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OBJECTIVE:
To impart the knowledge on the origin of metazoa from protozoa together with symmetry, metamerism and coelom formation leading to the origin of chordates and vertebrates.

UNIT I: Protozoa And Porifera

UNITII:Cnidaria,CoelentrataAndCtenophora

UNIT III :Platyhelminthes And Nemathelminthes
General characteristics and classification upto classes. Life cycle and pathogenicity of Taeniasolium, Ascarislumbricoides, Wuchereriaabancrofti and parasitic adaptations.

UNIT IV :Annelida And Arthropoda

UNIT V :Mollusca And Echinodermata
General characteristics and classification upto classes. Torsion in Gastropoda and Pearl formation. Life cycle of Sepia. Water vascular system, larval forms of Echinodermata and Chordates affinities.
Text books
2. Invertebrate Zoology – VeerbalaRastogi. (or) Dhami&Dhami

Reference Books

16UZO1MC02 - INVERTEBRATA LAB COURSE

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OBJECTIVE:
To observe the anatomy and structural modifications in invertebrates and to develop dissection skill.

UNIT I : Major Dissection
Cockroach: Digestive system, Circulatory system, Nervous system, Reproductive system - Pila: Nervous system - Leech / Earthworm: Nervous System, Reproductive system - Prawn: Nervous system (including Appendages).

UNIT II : Minor Dissection
Earthworm: Viscera, Lateral hearts
Pila: Digestive system (Including radula)
Freshwater Mussel: Digestive system

UNIT III : Mounting
Earthworm: Body setae; Pineal setae
Pila: Radula  Freshwater muscle: Pedal ganglia

~ 4 ~
UNIT IV : Mounting
Cockroach: Salivary apparatus, Mouth parts - Honey Bee, House fly and Mosquito mouth parts

UNIT V : Spotters
Representatives from each phylum based on structural organisation and phylogeny – record

Text books


16UZO1MC03 -ECONOMIC ENTOMOLOGY

SEMESTER I  CREDITS  3
CATEGORY MC  NO.OF HOURS/ WEEK  3

OBJECTIVE: To study the economic importance of insects and insect pest management.

UNIT I: Introduction To Insects
Outline classification of Class Insecta, Causes of insects assuming pest status, methods of collection, mounting and preservation of insects.

UNIT II: Agricultural Entomology
Most common insect pests of rice and their control: rice thrips, brown plant hopper and rice ear head bug. Insects pests of stored grains and their preventive and curative methods: internal and external feeder, scavenger. Locusts in control.

UNIT III: Medical And Veterinary Entomology
Insects in relation to public health and their control: mosquito, housefly, eye fly, sand fly, bed bug, flea and head louse. Most common insect pests of domestic animals and their control: stable fly, shaft louse and head maggot.

**UNIT IV: Apiculture And Sericulture**


**UNIT V: Pest Management**

Formulation and classification of insecticides, biological control of insect pests, Integrated Pest Management.

**Text Books**


**Reference Books**

OBJECTIVES:

1. To provide information on the diversity of plants and their significance.
2. To provide suitable knowledge on the taxonomy of angiosperms, their economic importance and anatomy.
3. To provide details on the physiology, reproduction and lifecycle of various plant forms.

Unit I: Plant Diversity (1 + 10 + 1)
Structure and reproduction (No developmental studies)
Algae : *Ectocarpus*
Fungi : *Puccinia*
Bryophytes : *Funaria*
Pteridophytes : *Selaginella*
Gymnosperms : *Cycas*

Unit II: Taxonomy And Economic Botany (1 + 10 + 1)
Detailed studies of the following families: *Annonaceae, Rutaceae, Cucurbitaceae, Lamiaceae, Euphorbiaceae and Poaceae.*

Economic Botany: Common name, binomial, family, the morphology of the useful parts and uses of – vegetables (beet root, potato) - fruits (banana, papaya) – cereals (rice, wheat) - pulses (green gram, pigeon pea) – edible oil yielding plants (sesame oil, coconut oil) - fibre yielding plants (cotton, jute) – medicinal plants (vinca, asafoetida) – narcotic plants (tobacco, cannabis) – timber yielding plants (teak, sal) – spices (cardamom, cloves) – condiments (ginger, turmeric) – essential oils (sandalwood oil, eucalyptus oil) – beverages: alcoholic (wine, beer) and non-alcoholic (tea, coffee).
Unit III: Anatomy (1 + 10 + 1)

Unit IV: Embryology (1 + 10 + 1)

Unit V: Plant Physiology (1 + 10 + 1)

Text Books

BOOKS FOR REFERENCE


16UPB1AL02 - ALLIED PRACTICAL I

SEMESTER I CREDITS 1
CATEGORY AL NO.OF HOURS/ WEEK 2

OBJECTIVE:

1. To provide Practical knowledge about the diversity of plants and their significance.
2. Microscopic study of plants mentioned in theory syllabus.
3. Study of families mentioned in the theory syllabus.
5. Anatomy of stem, root and leaf in dicots and monocots.
6. Observation of slides on microsporogenesis, megasporogenesis and embryo.
7. Transpiration pull.
8. Potato osmoscope.
9. Wilmott’s bubbler on photosynthesis using different light and carbon dioxide concentration
10. Separation of photosynthetic pigments using paper chromatography.

16UZO2MC01 –CHORDATA

SEMESTER II CREDITS 4
CATEGORY MC NO.OF HOURS/WEEK 4

OBJECTIVE :
To study the origin, diversity and evolution of chordates with their characteristic features and affinities with nonchordates.

UNIT I : General Characters And Classification of Phylum Chordata
Origin of Chordata, Differences between nonchordates and chordates, General characters, Affinities and Systematic position of Hemichordata (Balanoglossus), Urochordata (Ascidian), Cephalochordata (Amphioxus).

UNIT II : Prochordates And Agnatha
Characteristics of subphylum veterbrata, Classification of Vertebrata up to Class level, General characters and affinities of Prochordates (Petromyzon), Agnatha - Pisces (Scoliodonsorrakowah) General characters and classification, Origin of fishes, Affinities of Dipnoi - Types of scales and fins - Accessory respiratory organs - Air bladder - Parental care - Migration - Economic importance.

UNIT III : Amphibia
General characters and classification - Origin of amphibia - Type study - Ranahexadactyla - Adaptive features of Anura, Urodela and Apoda - Neoteny in Urodela - Parental care in Amphibia.
UNIT IV : Reptilia

General characters and classification - Type study - Calotes versicolor (endoskeleton of Varanus instead of Calotes) - Origin of reptiles and effects of terrestrialisation, Extinct reptiles

Snakes of India - Poison apparatus and biting mechanism of poisonous snakes - Skull in reptiles as basis of classification

UNIT V : Aves And Mammalia

Aves: General characters and classification - Type study - Columba livia - Origin of birds, Flight adaptations, Migration.

Mammalia: General characters and classification - Type study - RABBIT - Adaptive radiation in mammals - Egg laying mammals, Marsupials, Flying mammals, Aquatic mammals, Dentition in mammals.

Text Books


Reference Books


16UZO2MC02 - CHORDATA LAB COURSE

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OBJECTIVE:
To study the origin, diversity and evolution of chordates with their characteristic features and affinities with nonchordates.

UNIT I: Dissections
Frog / Fish: External features, Digestive system, Arterial system, Venous system, 5th Cranial nerve, 9th and 10th cranial nerves, Male and female urinogenital system.

UNIT II: Mounting
Fish: Placoid and Ctenoid scales, Frog: Hyoid apparatus and Brain.

UNIT III: Osteology

UNIT IV: Specimens And Slides
Testudelegans, Carapace, Plastron, King fisher, Parrot, Owl, Hornbill, Wood pecker, Armadillo, Bat.

UNIT V: Embryology

Stages in the development of Amphioxus, Frog and Chick-Placenta in shark and mammals.

Text Books


Reference Books


16UZO2MC03 - FUNDAMENTALS OF BIOTECHNOLOGY

SEMESTER II CREDITS 3
CATEGORY MC NO. OF HOURS/WEEK 3

OBJECTIVE:

To outline the basics of Biotechnology - scope and importance and to understand the interdisciplinary activity.

UNIT I: Introduction to Biotechnology

Definition - interdisciplinary activity- scope and importance, Biotechnology global scenario - International safety guidelines - Patent law and intellectual property rights.

UNIT II: Principles of Tissue Culture

Culture media - Primary culture and cell lines - Organ culture. Industrial application of animal tissue culture.
UNIT III: Fundamentals of R-Dna Technology

Restriction enzymes: classification - Nomenclature and activity - Restriction mapping of DNA; Plasmids, Cosmids and transposons. Molecular cloning - construction of genomic libraries - Indirect cloning - cDNA preparation and uses of DNA probes.

UNIT IV: Biochemical Engineering

Basic concepts of fermentation- bioreactor design- biosensors.

UNIT V: Agriculture And Aquaculture Biotechnology


TEXT BOOKS

5. Ramawatet al., 2009 Comprehensive Biotechnology, S.Chand&Compy, New Delhi.
OBJECTIVES:

- To provide information on the classification, growth, morphology and genetics of microbes and the recent advances in the field of microbiology.
- To understand the fundamentals of the fermentation process, strain improvement and culture.

To understand the use of different microorganisms for manufacture of a variety of industrial products.

Unit I: INTRODUCTION  
(1 + 10 + 1)
Classification of microbes - A general account of characteristics and classification of bacteria, fungi, Mycoplasma and viruses.

Unit II: MORPHOLOGY, PHYSIOLOGY AND GENETICS OF BACTERIA  (1 + 10 + 1)

Unit III: FERMENTATION  
(1 + 10 + 1)
Unit IV: INDUSTRIAL MICROBIOLOGY (1 + 10 + 1)
Microbial enzymes (Amylase), Organic acid (Citric acid), fermented products (cheese production), beverages (wine), General account on biofertilizers, biopesticides, biopolymers, biosensors, antibiotics (penicillin), vitamins.

Unit V: Environmental Microbiology (1 + 10 + 1)
Bioremediation – Domestic sewage and waste water treatment – Biodegradation of xenobiotics – Biomineralization – Biomining and bioleaching – Biofuels.

TEXT BOOKS

BOOKS FOR REFERENCE

16UPB2AL02– ALLIED PRACTICAL – II

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**OBJECTIVE:**

To provide practical knowledge about microbes and the recent advances in the field of microbiology.

1. Sterilization – Preparation of culture media – nutrient broth and agar - Potato dextrose agar.
3. Pour plate, spread plate and Streak plate techniques – serial dilution.
4. Hanging drop method.
5. Antibiotic sensitivity assay
7. Demonstration of Fermentor operation.
8. Ethanol production and estimation.
9. Wine fermentation
10. Citric acid production
11. Glutamic acid production
OBJECTIVE: To enlighten the functions of organ systems in animals and man towards homoeostasis.

UNIT I: NUTRITION AND DIGESTION
Nutrition-Food requirements-Carbohydrates, Proteins, Fats, Minerals, and Vitamins. Digestive enzymes and their role in digestion—Metabolism—metabolic pathways with reference to carbohydrates

UNIT II: RESPIRATION, EXCRETION AND CIRCULATION

UNIT III: NERVOUS SYSTEM AND ENDOCRINE SYSTEM

UNIT IV: METABOLIC PATHWAYS
Glycogenesis—Glycogenolysis—gluconeogenesis—metabolic pathway of glucose—glycolysis—production of ATP in aerobic
pathway – Kreb’s cycle – electron transport chain- oxidative phosphorylation – hormonal control of carbohydrate metabolism and regulation of blood glucose level.

UNITV : ENZYME KINETICS

Enzymes: classification and nomenclature of enzymes— physico-chemical—properties of enzymes—enzymekinetics—mechanism of enzyme action—factors affecting enzyme activity.

TEXT BOOKS


REFERENCE BOOKS


16UZO3MC02 - ANIMAL PHYSIOLOGY AND BIOCHEMISTRY LAB COURSE

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OBJECTIVE: To illustrate the function of organs and organ systems in different animals..

UNIT I : DIGESTIVE ENZYMES

UNIT II : OXYGEN CONSUMPTION
Estimation of oxygen consumption in an aquatic and a terrestrial animal. Estimation of total protein, fat and carbohydrate

UNIT III : QUALITATIVE DETECTION OF EXCRETORY PRODUCTS
Influence of temperature on the ciliary activity of freshwater mussel gill and calculation of Q 10.

UNIT IV : HAEMATOLOGY
Blood - total and differential counts.

UNIT V : Recording of heart beat, muscle twitch and reflexes in frog.
TEXT BOOKS

REFERENCE BOOKS

16UZO3MC03 - DEVELOPMENTAL BIOLOGY

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OBJECTIVE:
This course will introduce learners to the field of developmental biology and help them to understand the mechanisms involved in the process of development of a single fertilized zygote into a complete organism. It also places emphasis on the role of genetics and environment on development.

UNIT I: BASIC CONCEPTS OF DEVELOPMENT
History of developmental biology; Cell differentiation, commitment and aging; Cell specification and its types; Concept of organizers and inductors; Oogenesis and Spermatogenesis.
UNIT II : FERTILIZATION AND MORPHOGENESIS
Fertilization in sea urchin and mammals; Cleavage patterns and planes; morphogens - movement and gradients; Types of morphogenetic cell movements - invagination, involution, ingresson, delamination and epiboly; Gastrulation in sea urchin, frog, chick and mammals; fate maps

UNIT III : ORGANOGENESIS
Development of Eye, Ear, Brain and Heart and Limb in chick; development of the placenta and extra embryonic membranes in chick; Axis formation (anterior-posterior and dorsal-ventral axis) and genetic control of pattern formation and morphogenesis in Drosophila sp.

UNIT IV : REGENERATION
Regeneration: types, regeneration in hydra, limb regeneration in salamander and pattern formation in regeneration blastema; liver regeneration; regeneration and aging; Stem cells - types of stem cells, role in regeneration and development.

UNIT V : DEVELOPMENTAL ISSUES
Congenital malformation - causes and examples; environmental disruption of normal development by teratogenic agents and endocrine disruptors; Multiple births, conjoined twins; Types of assisted reproductive techniques and procedure of in vitro fertilization and ART.

TEXT BOOKS
REFERENCE BOOKS


16UZO3MC04 – ORGANICEVOLUTION

SEMESTER III CREDITS 3
CATEGORY MC NO.OF HOURS/ WEEK 3

OBJECTIVE: To Explore the process and products of evolution.

UNIT I : INTRODUCTION

UNIT II : CAUSAL FACTORS
Lamarckism - Neo Lamarckism - Darwinism - Neo Darwinism and modern synthetic theory - DeVrie’s Mutation theory – modern concepts of mutation - Mutation and their role in evolution - Animal colouration and Mimicry

UNIT III : ADAPTIVE RADIATION AND SPECIATION
Isolating mechanisms - Modes of speciation-Hybridization is an evolutionary catalyst- Law of Adaptive Radiation- Adaptive radiation in reptiles and mammals - Convergence and parallelism - Evolutionary constancy.
UNIT IV : EVIDENCES AND PALAENTOLOGY


UNIT V : MAN AND NATURAL SELECTION


TEXT BOOKS


REFERENCE BOOKS

OBJECTIVE
To enable the students understand the concepts of chemistry.

Unit I: HANDLING OF CHEMICALS AND DATA ANALYSIS (1+13+1 h)
1.1 Storage and handling of chemicals: Handling of acids, ethers, toxic and poisonous chemicals. Antidotes, first aid procedure.
1.2 Errors in chemical analysis: Accuracy, precision. Types of error-absolute and relative errors. Methods of eliminating and minimizing errors.
1.3 Separation techniques: Solvent extraction. Principle of adsorption and partition chromatography, paper chromatography, thin layer chromatography, column chromatography and their applications.

Unit II: CHEMICAL BONDING (1+13+1 h)
2.1 Ionic Bond: Characteristics of ionic compounds, Structure of NaCl and CsCl, Factors influencing the formation of ionic bond.
2.2 Covalent Bond: Characteristics on covalent compounds. Structure of CH₄, NH₃, H₂O based on hybridisation.
2.3 Coordinate Bond: Nature of coordinate bond. Coordination complexes - Werner’s theory. Isomerism in square planar and octahedral complexes. Structure and functions of chlorophyll and hemoglobin.
2.4 Hydrogen Bond: Types, theory and importance of hydrogen bonding. Hydrogen bonding in carboxylic acids, alcohol, amides, polyamides, DNA and RNA.
2.5 Stabilizing forces in protein and DNA, van der Waal’s
forces, dipole-dipole and dipole-induced dipole interactions.

**Unit III: VOLUMETRIC ANALYSIS**  (1+8+1 h)

3.1 Methods of expressing concentration: normality, molarity, molality, ppm, ppb.
3.2 Primary and secondary standards: preparation of standard solutions
3.3 Principle of volumetric analysis: end point and equivalence point.

**Unit IV: KINETICS AND CATALYSIS**  (1+8+1 h)

4.1 Chemical Kinetics: Rate, rate constant, rate law, order and molecularity. Derivation of rate expression for the first order reaction.
4.2 Catalysis-Homogeneous and heterogeneous catalysis.

**Unit V: CHEMISTRY OF BIOMOLECULES**  (1+8+1 h)

5.1 Fats – Occurrence and composition. Hydrolysis of fats.
5.2 Vitamins – Source, provitamin, properties and classification. Structure and function of vitamin A, C, D, K, and E
5.3 Hormones – Thyroxin, adrenaline and sex hormones (structure and functions only)

**TEXT BOOKS**


~ 26 ~
BOOKS FOR REFERENCE


16UCH3AL04 - CHEMISTRY PRACTICAL FOR BIOLOGY-I

SEMINER  III  
CREDITs  1

CATEGORY  A  
NO.OF HOURS/ WEEK  2

OBJECTIVE
To understand the principle and carry out the qualitative organic analysis systematically.

ORGANIC ANALYSIS
a) Detection of nitrogen, sulphur and halogens
b) Tests for aromaticity
c) Tests for saturation
d) Identification of chemical nature (acidic/basic/neutral) and the following functional groups
   i) Carboxylic acid
   ii) Phenols
   iii) Aldehydes
   iv) Ketones
   v) Carbohydrates
   vi) Primary amines
   vii) Amides

BOOKS FOR STUDY

16UZO4MC01- ENVIRONMENTAL BIOLOGY

**SEMESTER IV**  
**CREDITS**  4  
**CATEGORY**  MC  
**NO. OF HOURS/ WEEK**  4

**OBJECTIVE:** To generate up-to-date knowledge on environmental conservation and management through a comprehensive understanding of the components of ecosystem, biological cycles, habitat ecology, resource ecology, pollution and its management.

**UNIT I : ECOSYSTEM**


**UNIT II : POPULATION AND BIOLOGICAL CYCLES**

UNIT III : ENVIRONMENTAL STRESSES AND MANAGEMENT


UNIT IV : MANAGEMENT OF ECOSYSTEMS AND BIODIVERSITY


UNIT V : AGENCIES OF ENVIRONMENTAL CONSERVATION


TEXT BOOKS


REFERENCE BOOKS


16UZO4MC02 - ENVIRONMENTAL BIOLOGY LAB COURSE

SEMMESTER IV CREDITS 2
CATEGORY MC NO.OF HOURS/ WEEK 2

OBJECTIVE: To provide a method for assessing biotic factors, abiotic factors and the organisms in the environment.

UNIT I: ESTIMATION OF ABIOTIC FACTORS
Estimation of dissolved Oxygen, Dissolved carbon-di-oxide, Determination of alkalinity in water samples, Determination of salinity of water samples, Determination of bicarbonate and carbonates.

UNIT II: MOUNTING TECHNIQUES
Collection, isolation, identification and mounting of marine and freshwater plankton.

UNIT III: ADAPTATION AND ANIMAL ASSOCIATIONS
Study of sandy shore fauna.
Study of rocky shore fauna.
Study of animal Association.

UNIT IV: INSTITUTIONAL VISIT AND FIELD WORK

Study of pond as an ecosystem- Field trip to lakes, pond and different shores. Collection fauna from sea shore. Visit to environmental biology labs, Research Institutes and Effluent treatment plants.

UNIT V: COLLECTION OF MICROARTHROPODS

Study of different soil microarthropods - Extraction and identification of soil micro arthropods through Tullgren’s funnel method and Ladell’s Floating Method.

TEXT BOOKS


REFERENCE BOOKS


OBJECTIVE: To understand and learn the environment and biological processes of marine environment.

UNIT I: MARINE ECOLOGY
Marine environment, ecological factors light, temperature, salinity, pressure Classification of marine environment pelagic environment, planktonic and nektonic adaptations, benthic environment intertidal, interstitial and deepsea adaptation. Other coastal environments coral reefs, estuaries, mangroves, seagrass beds, kelp forests polar seas and hydrothermal vents.

UNIT II: PHYSICAL OCEANOGRAPHY
Physical Properties of Seawater- density, viscosity, surface tension, conductivity and their relationship, temperature distribution in the sea-heat budget, UV radiation Dynamics of the ocean-general surface circulation, Waves, Currents and Tides.

UNIT III: CHEMICAL OCEANOGRAPHY

UNIT IV: BIOLOGICAL OCEANOGRAPHY
UNIT V : OCEAN MANAGEMENT

Role of National and international agencies and organizations in ocean management-FAO, UNEP, DOD, WOCE, WHOI, IOI Malta, IMO INMARSAT- IUCN, SCAR, SCOR, Marpol, Traffic. Ocean policy (India) - research and management.

TEXT BOOKS


REFERENCE BOOKS


OBJECTIVE: To enlighten the functions of organ systems in animals and man towards homoeostasis.

UNIT I: IDENTIFICATION OF PLANKTON
phytopiankton and zooplankton (diatoms, dinoflagellates, hydrornedusae, copepods, pteropods, chaetognatha, thailaceae and planktonic larvae) - Identification of locally available macroalgae, sea grass and holophytes including mangrove plants.

UNIT II: FIELD SURVEY
Field collection - submission of 10 herbarium sheets - Extraction and quantification of plant pigments - Determination of primary production using light and dark bottle techniques.

UNIT III: POPULATION STUDIES
Population analysis of Cerithideacingulata, Uca sp.: Quadrate and Transect method.

UNIT IV: COMMUNITY STUDIES
Collection and identification of animal and community studies of different environments
Pelagic, Muddy shore, Sandy shore, Rocky shore, Interstitial, Oyster bed community, Phytal faunal community (Seaweed and seagrass), Fouling and boring organisms, Assessment of biodiversity of any one of the above communities.

UNIT V: FIELD STUDY
Preparation of a Field Report.

TEXT BOOKS

REFERENCE BOOKS

16UZO4ES03 - BIOPHYSICS AND BIOSTATISTICS

SEMESTER IV CREDITS 2
CATEGORY ES NO.OF HOURS/ WEEK 4

OBJECTIVES: To enlighten statistical applications in biological sciences and to elaborate principles of physics in biology.

UNIT I: BIOPHYSICAL PRINCIPLES

UNIT II: APPLICATIONS OF BIOPHYSICS
Radioactive isotopes – Radiation- Geiger-Muller counter- biological impacts – Autoradiography
Medical and biological uses of X-rays – NMR-Ultrasound - Laser and their applications – Colorimetric - Principles of electrophoresis
UNIT III: COLLECTION OF DATA:
Definition of statistical population and sample in biological studies - Variables: qualitative and quantitative - discrete and continuous - Derived variables – rates ratios, percentages and indices - Unites of measurement – abbreviations of common units of measurements – expression of very large of small numbers as an index of ten.

UNIT IV: CLASSIFICATION AND PRESENTATION OF DATA
Types of Classification: Qualitative and quantitative - Qualitative classification: Chronological, geographical etc. and continuous - frequency distributions - Diagrammatic and graphical representations of data – Bar diagrams (Simple, multiple and subdivided) – Pie diagram – Cartogram- Frequency diagram: histograms- frequency polygon - frequency curve line graphs.

UNIT V: DESCRIPTIVE & INFERENTIAL STATISTICS

TEXT BOOKS
16UZO4ES04 - BIOPHYSICS AND BIOSTATISTICS LAB
COURSE

SEMESTER IV CREDITS 2
CATEGORY ES NO.OF HOURS/WEEK 2

OBJECTIVE: To indicate the merger of biological research with various fields of biophysics and biostatistics.

BIOPHYSICS

UNIT I: SEPARATION TECHNIQUES
Separation of amino acids using radiant and ascending chromatography – polymerization of gel from using PAGE - Fractionation of serum proteins using SDS

UNIT II: MEASUREMENTS
Measurement of viscosity of different liquids using drop weight method
Measurement of surface tension on different liquids using burette method

UNIT III: MEASURE OF CENTRAL TENDENCY
Measure of central tendency using leaf: Arithmetic mean - median - mode - geometric mean - Measures of dispersion: Standard deviation – Standard error

UNIT IV: MEASUREMENTS
Test of significance: Chi-square test for goodness of fit – Student t test
ANOVA - Height and weight comparison, BMI index calculation.

UNIT V: STATISTICAL SOFTWARE
Hands on training of SPSS and Primer.
TEXT BOOKS


REFERENCE BOOKS


16UCH4AL03 - GENERAL CHEMISTRY FOR BIOLOGY-II

SEMESTER IV CREDITS 2
CATEGORY AL NO.OF HOURS/ WEEK 4

OBJECTIVE

1. To understand the chemistry of biomolecules and natural products.

2. To understand the concepts of agricultural chemistry.

Unit I: PROTEINS AND ENZYMES

1.1 Amino acids: Classification, preparation and properties, zwitter ions, isoelectricpoint, peptide linkage and peptide synthesis.

1.2 Proteins: Classification based on structure and functions,
primary and secondary structure, N-terminal analysis, denaturation and renaturation, test for protein- Ninhydrin Test, Biuret Test.

1.3 Enzymes: Classification, factors affecting enzyme activity, mechanism of enzyme action, kinetics of enzyme reaction. Michaelis-Menten equation (no derivation), types of enzyme inhibition.

Unit II: LIPIDS (1+8+1 h)

2.1 Types and functions of lipids (fatty acids, glycerides, complex lipids and non-glycerides), fats and oils (rancidity, saponification, hydrogenation of oils), waxes, phospholipids (lecithins, cephalins, plasmalogens)

2.2 Steroids: structure and functions cholesterol, types and functions of plasma lipoproteins. Bile salts, steroid hormones.

Unit III: NUCLEIC ACIDS (1+10+1 h)

3.1 Components of nucleic acids, structure of purine and pyrimidine bases, structure of DNA and RNA.

3.2 Hydrogen bonding in nitrogenous bases in DNA, properties and types of DNA and RNA, differences between DNA and RNA.

3.3 Replication, translation and transcription of DNA, regulatory metabolism, mutation, genetic engineering, codon.

Unit IV: CARBOHYDRATES (1+10+1 h)

4.1 Classification and functions of carbohydrates. Structure of glucose and fructose, interconversions, mutarotation. Differences between reducing and non-reducing sugars. Test for carbohydrates.

4.2 Structure of sucrose, inversion of cane sugar.

4.3 Glycolysis, TCA cycle, relationship between glycolysis and respiration, photosynthesis.

Unit V: NATURAL PRODUCTS AND AGRICULTURAL CHEMISTRY (1+12+1 h)

5.1 Alkaloids: Classification, isolation and biological importance (mention of papaverine, nicotine, coniine).

5.2 Terpenes: isoprene rule, classification, extraction and
biological importance (mention of Camphor, Citral, and Pinene).

5.3 Flavones and flavonoids: Structure, isolation and importance.

5.4 Types of soil, soil analysis, fertilizers—role of macro and micro nutrients, NPK fertilizers, urea, superphosphate of lime and potassium nitrate.

5.5 Insecticides [dichlorodiphenyltrichloroethane (DDT) and benzenehexachloride (BHC)], herbicides [2,4-Dichlorophenoxyacetic acid (2,4-D) and 2,4,5-Trichlorophenoxyacetic acid(2,4,5-T)], fungicides (bordeaux mixture, lime-sulphur) – structure and uses.

BOOKS FOR STUDY


BOOKS FOR REFERENCE


### OBJECTIVES

1. To understand the concepts of quantitative analysis
2. To understand the separation technique in the analysis of biologically important compounds

### EXPERIMENTS

1. Estimation of ascorbic acid using iodimetric method.
2. Estimation of glucose using benedict's method.
3. Estimation of acetic acid in vinegar.
4. Estimation of glycine.
5. Determination of hardness of water.
6. Determination of strength of H$_2$O$_2$.
7. Estimation of calcium in milk.
8. Determination of iodine value of oil.
10. Determination of available chlorine in bleaching powder.
11. Determination of available iodine in table salt.
12. Determination of available CO$_2$ in baking powder.

### DEMONSTRATION EXPERIMENTS:

1. Column chromatography of leaf and flower extract.
2. TLC – Separation of triglycerides.
4. Determination of pH of soil, water.
5. Tests for carbohydrates and amino acids

### BOOKS FOR STUDY

OBJECTIVE: To emphasize cell as the structural and functional unit and to elaborate heredity and variations.

UNIT I: INTRODUCTION
General account of cell- Cellular building blocks- basic structure and organization- origin of single cell to multicellular organism- cell theory.

UNIT II: TOOLS AND TECHNIQUES
Microscopy- Light, Phase contrast, Dark field, Fluorescence and Electron microscopes – Cytological study of living and dead cells, Microtechniques (vital staining) – Molecular techniques: cell fractionation- homogenization and centrifugation- isolation of cellular components. Tissue culture.

UNIT III: CELL STRUCTURE AND CELLULAR COMPONENTS

UNIT IV: MOLECULAR BIOLOGY
UNIT V : ADVANCED STUDIES IN MOLECULAR BIOLOGY


TEXT BOOKS


REFERENCE BOOKS

OBJECTIVE: To understand the activities of the cell in the genetic and in the molecular level and it helps the students in understanding the maintenance and alteration of the cellular activities.

UNIT I: MOLECULAR GENETICS OF THE CELL

UNIT II: CHROMOSOMAL VARIATIONS AND MAPPING

UNIT III: DNA RECOMBINATION & MUTATION
DNA repair mechanisms; Mutagenesis, Mutations, and Mutants-Types of Mutations, Biochemical Basis of Mutants, Mutagenesis, Mutational Hot Spots, Reversion.; Transposable elements (Insertion sequence and transposons, Integrons and Antibiotic Resistance cassettes; Bacterial Genetics (Conjugation, Transformation, Generalized transduction, Specialized Transduction).

UNIT IV: GENE REGULATION MECHANISMS
General aspects of Regulation, The lactose system and the operon model, The Galactose operon, The Arabinose operon,
The Tryptophan operon, Relative positions of Promoters and Operators, Feedback Inhibition.

UNIT V: MEMBRANE BIOLOGY AND SIGNAL TRANSDUCTION

Membrane organization; membrane proteins - Transport across cell membranes (passive and active) - Internalization of macromolecules and particles -Signal molecules, receptors and second messengers.

TEXT BOOKS


2. Lewin B. 2008. Genes IX. Jones and Bartlett publishers


REFERENCE BOOKS


OBJECTIVE: To study the influence of biotechnology in the field of animal sciences and to create awareness about the applied aspects of animal biotechnology.

UNIT I: ANIMAL CELL, TISSUE AND ORGAN CULTURE

History of animal cell and organ culture - requirements of animal cell, tissue and organ culture – characteristics of animal cell growth in culture - culture media- natural media-synthetic media- cultivation of animal cell in bioreactors-organ culture techniques-stem cells and applications, technological uses of animal cell culture.

UNIT II: ANIMAL CELLS AND GENE TRANSFER SYSTEM


UNIT III: TRANSGENIC ANIMAL TECHNOLOGY

Concept of transgene and transgenesis – transgeneic mammals- knock out mice, sheep, transgenic fishes, - animals as bio reactor, molecular farming and application of molecular markers – important of live stocks.

UNIT IV: ANIMAL BIOTECH AND HEALTH CARE

Production of Hybridoma and microclonal antibodies, human live insulin, RFLP, RAPD, DNA finger printing – Human genome project, DNA diagnostic systems-Gene therapy

UNIT V: ANIMAL BIOTECH AND SOCIETY

Socio ethical problem due to animal genetic engineering – recent trends in animal biotechnology – ethical implications.
TEXT BOOKS


REFERENCE BOOKS

OBJECTIVE: To emphasize the importance of immune system in protecting the body.

UNIT I: INTRODUCTION
General concepts of the immune system. Innate and adaptive immunity; Inflammation - general properties - Structure, properties and functions of the immune cells & organs: Hematopoiesis, T and B-lymphocytes, NK cells; Monocytes and macrophages; Neutrophils, eosinophils, and basophils - Mast cells and dendritic cells. Thymus and bone marrow; Lymph nodes, thymus and bursa of Fabricius, lymph node, spleen, Peyer’s patches and Kupffer cells, spleen, MALT, GALT and CALT.

UNIT II: ANTIGEN AND ANTIBODIES

Antibodies: Structure, function and properties of the antibodies; Different classes and biological activities of antibodies; Antibody as B cell receptor, antigenic determinants on antibodies (isotype, allotype and idiotype). Genesis of antibody variability. Hybridoma technology, monoclonal antibodies and abzymes - Introduction to antibody engineering.

UNIT III: CELL MEDIATED IMMUNITY
Cell types (CTLs, NK cells, macrophages and TDTH cells), effectors mechanisms and effectors molecules of cell mediated reactions. Assessment of cell-mediated cytotoxicity. Cytokines - properties and functions of interleukin (IL). Regulation and modulation of immune response: A general account.
Adjuvants, tolerance, immunopotentiation and immunosuppression. Hypersensitivity: Types and mechanism of hypersensitive reactions.

UNIT IV: AUTOIMMUNITY


UNIT V: CLINICAL IMMUNOLOGY

Immunity against viral, bacterial and parasitic infections - Immunological basis of hypersensitivity - Graft rejections. Vaccines: Types and uses - Immunization schedule for children - Prevention of post natal diseases: tetanus, diphtheria, whooping cough, cholera, yellow fever, measles and AIDS.

TEXT BOOKS


REFERENCE BOOKS


**16UZO5MC05 - MOLECULAR BIOLOGY, GENETICS AND BIOTECHNOLOGY LAB COURSE**

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**OBJECTIVE:** To provide hands on training in cellular and molecular techniques and correlate functional significance and inter dependence of Cytogenetics.

**UNIT I: TECHNIQUES IN CELL BIOLOGY**

Micrometry- Stage and Ocular micrometer - Mounting of buccal epithelium and observing living cells using vital staining. Mendelian traits in man, law of independent assortment, Counting of RBC and WBC using Haemocytometer (Demonstration only), Culturing of Drosophila.

**UNIT II: MOUNTING TECHNIQUE**

Mitosis in Onion root tip squash preparations, Meiosis in grasshopper testis squash, Human ABO blood grouping & Rh typing.

**UNIT III: MOLECULAR TECHNIQUES**

Isolation of genomic DNA of Eukaryotes/ Bacteria (Plasmid), Quantification of human DNA, Estimation of DNA – Polyclaramine method (Demonstration)

**UNIT IV: CHROMOSOME AND KARYOTYPING**

Karyotyping– identification of chromosome abnormalities, Mounting of the giant chromosomes of Chironomous larva (salivary gland)
UNIT V: RESTRICTION DIGESTIONS AND AGAROSE GEL ELECTROPHORESIS

DNA / RNA/ Plasmid Isolation/Extraction method, Agar plates for bacterial plasmid clone selection with ampicilling and GUS, Acrylamide gel electrophoresis for SSR/microsatellite methods.

TEXT BOOKS


REFERENCE BOOKS


16UZO5ES01 - MEDICAL LABORATORY TECHNIQUES

SEMESTER V CREDITS 3
CATEGORY ES NO.OF HOURS/ WEEK 4

OBJECTIVE: To study the basis of medical laboratory techniques.

UNIT I: HAEMATOLOGY

Composition of blood and their function- collection of blood & lab procedure-haemopoiesis- types of anaemia- mechanism of

UNIT II : LABORATORY SAFETY AND HUMAN HEALTH AND HYGIENE


UNIT III : MEDICAL MICROBIOLOGY AND INSTRUMENTATION TECHNIQUES

Definition and scope of microbiology- structure and function of cells - parasites - Entamoeba-Plasmodium-Leishmania and Trypanosome- hospital epidemiology-medical ethics.

Computer tomography (CT scan) – Magnetic Resonance imaging – flowcytometry – treadmill test – PET – SPECT.

UNIT IV : PHYSIOLOGY


UNIT V : DIAGNOSTIC PATHOLOGY

cutting and remedies - Frozen section techniques- freezing microtome.

**TEXT BOOKS**

4. Sood, R, 2009. Medical Laboratory technology, Methods and interpretation

**REFERENCE BOOKS**


**16UZO5ES02 - MEDICAL LABORATORY TECHNIQUES LAB COURSE**

**SEMESTER V**

**CREDITS** 1

**CATEGORY** ES (P) **NO.OF HOURS/ WEEK** 2

**OBJECTIVE:** To impart hands on training for identifying blood cell abnormalities for the diagnosis of disease. To provide skills necessary to perform blood cell count and evaluation of blood elements within stated limits of accuracy.

**UNIT I : BASICS OF LABORATORY TECHNIQUES**

Microscope handling, collection of blood, Blood Pressure, Pulse rate, hemocytometer, cellcounter.
UNIT II : HAEMATOLOGY
Clotting time, Bleeding time, Haemoglobin estimation, Erythrocyte Sedimentation Rate, packed cell volume, platelet count.

UNIT III : HAEMOGRAM
Differential count, Total Red Blood cell count, Total White blood cell count, Eosinophilic count, Reticulocyte count.

UNIT IV : QUALITATIVE AND QUANTITATIVE ESTIMATION
Qualitative Test - Protein, Carbohydrate and Lipid.

UNIT V : FIELD VISIT
Field visit to different hospitals- report submission- clinical laboratory visit & Demonstration.

TEXT BOOKS

REFERENCE BOOKS
OBJECTIVE: To learn various instrumentation and analytical techniques employed for understanding biological molecules and processes.

UNIT I: INTRODUCTION TO LABORATORY PRACTICES
Guide lines for good laboratory practices; Laboratory symbols; Cleaning and sterilization of labware and reagents; handling and care of laboratory animals; Laminar flow hood: types and use; Chemical balance: types and working mechanism; Concepts of molecular weight, atomic weight, preparation of solutions of a particular molarity and percentage; Buffers: definition and preparation of buffers, pH meter; Safety and ethical issues in laboratory settings

UNIT II: CELLULAR TECHNIQUES
Microscopy - Light microscope, SEM, TEM, Atomic force and scanning tunneling electron microscope; Cryopreservation - principle and procedure; Fluorescence activated cell sorting; X-ray crystallography

UNIT III: SEPARATION TECHNIQUES
Centrifugation - working principle and types of centrifugation; Spectrophotometry; Mass spectrometry; Chromatography - principle and types of chromatography

UNIT IV: MEDICAL INSTRUMENTATION
ESR measurement, haemoglobin measurement, blood pressure, blood flow, ECG, cardiac pacemakers; X-ray imaging, CT scan and NMR imaging; Ultrasound imaging; medical applications of laser; Biosensors - glucose biosensor, alcohol biosensor, artificial retina, environmental biosensors, cantilever -based biosensors, DNA biosensor
UNIT V : MOLECULAR ANALYSIS

Isolation of DNA, RNA and proteins; Electrophoresis of DNA and proteins; Polymerase chain reaction; ELISA; Immunofluorescence; Fluorescent in situ hybridization; Southern and Western blotting.

TEXT BOOKS


REFERENCE BOOKS

OBJECTIVE: To enable the learner to understand the basic concepts and use of certain bioinstrumentation and bioanalytical techniques.

UNIT I: BASIC INSTRUMENTS

UNIT II: BLOTTING TECHNIQUES
ESR measurement by Westergren method. Estimation of glucose concentration by colorimetry.

UNIT III: SEPARATION TECHNIQUES
Separation of amino acids by paper chromatography, Separation of plant pigments by column chromatography.

UNIT IV: ISOLATION METHODS
Isolation of casein protein from milk, SDS-PAGE of protein sample.

UNIT V: DEMONSTRATION
Demonstration of the working of PCR thermocycler and HPLC system, Visit to a bioinstrumentation lab/facility and submission of the observation report.

TEXT BOOKS

REFERENCE BOOKS

16UZO5SK01 - ECONOMIC ZOOLOGY: DAIRY FARMING, POULTRY AND FISHERY FARMING

SEMESTER V CREDITS 4
CATEGORY SK NO. OF HOURS/ WEEK 6

OBJECTIVE: To study the importance and application of poultry and dairy for the betterment of human livelihood, and to provide practical knowledge on poultry and dairy farming.

UNIT I: POULTRY INDUSTRY
Poultry industry in India - Poultry for sustainable food production and livelihood - Commercial poultry farming - Nutritive value of egg and meat - Broiler management (Definition; Housing and equipment; Brooding, feeding and health cover of broilers; Record keeping; Broiler integration) - Layer management (Brooder; Grower and layer management; Culling of layers; Marketing of eggs and meat).

UNIT II: QUAIL AND TURKEY
Quail and Turkey management (Management; Feeding; Health cover; Marketing Strategy) – Backyard Poultry Farming in India: Management- Women in backyard poultry farming.
UNIT III : DAIRY FARMING

UNIT IV : DAIRY TECHNOLOGY

UNIT V : CULTURE OF ALGAE, PRAWNS AND MOLLUSC
An introduction to cultivable species of marine shrimps and their biology – *Penaeus indicus*, *P. monodon* and *P. vannamei*, Phyto and Zoo-plankton cultures. Traditional methods of fish and prawn culture – Important freshwater molluscan fisheries including edible oyster and pearl oysters and induced breeding in shrimps. Economic values.

UNIT VI : FRESHWATER AND MARINE AQUACULTURE

TEXT BOOKS


REFERENCE BOOKS


16UZO6MC01 - ENVIRONMENTAL BIOTECHNOLOGY

SEMIESTER VI  CREDITS 5
CATEGORY MC  NO.OF HOURS/ WEEK 5

OBJECTIVE: To describe and discuss the application and role of biotechnology in conceiving and protecting the environment. To understand the commercial aspects of Environmental Biotechnology.homoeostasis.

UNIT I: INTRODUCTION

Important areas of Environmental Biotechnology – Waste treatment – Biomass as source of energy - waste as renewable source of energy, Biocomposition of wastes, sources of wastes (Industrial, agricultural, forestry, municipal source) Biomass

UNIT II : BIO-ENERGY


UNIT III : BIO-REMEDIATION

Insitu Bioremediation, Ex situ Bioremediation, Solid phase system, scenery based system, Bioremediation of Industrialists of hydrocarbons, Bioremediation of Industrialists in paper and pulp industry, Bioremediation of heavy metals – metal biosorption technology, Bioremediation of coal wastes through VAM fungi, Bio remediation of Xenobiotics

UNIT IV : DEGRADATION OF WASTES AND MICROBES

Definition of xenobiotics, Gene manipulation of pesticides degrading microorganisms, Bio Augmentation, Biofiltration, Microorganisms used in biofilters, Mechanism of biofiltration microbial denitrification, Bioleaching, microorganisms used in bioleaching – Direct and indirect leaching method, copper leaching, uranium leaching, gold leaching, silica leaching, Ecological Impacts of GMMS (Genetically modified Microorganisms)

UNIT V : BIOREACTORS AND ENVIRONMENTAL ENGINEERING

Design of Bioreactors: Reactors types, Batch reactors, Continues reactions - Uses of Bio Reactors.

TEXT BOOKS


REFERENCE BOOKS

16UZO6MC02 - ENVIRONMENTAL TOXICOLOGY

SEMESTER VI CREDITS 5
CATEGORY MC NO.OF HOURS/ WEEK 5

OBJECTIVE: To learn the principles, application and management of environmental toxicology. To get an exhaustive knowledge of toxic effects with Special reference to human.

UNIT I : INTRODUCTION TO TOXICOLOGY

UNIT II : FACTORS AFFECTING TOXICITY
Species and strain, age, sex, nutritional status, hormones, environmental factors, circadian rhythms. Absorption and distribution of toxicants-portals of entry-skin, gastro intestinal tract, gills and respiratory system.

UNIT III : ECOTOXICOLOGY
Examples of ecotoxicology, Scientific approach to ecotoxicology, Entry, movement, and fate of pollutants in ecosystems. Air pollution- Classification and properties of air pollutants, Behaviour and fate of air pollutants, photochemical smog, Acid Rain, health effects of air pollution. Water pollution- Origin of Wastewater, Domestic Water Pollution, Industrial water pollution, Agricultural water pollution, Toxic water pollutants and their health effects, Groundwater pollution, marine pollution

UNIT IV : BIO-DISTRIBUTION


UNIT V : RADIOACTIVE POLLUTION


Text books


REFERENCE BOOKS


UNIT I : ESTIMATION METHODS
Analysis and estimation of critical pollutants : Estimation of Ammonia (NH3), Estimation of Hydrogen sulphide (H2S)

UNIT II : ENVIRONMENTAL DETERMINANTS
Estimation of BOD, Estimation of COD

UNIT III : RESIDUE ANALYSIS
Pesticide residues in sea water and selected beverages, Petroleum hydrocarbons in sea water

UNIT IV : XENOBIOTICS
Heavy metals (Cu, Cd, Pb, Hg) in seawater, sediments & animal tissues, Preparation of solution (Standard, Normal, Molar) for toxicological studies

UNIT V : TOXICITY TESTING
Methodology of toxicity testing – acute and chronic tests (demonstration), Use of LC50 values – sub lethal effects of critical pollutants on fish and Shellfish.

TEXT BOOKS
REFERENCE BOOKS


16UZO6MC04 - WILDLIFE CONSERVATION BIOLOGY

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OBJECTIVE: To impart knowledge on Protection of natural habitats of organisms through controlled exploitation and maintenance of rare species in protected areas such as national parks, sanctuaries etc.,

UNIT I : BIODIVERSITY EXTINCTION AND CONSERVATION APPROACHES


UNIT II : THEORY AND ANALYSIS OF CONSERVATION OF POPULATIONS

UNIT III: NATIONAL AND INTERNATIONAL EFFORTS FOR CONSERVATION


UNIT IV: WILDLIFE IN INDIA


UNIT V: MANAGEMENT OF WILDLIFE


REFERENCE BOOKS

OBJECTIVE : To impart knowledge on the methods of analyzing and experimenting animal behavioural elements and conservation of wildlife.

UNIT I : SURVEY AND INVENTORY
Census Techniques, Usage of GPS, Marking boundary of an area using GPS, Geo referencing of an image file to create vector image (Q GIS), Overlaying GPS points over vector image and construction of GPS (Q GIS), Map reading, Recording angle of animal citation, Population estimation by block counting, Identification of indirect signs, Line Transect Method, Pug mark tracing and sex identification, Construction of transect lines and sampling.

UNIT II : FOREST ECOLOGY

UNIT III : IDENTIFICATION OF INVERTEBRATES
Invertebrate sampling protocols, Identification of important Insects, Identification of important butterflies.

UNIT IV : IDENTIFICATION OF VERTEBRATES
Identification of individual elephants based on morphology. Identification of fecal parasites.

UNIT V : ANIMAL BEHAVIOUR

Foraging behaviour in ants - Orientation and cues, Quantifying aggressive behaviour in ants, Predatory behaviour in fish, Focal behavioural sampling - Behavioural repertoire, Time activity budgeting, Evolutionary significance of Isozyme analysis, Pattern of evolution from museum study.

TEXT BOOKS


REFERENCE BOOKS

OBJECTIVE: To make the students to learn the objectives and scope of comparative reproduction and endocrinology, anatomy, morphology and histology of endocrine tissues of vertebrates, endocrine organs and their functions.

UNIT I- INTRODUCTION TO REPRODUCTION
General introduction to reproduction - Reproductive Systems - Female Reproductive System. Male Reproductive System Sexual Development - Sexual Differentiation and Development - Puberty - Menstrual Cycle

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

UNIT-III: PITUITARY AND THYROID GLANDS
Pituitary gland-characteristics, structural organization-hormone secretion and its functions-Hypothalamic control. Thyroid gland-structural organizations, metabolic effects of thyroid-effects on reproduction-parathyroid its structure and functions.

UNIT-IV: PANCREAS AND ADRENAL GLANDS
Structure of pancreas, pancreatic hormones and their functions. Structural organizations of adrenals, functions of cortical and medullary hormones.

UNIT V: VERTEBRATE REPRODUCTIVE ENDOCRINOLOGY
Structure of mammalian testis and ovary - male and female sex accessory organs - hormones of testis and ovary-estrous and

TEXT BOOKS


REFERENCE BOOKS


OBJECTIVE: To study the sequences of biological origin, their deposition and tools for retrieving and interpreting data for simulations.

UNIT I: BIOLOGICAL DATA BASES
Introduction to data types and Source, Classification and Presentation of Data. Quality of data, private and public data sources. General Introduction of Biological Databases; Nucleic acid databases (NCBI, DDBJ, and EMBL). Protein databases (Primary, Composite, and Secondary). Specialized Genome databases: (SGD, TIGR, and ACeDB). Structure databases (CATH, SCOP, and PDBsum), database management System.

UNIT II: DATA STORAGE AND RETRIEVAL
Flat files, relational, object oriented databases and controlled vocabularies. File Format (Genbank, DDBJ, FASTA, PDB, SwissProt). Introduction to Metadata and search; Indices, Boolean, Fuzzy, Neighboring search. The challenges of data exchange and integration. Ontologies, interchange languages and standardization efforts. General Introduction to XML, UMLS, CORBA, PYTHON and OMG/LIFESCIENCE.

UNIT III: SEQUENCE ALIGNMENTS
Introduction to Sequences, alignments and Dynamic Programming; Local alignment and Global alignment (algorithm and example), Pairwise alignment (BLAST and FASTA Algorithm) and multiple sequence alignment (Clustal W algorithm), Phylogenetic Analysis, Tree evaluation, Hidden Markov Model.
UNIT IV : GENE IDENTIFICATION, PREDICTION, EXPRESSION AND MICROARRAYS

Basis of gene prediction, pattern recognition, Gene prediction methods, Gene prediction tools, DNA Microarrays, Gene Expression profiles, Tools for microarray Analysis, Applications of Microarray Technology.

UNIT V : PROTEIN STRUCTURE VISUALIZATION AND DRUG DISCOVERY


TEXT BOOKS


REFERENCE BOOKS


16UZO6MS02 - BIOINFORMATICS LAB COURSE

SEMMESTER VI CREDITS 1
CATEGORY MS NO.OF HOURS/ WEEK 2

OBJECTIVE : To learn the structure and organisation of databases and tools available for analysis and interpretation.

UNIT I : INTRODUCTION TO DATA BASE

NCBI, GenBank, Entrez, PUBMED, OMIM : Gene Map, Morbid Map, Gene on a chromosome Map, BLAST, Sequence Analysis, Graphical Display, Text Display. EMBL : Sequence Alignment, Dynamic Programming, Pairwise Alignment – Needleman and Wunch (Global), Pairwise Alignment – Smith and Waterman (Local), Multiple Sequence Alignment (Online).

UNIT II : DNA DATA BANK OF JAPAN (DDBJ)

Nucleic Acid Sequence Data Banks, Sequence Similarity Searching Tool (FASTA), Working with FASTP.
UNIT III : PROTEIN SEQUENCE DATABANK SWISS-PROT

SWISS 2DPAGE, Exploring Swiss-prot 2D PAGE Database, Protein Information Resource

UNIT IV : ONLINE BIOINFORMATICS TOOL

Primer Design, Sequence file format conversion, Phylip, Phylogenetic Tree, Tree Prediction

UNIT V : MULTIPLE SEQUENCE ALIGNMENT – CLUSTALX


TEXT BOOKS


REFERENCE BOOKS

1. Lesk, A. M. 2005. Introduction to bioinformatics, Oxford University, USA.

ADVANCED ZOOLOGY ALLIED OFFER TO OTHER DEPARTMENTS

16UZO1AL01 ANIMAL DIVERSITY

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OBJECTIVE: To observe the organization, functional morphology and diversity of representative invertebrates and chordates.

UNIT I: PROTOZOA PARASITES
Structure, organization and life history of *Entamoebahistolytica* and *Plasmodium vivax, Obeliageniculata.*

UNIT II: NEMATODE PARASITES
Structure, organization and life history of *Taeniasolium,* Nematode parasites of man – *Ascaris* and *Hirudinaria.*

UNIT III: ECHINODERMATA ANS MOLLUSCA
Structure, organization and life history of *Penaeusindicus,* *Pilaglobosa* and Star fish.

UNIT IV: AMPHIBIA, RETILIA AND AVES
Organization of Frog, Calotes, Pigeon and Rat.

UNIT V: EMBRYOLOGY
Types of chordate eggs, extra embryonic membranes and their functions in chick, placentation in mammals.

Text Books


16UZO1AL02 ANIMAL DIVERSITY LAB COURSE

SEMESTER I CREDITS 2
CATEGORY AR (P) NO.OF HOURS/WEEK 2

OBJECTIVE: To observe the organization, functional morphology and diversity of representative invertebrates and chordates

UNIT I: MAJOR DISSECTION
Cockroach: Digestive system, Nervous system. Freshwater mussel /Pilaglobosa: Digestive system Prawn: Nervous system. Frog: Arterial system and venous system

UNIT II: MINOR DISSECTION
Earthworm: Lateral hearts. Cockroach: Reproductive system

UNIT III: MOUNTING

UNIT IV: SPOTTERS – INVERTEBRATE
Representatives from each phylum based on structural organization and phylogeny.

UNIT V: SPOTTERS – VERTEBRATE
Representatives from each phylum based on structural organization and phylogeny.

TEXT BOOKS


**16UZO2AL01 AGRICULTURAL ENTOMOLOGY**

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**OBJECTIVE:** To impart knowledge on insect pests and plant protection to sustain green revolution.

**UNIT I : AN OUTLINE CLASSIFICATION OF INSECTS**

Causes for insect assuming pest status and methods of collection, preservation and mounting of insect pests.

**UNIT II : INSECT VECTORS OF PLANT DISEASES**

Insect pests of stored grains their preventive and curative methods – Locust and its control.

**UNIT III : COMMON INSECT PESTS**

Most common insect pests of the following plants and their control measures: Paddy, Sugarcane, Groundnut, Coconut and Cotton.

**UNIT IV : APICULTURE**

UNIT V : PEST MANAGEMENT

Elementary knowledge of insecticide, Biological control of Insect pests and Integrated Pest Management.

Text Books


Reference Books


16UZO2AL02 AGRICULTURAL ENTOMOLOGY LAB COURSE

| SEMESTER | II | CREDITS | 2 |
| CATEGORY | AR (P) | NO.OF HOURS/ WEEK | 2 |

OBJECTIVE: To impart knowledge on plant protection from insect pests.

UNIT I : COLLECTION, PRESERVATION AND MOUNTING

Methods of collection, preservation and mounting of insects.
UNIT II : SURVEY AND IDENTIFICATION
Survey and identification of economically important pests of Paddy, sugarcane, cotton, groundnut and coconut.

UNIT III : LIFE CYCLE OF INSECT
Study of life cycle of Hemimetabolous and Holometabolous insects (at least one example each) – Study of parasitic and predatory insects (at least one example each) in relation to biological control.

UNIT IV : SERICULTURE
Study of silkworm rearing and bee keeping- insecticide formulation and IPM approaches.

UNIT V : Field trip to institutions of Agriculture and Record.

Text Books

Reference Books
OBJECTIVE: To provide biologically important predictions from annotated data and transformation of these data for genome / gene / DNA analyses.

UNIT I: INTRODUCTION TO BIOINFORMATICS


UNIT II: COMPUTATIONAL MOLECULAR BIOLOGY

Data mining and Sequence Analysis - Database Similarity Searches - Practical Aspects of Multiple Sequence Alignment - Phylogenetic Analysis – Recent trend in bioinformatics.

UNIT III: INTERNET AND BIOINFORMATICS

Data mining in Bioinformatics- Knowledge discovery - Problems faced in Bioinformatics - Human Genome Project - Influence areas - Bioinformatics in India

UNIT IV: BIOLOGICAL DATABASE AND THEIR MANAGEMENT

Database concepts - Introduction of SQL - Biological Database - Sequence Database- DNA sequence data bases, specialized database, secondary protein sequence data bases – and composite protein sequence data bases.
UNIT V: DATABASE AND TOOLS

Predictive Methods Using Nucleic acid and Protein Sequences
Submitting DNA Sequences to the Database - Internet & Data mining - Programming in C.

TEXT BOOKS


REFERENCE BOOKS