapy

Biotechnology and Bio-safety operation guidelines and regulations. Intellectual property right and protection (self study) –Forms of protection, General Agreement of Tariff’s and Trade (GATT) and Trade Related IPR’s (TRIPs), Patenting of biological materials- significance.

(12 hours)

**Reference Books**

Semester – I

17MZOC17  Evolution  4 hrs /week

Objectives

To facilitate the students

➢ To understand the basic principles of Evolution
➢ To know about the origin of life and theories of Evolution

Unit – 1: Origin of life and evolutionary concepts

Theories of evolution – Biochemical origin of life – Lamarckism – Darwinism – Natural selection and Variation - Mutation theory of De Vries* 12 hrs

Unit – 2: Mechanism of Evolution


Unit – 3: Consequences of Evolution

Adaptation – Types – Structural, Physiological, Protective and Animal association adaptations- Divergent evolution- Convergent evolution- Mimicry and Colouration* 12 hrs

Unit – 4: Paleontology and Behavioural evolution


Unit – 5: Human evolution and Philosophical issues

Uniqueness of man – Fossil history and phylogeny of man – Cultural evolution and evolutionary future of mankind*. 12 hrs

Self study

References


Mark Ridley (2004), Evolution, Third edition, Blackwell Science Ltd, USA


Rao, C.V. (2005), Human evolution and its uniqueness, Atlantic Publishers and distributors, New Delhi
Microbiology

1. Techniques for pure culture of microbes – Spread, pour and streak plate methods - 2 h
2. Isolation and enumeration of microbes from soil, water and air. - 5 h
3. Identification of bacteria by Gram staining and negative staining - 3 h
4. Identification of bacteria by biochemical test – Indole, Methyl red, Voges Proskauer, Citrate Utilization, Catalase and Starch Hydrolysis Tests – 5 h
5. Identification of fungi by lacto phenol cotton blue staining - 5 h
6. Growth curve of E.coli - 5 h
7. Methyl blue Reductase Test of milk - 5 h
8. Fermentation technique - Production of Wine - 5 h
9. Biodegradation of industrial effluents using microbes - 5 h
10. MPN technique for the identification of coliforms in water samples - 5 h
11. Antibiotic sensitivity test - 5 h

Immunology

1. Single radial immunodiffusion - 5 h
2. Precipitin ring test - 2 h
3. Enzyme Linked Immunosorbent Assay - 3 h

Biotechnology

1. Isolation and estimation of DNA from goat liver - 5 h
2. Separation of DNA by agarose gel electrophoresis - 5 h
3. Isolation and purification of plasmid DNA by alkaline denaturation method - 5 h
Objectives:

- To disseminate information on economic aspects of Zoology
- To inculcate knowledge on useful animals to man kind
- To understand the modern techniques of animal culture

Unit 1: Apiculture

Life history of honey bee, kinds of honey bees- natural hives- Artificial hive –Newton’s hive and other appliances, enemies and diseases of honey bees - 3 Hrs

Unit 2: Sericulture

Life cycle and rearing of silkworm moth (*Bombyx mori*), – Diseases- Protozoan, bacterial, fungal & viral -3Hrs

Unit 3: Pisciculture

Cultivable species of fishes in India –construction of a pond – polyculture- Sewage fed fish culture – induced breeding. -3Hrs

Unit 4: Vermiculture

Cultivable species of earthworm – vermi composting methods – conditions required for vermicomposting – vermicast – vermiwash - 3Hrs.

Unit 5: Poultry Science

Breeds of fowls – the deep litter system – practical aspects of chick rearing – management of growers and layers – feed formulations – vaccines - 3 Hrs

Reference Books:


SEMESTER IV
BIOSTATISTICS AND THESIS WRITING

17MZOC21 (4 Hrs/ week)

Objectives
To make the students
- learn the methods of data collection and the application of statistical methods in solving biological problems
- know the principles of research design and thesis writing

Unit – I Introduction to Statistics

Statistics – Definition, Scope, functions and limitations, Development of Biostatistics and its applications

Sources of statistical data - primary and secondary sources, statistical organizations

Presentation of data - classification and tabulation of data, frequency distribution, Diagrammatic and graphical representation of statistical data – Bar diagrams, Pie chart, Line graph, Pictogram, Histogram, Frequency polygon, Frequency curve, Ogive

10 hrs

Unit – II Descriptive statistics

Measures of central tendency – objectives, mean, median and mode, uses, merits and demerits
Measures of dispersion – objectives, range, quartile deviation, mean deviation, standard deviation, absolute and relative measures of dispersion, uses, merits and demerits
Correlation and regression analysis - Definition, uses, types of correlation, methods of studying correlation – Scatter diagram, graphic method, Karl Pearson’s coefficient of correlation, Rank, Concurrent deviation, least squares method, regression lines, regression equations, regression coefficients

15 hrs

Unit – III Sampling and Theoretical Distribution

Sampling – meaning, advantages, concept of parameter and statistics, sample size, sampling error, types of samples – Probability samples – Simple random sample, stratified random sample, systematic sample, cluster sample, multi stage. Non – probability samples – purposive sampling, quota sampling, accidental sampling
Introduction of probability and its applications – Theoretical distributions – Binomial, Poisson and Normal distributions; properties, uses and applications

10 hrs

Unit – IV Testing of Hypothesis

Procedure of testing hypothesis, student’s t- test, Analysis of variance - one way and two way classification, Non-parametric and distribution free tests – Chi-square test.

15 hrs

Unit – V Introduction to Research

Research – Knowledge and sciences, types and application, Research definition – research design – identifying the problem, reviewing the literature, designing the study – Chapter outline

Documentation - Report writing, presentation, test layout, use of tables and figures, their placement, numbering, foot notes to tables and figures, spacing and alignment, Referencing – Reference systems, essential information – special capitalization and alphabetical and chronological order, editing and evaluating the final report, Components of a research thesis

10 hrs

REFERENCES

5. Klaynekl Daniel (2009), Biostatistics, Wiley India Pvt. Ltd., New Delhi