Botany

SYLLABUS OF URET- BERHAMPUR UNIVERSITY

(BOTANY)

Part-I
(Research Methodology)
Marks=100

1) Principles Microbial methods: Preparation of solid and liquid media for algae, fungi and bacteria, mass culture of algae, fungi, bacteria.
2) Principles and application of Plant Tissue culture and techniques: Media preparation, micro and macro nutrients, hormones, hardenings, Micro-propagation.
3) Principles and application of light phase contrast, fluorescence, scanning and transmission electron microscopy, fixation and staining.
4) Principles and applications of gel-filtration, ion-exchange and affinity chromatography; Thin layer and gas Chromatography; High pressure liquid (HPLC) chromatography; Electrophoresis and electrofocussing.
5) Principles of centrifugation technique and ultracentrifugation for separation of Biological samples.
6) Principles and techniques of nucleic acid hybridization; Sequencing of Proteins and nucleic acids; Southern, Northern and South-Western blotting techniques; Polymerase chain reaction; Methods for measuring nucleic acid and protein interactions.
7) Principles of electrophoresis, SDS-PAGE, native PAGE, agarose electrophoresis, 2 - D electrophoresis, single cell gel electrophoresis, Pulse field electrophoresis
8) Principles of biophysical methods used for analysis of biopolymer structure, X-ray diffraction, fluorescence, UV, Visible, NMR and ESR spectroscopy; Atomic absorption and plasma emission spectroscopy.
9) Principles and applications of tracer techniques in biology; Radiation dosimetry; Radioactive isotopes and half life of isotopes; Effect of radiation on biological system
10) Principles and practice of statistical methods in biological research, samples and populations; Basic statistics average, statistics of dispersion, coefficient of variation; Standard error; Confidence limits; Probability distributions (biomial, Poisson and normal; Tests of statistical significance; Simple correlation of regression; Analysis of variance
11) Research paper reading, writing: Searching literature, structuring and writing a research paper (review of literature, title, introduction, material and methods, results, discussion), citing references, research and publication ethics, peer review, plagiarism.

Part-II
(Subject Specific: Botany)
Marks=100

1) Principles of Taxonomy as applied to the systemic and Classification of Plant Kingdom: Taxonomic structure; Biosystematics; Plant geography; Floristic.

2) Silent features of algae, fungi, bryophytes and pteridophytes; Principles of palaeobotany; Economic importance of algae, fungi and lichens.
3) Comparative anatomy and morphology of gymnosperms and angiosperms; Histochemical and ultra structural aspects of development; Differentiation and morphogenesis.
4) Androgensis and gynogenesis; Breeding system; Pollination biology; structural and functional aspects of pollen and pistil; Male sterility; Self and inter-specific incompatibility; Fertilization; Embryo and seed development.
5) Plants and civilization; Centre of origin and gene diversity; Botany, utilization, cultivation and improvement of plants of food, drug, fiber and industrial values, Unexploited plants of potential economic value; Plants as a source of renewable energy; Genetic resources and their conservation.
6) Water Relation; Mineral nutrition; Photosynthesis and photorespiration; Nitrogen, Phosphorous and Sulphur metabolism; Stomatal physiology
7) Physiology and biochemistry and seed dormancy and germination; Hormonal regulation of growth and development; Photoregulation: Growth responses, Physiology of flowering:, Senescence.
8) Principles of plant breeding; important conventional methods of breeding self and cross-pollinated and vegetatively propagated crops; Non conventional methods; Polyploidy: Genetic variability; Plant diseases and defensive mechanisms.
9) The law of DNA constancy and C-value paradox; Numerical, and structural changes in chromosomes; Molecular basis of spontaneous and induced mutations and their role in evolution; Environmental mutagenesis and toxicity testing; Population genetics.
10) Structure of pro-and eukaryotic cells; membrane structure and function; intracellular compartments, protein sorting, secretory and endocytic pathway; cytoskeleton, nucleus; mitochondria and chloroplast and their genetic organization; cell cycle; structure and organization of chromatin; polytene and lamp brush chromosomes; dosage compensation and sex determination and sex linked inheritance.
11) Interactions between environment and biota; Concept of habitat and ecological niches; Limiting factor; Energy flow, food chain, food web and tropic levels; Ecological pyramids and recycling, biotic community-concept, structure, Dominance, fluctuation and succession; N.P.C. and S cycles in nature
12) Ecosystem dynamics and management; Stability and complexity of ecosystems; Speciation and extinctions; environmental impact assessment; Principles of conservation; Conservation strategies; sustainable development.
13) Physico-chemical properties of water; Kinds of aquatic habitats (fresh water and marine); Distribution of and impact of environmental factors on the aquatic biota; Productivity, mineral cycles and biodegradation in different aquatic ecosystems; Fish and Fisheries of India with respect to the management of estuarine, coastal water systems and man-made reservoirs; Biology and ecology of reservoirs.
14) Structure, classification, genetics, reproduction and physiology of bacteria and viruses (of bacteria, plants and animals); yeast (a general accounts).

15) Microbial fermentation; Antibiotics, organic acids and vitamins; Microbes in decomposition and recycling processes; Symbiotic and asymbiotic N2-fixation; Microbiology of water, air, soil and sewage: Microbes as pathological agents in plants, animals and man; General design and applications of a biofermenter, Biofertilizer.

16) Energy metabolism (concept of free energy); Thermodynamic principles in biology; Energy rich bonds; Weak interactions; Coupled reactions and oxidative phosphorylations; Group transfer; Biological energy transducers;Bioenergietics.

17) Van der Waal's, electrostatic, hydrogen bonding and hydrophobic interaction; Primary structure and proteins and nucleic acids; Conformation of proteins and polypeptides (secondary, Tertiary, quaternary and domain structure);Reverse turns and Ramachandran plot; Structural polymorphism of DNA, RNA and three dimensional structure of tRNA; Structure of carbohydrates, polysaccharides, glycoproteins and peptido-qlycans: Helix coil transition; Energy terms in biopolymer conformational calculation.

18) Enzyme Kinetics (negative and positive cooperativity); Regulation of enzymatic activity; Active sites; Coenzymes: Activators and inhibitors, isoenzymes, allosteric enzymes; Ribozyme and abzyme.

19) Glycolysis and TCA cycle; Glycogen breakdown and synthesis; Gluconeogenesis; Interconversion of hexoses and pentoses; Amino acid metabolism; Coordinated control of metabolism; Biosynthesis of purines and pyrimidines;Oxidation of lipids; Biosynthesis of fatty acids; Triglycerides; Phospholipids; Sterols.

20) Fine structure of gene, Eukaryotic genome organization (structure of chromatin, coding and non-coding sequences, and satellite DNA); DNA damage and repair, DNA replication, amplification and rearrangements. Organization of transcriptional units; Mechanism of transcription of prokaryotes and eukaryotes; RNA processing (capping, polyadenylation, splicing, introns and exons); Ribonucleoproteins, structure of mRNA; Genetic code, and protein synthesis.

21) Regulation of gene expression in pro and eukaryotes; Attenuation and antitermination; Operon concept; DNA methylation; Heterochromatization; Transposition.

22) Lysogeny and lytic cycle in bacteriophages; Bacterial transformation; Host cell restriction; Transduction; Complementation; Molecular recombination; DNA ligases;Topoisomerases;Gyrases;Methylases;Nucleases;Restrictionendonucleases; plasmids and bacteriophage base vectors for cDNA and genomic libraries.