

BOTANY

SEMESTER WISE COURSE OUTCOME FOR ODD AND EVEN SEMESTER OF POSTGRADUATE PROGRAM

Semester – 1

MBOTCC-I (Phycology, Mycology and Bryology)

Unit-1&II

On completion of this course unit students would be able to

COs1- Understand the structure of the algal cell and mode of reproduction.

Cos2- Know the classification and general accounts and economic importance of Chlorophyceae, Charophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae, and Rhodophyceae.

COs3- Understand the role of pigments, reserve food, cell wall, flagella, eyespot, and pyrenoids in the classification and evolution of algae.

Unit-III

On completion of this course unit students would be able to

COs-4- Learn to explain the general account, Classification, Distribution, morphology, Anatomy, Reproduction & Economic importance of Lichen.

Cos5- Understand the classification and general characters of fungi, cell ultrastructure, unicellular and multicellular organization, cell wall composition, nutrition (saprobic, biotrophic, symbiotic), reproduction: vegetative, asexual, and sexual; heterothallism, heterokaryosis.

Unit-IV

On completion of this course unit students would be able to

Cos6- Students learn the concept of classification, structure, reproduction, and evolution concerning Mestigomycotina, Zygomycotina, Ascomycotina, Basideomycotina & Deuteromycotina.

Cos7-Understand the phylogeny of Fungi and their economic importance, the role of fungi as a bio-control agent.

Unit-V

On completion of this course unit students would be able to

Cos8- Students learn to understand the general features, reproductions and evolutionary trends of sporophytes & conducting tissues of Marchantiales, Jungermaniales, Anthocerotales, Sphagnales, and Polytricales.

Cos9-They Know the economic importance of Bryophyta.

Semester – 1

MBOTCC-2 (Microbiology and Plant Pathology)

Unit-1,

On completion of this course unit students would be able to

COs1- Understand the History and scope of microbiology and the theory of spontaneous generation. Sterilization process.

COs2- Capable to explain diversity of microorganisms: Archaea, Bacteria, Cyanobacteria, Phytoplasma, Rickettsia.

Unit-II

On completion of this course unit students would be able to

COs3- learn the structure, reproduction, nutritional classification and economic importance of bacteria.

COs4- Learn to explain the nature, ultrastructure, multiplication, transmission and economic importance of viruses, and the brief account of Viroids and Prions.

Unit-III

On completion of this course unit students would be able to

COs5- understand the use of microorganisms in agriculture and Industry.

Unit-IV

On completion of this course unit students would be able to

COs6- Analyze the classification of plant disease and the appearance of symptoms due to different microbes and the role of enzymes and toxins in pathogenesis. Effect of infection on the physiology of host with particular reference to photosynthesis, respiration, nitrogen metabolism, and osmoregulation. Host defence mechanism with special reference to structural and biochemical defence.

Unit-V

On completion of this course unit students would be able to

COs7- Know seed pathology with special reference to seed-born mycoflora, mycotoxin and its hazard quarantine regulation and seed classification. Rhizosphere and rhizoplane microflora and its significance in soil-born disease.

COs8- Understand the etiology, symptoms, and control measures of the following plant disease: Rust of linseed, Leaf blight of maize, Tikka disease of groundnut, Bunchy top of banana, a Black tip of mango, Yellow vein mosaic of bhindi, Little leaf of brinjal and citrus canker.

Semester – 1

MBOTCC-3 (Pteridophyta, Gymnosperm and Paleobotany)

Unit-I

On completion of this course unit students would be able to

COs1- Understand the Classification & detail general features: vegetative and reproductive, with special reference to development, characterization, position, and protection provided to the spore-producing organs of the sporophytes and sexuality of the gametophytes in the following classes/order. Psilopsida – Psilotales, Lycopsida – Lycopodiales, Selaginellales, and, Isoetates.

COs2- explain the stellar evolution, gametophytic variations and evolution in Lycopodiales, Heterosporous VS. seed habit with special reference to Selaginella.

Unit-II

On completion of this course unit students would be able to

COs3- explain characterization, classification, and distinction between Eusporangiate, Proto-leptosporangiate, and Leptosporangiate.

COs4-Understand structure, reproduction and phylogenetic considerations of the Eusporangiate and Leptosporangiate

COs5-Understand Sphenopsida _ Equisetales.

COs6-understand the meaning of the following: Cytology vs. phylogeny of ferns and the Role of polyploidy in the evolution of ferns.

COs7- explain the economic importance of Pteridophyta.

Unit-III

On completion of this course unit students would be able to

COs8- learn the characteristic features, distribution and economic importance of gymnosperms, Classification of Gymnosperms., Comparative morphology, anatomy, reproductive structure and, interrelationships of the living orders Cycadales, Ginkgoales & Taxales.

Unit-IV

On completion of this course unit students would be able to

COs9- Understand Coniferales: Characteristic features, families of modern conifers, their distinguishing features, the evolution of female cones concerning transition conifers as the evolutionary line between Cordiales and Coniferales.

COs10- explain the comparative account and reproductive structures of Ephedrales, Gnetales, and angiospermic features within the group and the evolutionary trend in their sporophytic and gametophytic structure.

Unit-V

On completion of this course unit students would be able to

COs11- understand the types and nomenclature of fossils; Fossilization process and geological time scale; Principles and objective of fossil study. Comparative morphology, anatomy, reproductive structure and affinities of the following fossil groups: Psilophytales, Lepidodendrales, Cycadales, Cordiales, and Pentoxylales.

MBOTAECC-I

COs1- Students able to understand the importance of Environmental sustainability & Swachha Bharat Abhiyan

Semester – 2

MBOTCC-5 (Biofertilizer Technology)

Unit-I

On completion of this course unit students would be able to

COs1- understand the structures and characteristics features of

Bacteria: *Azospirillum*, *Azotobacter*, *Rhizobium* and *Frankia*, Cyanobacteria: *Anabaena*, *Nostoc*, Fungi: *Glomus* etc.

Unit-II

On completion of this course unit students would be able to

COs2- understand nitrogenous Bio-fertilizers: Bacteria their isolation and purification and formation of inoculums, application of inoculates mass multiplication and inoculums production of *Rhizobium*.

COs3- learn the methods of application of *Rhizobium* inoculants.

Unit-III

On completion of this course unit students would be able to

COs4- learn the methods of isolation and purification and mass multipli of Cyanobacteria as a bio- inoculants – Though or Tank method. Pit method, Field method. Methods of application of cyanobacterial inoculum. Azolla-mass cultivation and application in the rice field.

Unit-IV

On completion of this course unit students would be able to

COs5- learn about ecto and endomycorrhizae and their importance in agriculture. Isolation of VAM fungi by Wet sieving method and sucrose gradient method. Mass production of VAM inoculants and field application.

COs6- explain the Isolation, purification, mass multiplication and field application of phosphate solubilizer (*Pseudomonas striata*)

Unit-V

On completion of this course unit students would be able to

COs6- learn Bio fertilization processes – Decomposition of organic matter and soil fertility and vermicomposting. Biofertilizer storage, self-life, quality control and marketing.

MBOTCC-6 (Taxonomy, Anatomy, Embryology)

Unit-1

On completion of this course unit students would be able to

COs1- explain classification: A historical account of pre-Linnaean, Linnaean, Post Linnaean, and pre-Darwinian natural systems and post-Darwinian phylogenetic systems, Contemporary systems: Arthur Cronquist, Armen Takhtajan, Robert F. Thorne and Rolf M.T. Dahlgren.

Unit-II

On completion of this course unit students would be able to

COs2- Develop the concept of Taxa: Species, subspecies, variety, and form; genus, family and higher categories. Concept of character, and nomenclature

Unit-III

On completion of this course unit students would be able to

COs3- Explain Post-Mendelian approaches: An introduction to gen-ecology, Experimental taxonomy, Cytotaxonomy, Biosystematics, Palynotaxonomy, Chemotaxonomy, Numerical Taxonomy/Taximetrics & Molecular systematics

Unit-IV

On completion of this course unit students would be able to

COs4- Explain the factors affecting differentiation and morphogenesis. Meristem: Types, Organization of shoot, organization of root, Differentiation of epidermis with special reference to stomata

COs5- Develop ideas about Anomalous secondary growth, Nodal, Floral and seed anatomy- A phylogenetic consideration, Anatomy concerning taxonomy

Unit-V

On completion of this course unit students would be able to

COs4- Understand the development of ovule, megasporogenesis and organization of female gametophytes (embryo sacs), Pollen- Pistil interaction, Double fertilization and post-fertilization changes leading to the formation of seed, development of embryo, endosperm and seed coat, Polyembryony and Apomixes, Role of embryology in Taxonomy.

MBOTCC-7 (Physiology and Biochemistry)

Unit-I

On completion of this course unit students would be able to

COs1- Understand the concept of Osmotic relations; Transport phenomenon in plants: Transport of water and organic solutes, mechanism of xylem transport, mechanism of phloem transport, phloem loading and unloading

Unit-II

On completion of this course unit students would be able to

COs2- Explain the energy transduction mechanism in plants: Photosynthesis; Difference between two pigment systems, Light reaction and Dark reaction, water oxidizing complex; carbon fixation in C₃ and C₄ plants.

COs3- Understand the importance of Biological N₂ fixation.

Unit-III

On completion of this course unit students would be able to

COs4- Develop an idea of plant growth hormones and growth regulators. Mode of action of auxin, transport of auxin, physiological Role of auxin, Gibberellins & Cytokinin: Mode of action and physiological Role.

Unit-IV

On completion of this course unit students would be able to

COs5- Develop ideas about Enzymes; structure and classification, cofactors, coenzymes, prosthetic groups, isoenzymes, allosteric enzymes, multienzymes, mechanism of enzyme action, properties of enzymes.

Unit-V

On completion of this course unit students would be able to

COs6- Explain the Glycolysis, TCA cycle, ETS oxidative phosphorylation, photorespiration, Difference between oxidative phosphorylation and photophosphorylation.

MBOTCC-8 (Plant tissue Culture, Ethnobotany, Biodiversity & Biometry)

Unit-I

On completion of this course unit students would be able to

COs1- The concept of laboratory equipment; General techniques of aseptic manipulation; composition of culture media and its preparation, callus culture and single-cell culture, In vitro culture of vegetative parts and reproductive parts, colonial propagation, Isolation, culture methods and plant regeneration, Role of tissue culture in crop improvement

Unit-II

On completion of this course unit students would be able to

COs2- Understand the importance of the traditional knowledge base of Indian ethnic and local communities and their practices, medical and paramedical use of plants in aboriginal or preliterate societies in the world, and use of local biodiversity by aboriginal people for sustenance.

Unit-III

On completion of this course unit students would be able to

COs3- Understand the origin of the term, themes of biodiversity concept, Benefits of Biodiversity, Types of Biodiversity, distribution at the global and national level, assessment and inventory based on the recommendation of IUCN, Diversity Conventions and Biodiversity Act 2002.

COs4- Analyze the pattern of loss of biodiversity: Red lists, Red Data Book and green book, Red Data Categories: Extinct, endangered, vulnerable, and threatened species

Cause of Biodiversity loss and extinction, causes, human impacts including development pressure; Habitat loss, encroachment and overexploitation of resources, repercussions of loss biodiversity including future climate change.

Unit-IV

On completion of this course unit students would be able to

COs5- explain the methods of Conservation of Phytodiversity, The distinction between preservation and conservation, Conservation potential index, Protocol for conservation, traditional conservation practices, **and** In situ and ex-situ conservation,

COs6- Understand the patenting intellectual property rights, and Biosafety protocols. People's movements for conservation.

Unit-V

On completion of this course unit students would be able to

COs-6 Grasp the distribution and measurement of variation, Mean, Median, Mode, Standard deviation, Standard error, Coefficient of variability, the test of significance-t-test, F-test (analysis of variants); Measurement of a correlation coefficient, application of chi-square test for testing hypothesis.

Semester-3

MBOTCC 10 (Cell Biology, and Cytogenetics)

Unit-1

On completion of this course unit students would be able to

COs1- Develop ideas about the Cell theory and organization of the cell (Prokaryotes and Eukaryotes). Ultrastructure & Chemical composition of the following: Cell wall, plasma membrane, cytoplasm and cytoplasmic organelles like Plastids, mitochondria, endoplasmic reticulum, ribosome, Golgi complex, lysosome, peroxisome, and centrosome.

Unit-II

On completion of this course unit students would be able to

COs2- Understand the concept of the nuclear membrane, nuclear pore, nucleolus and karyolymph

COs3- Grasp the importance of the Cell cycle, cell apoptosis, control mechanism, cytokinesis and cell plate formation.

Unit-III

On completion of this course unit students would be able to

COs4- Develop the idea about the Organization of chromosomes and special types. Mendelian genetics, Gene interaction and Sex determination.

Unit-IV

On completion of this course unit students would be able to

COs5- Explain the importance of Extranuclear inheritance, Chromosomal aberration, polyploidy types and their Role in speciation, the mutation-molecular mechanism, and induction by physical and chemical mutagens.

Unit-V

On completion of this course unit students would be able to

COs6- Grasp the idea about Population genetics, Microscopy & micro densitometry

MBOTCC-11 (Molecular Biology)

Unit-1

On completion of this course unit students would be able to

COs1- Understand the concept of nucleic acids as hereditary material; Structure and forms of DNA and RNA, double helix, supercoiling of DNA, and packaging of DNA in prokaryotes and eukaryotes.

Unit-II

On completion of this course unit students would be able to

COs2- Explain the importance of DNA replication models; the Mechanism of DNA replication, Different types of DNA damage and repair mechanisms; and Diseases caused due to impairment in the repair mechanism.

Unit-III

On completion of this course unit students would be able to

COs3- Understand the importance of DNA binding Proteins, RNA polymerase types, structures and functions; Mechanism of Transcription in prokaryotes & Eukaryotes; mRNA processing, 5' capping, 3' polyadenylation, splicing rRNA & t-RNA processing and Genetic code.

Unit-IV

On completion of this course unit students would be able to

COs4- Understand the concept of translation machinery and mechanism in prokaryotes and eukaryotes; Role of t-RNA & ribosome; Post-translational modification of proteins.

Unit-V

On completion of this course unit students would be able to

COs5- Develop the idea of Regulation of gene expression: lac operon, trp operon. Eukaryotes- Regulation at DNA, transcription, translation and post-translational level. COs6- Explain the importance of Antisense technology and its application.

MBOTCC-12 (Recombinant DNA Technology)

Unit-I

On completion of this course unit students would be able to

COs1- Explain the importance of Polyacrylamide and agarose gel electrophoresis. Blotting techniques, Polymerase chain reaction and its applications and Various methods of DNA sequencing.

Unit-II

On completion of this course unit students would be able to

COs2- Evaluate the role of Restriction enzymes –Types and cleavage pattern DNA ligase- types and ligation of DNA molecule in vitro.

Cos3- Understand the concept of different types of cloning vectors.

Unit-III

On completion of this course unit students would be able to
COs4- Grasp the idea of the different strategies used for isolation/synthesis of the gene; chemical synthesis of a gene, construction of genomic DNA libraries
Construction of rDNA: Different strategies for the construction of rDNA (Use of restriction enzymes, linkers, adaptors, homopolymer tailing).

Unit-IV

On completion of this course unit students would be able to
COs5- Develop ideas about the different methods of selection of clones, different methods of DNA transfer in suitable host and Expression of foreign genes.

Unit-V

On completion of this course unit students would be able to
COs6- Explain the importance of the application of recombinant DNA technology: In medicine, agriculture and environment protection. DNA fingerprinting: Methodology and its application.

COs7- Evaluate the role of Intellectual property rights, bioethics, and patenting: IPR, sovereignty rights, CBD, bioethics and patenting.

COs8- Understand the importance of the safety of recombinant DNA technology: Restriction and regulation for the release of GMOs; Social and ethical issue.

MBOTCC-13 (Plant Ecology and Environmental Biology)

Unit-I

On completion of this course unit students would be able to
COs1- Develop the idea of Organism and population concept, Interactions among populations: Commensalism, amensalism, mutualism, proto cooperation, symbiosis, predation, parasitism, and competition.

COs2- Evaluate the role of Intraspecific and interspecific plant adaptations.

Unit-II

On completion of this course unit students would be able to
COs3-Grasp the idea of Community structure: Qualitative character, Quantitative character, and Synthetic character

COs4- Develop the idea about the method of studying plant community, Classification of communities

COs5- Evaluate the role of Community dynamics: Concept of Succession, Stabilization and climax Xerosere and Hydrosere and their serial stages.

Unit-III

On completion of this course unit students would be able to
COs6- Understand the importance of the Ecosystem, Ecological pyramids, and Structural organization of grassland, forest, and aquatic ecosystem
COs7- Develop the idea of Ecosystem energy: Law of thermodynamics, productivity, energy food chain and ecosystem budget, biogeochemical cycles.

Unit-IV

On completion of this course unit students would be able to
COs8- Understand the concept of environmental pollution, global warming, greenhouse effect, Ozone depletion, and climate change.

Unit-V

On completion of this course unit students would be able to
COs9- Develop the concept of environmental awareness: Man and biosphere (MAB); International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Programme (UNEP), World Environment Day, Wildlife Preservation Act (1972), Indian forest Conservation Act (1089).

Semester-4

MBOTEC- 1 (Cytogenetics and Crop improvement)

Unit-I

On completion of this course unit students would be able to

COs1- Evaluate the role of Haploidy, Aneuploidy and Polyploidy, the Role of polyploidy in evolution and speciation, Evolution of karyotypes

COs2- Understand the concept of chromosome banding pattern, their chemical nature, significance and effect.

Unit-II

On completion of this course unit students would be able to

COs3- Explain the importance of mutation, physical and chemical mutagens, classification, & mode of action, the molecular basis of gene mutations; site-directed mutagenesis, and the Role of mutation in crop improvement

COs4- Evaluate the role of cytoplasmic inheritance and maternal effect Transposons, mechanism of transposition, application of transposons.

Unit-III

On completion of this course unit students would be able to

COs5- Understand the concept of the role of cytogenetics in crop improvement, Epigenetics: epigenetics and Lamarckism, epigenome and epigenomics. Genetic diseases of humans: Eugenics.

Unit-IV

On completion of this course unit students would be able to

COs6- Evaluate the Role of cytogenetics in crop improvement, Genetic basis of evolution, Incompatibility, and Centres of a diversity of cultivated plants.

Unit-V

On completion of this course unit students would be able to

Cos7- Grasp the idea of classical methods of plant breeding and modern techniques of plant breeding: Hybrids vs cybrids, protoplast fusion and terminator gene technology

Heterosis and heterosis breeding, Breeding for disease and drought resistance

COs2- Understanding fundamental principles of Microscopy, SEM, TEM, and Electron microscope

COs3- Brief idea of radioisotopes, tracer techniques, and radiography

COs4- Study of cell chemistry

COs5- Explain cell apoptosis

Cos-

Genetics

COs1- Understanding Mendelian principles and its deviation

COs2- Study of sex determination, sex-linked and influenced phenotype

COs3- Discuss variation in chromosome structure, chromosome number and variation at molecular level

COs4- Study of population genetics, Quantitative genetics, probability and Chi-square test, linkage maps, and Interference

Paper-II

Biology and Diversity of Viruses, Bacteria and Fungi

- COs1- Explain structure, nature, replication and transmission of bacteriophage and RNA virus
- COs2- Study of cell structure, reproduction and economic importance of Archaeobacteria and Eubacteria. N₂ fixation
- COs3- Explain silent features of cyanobacteria and their role in N₂ fixation
- COs4 – Understand the classification, structure, reproduction, and evolution with reference to Mestigomycotina, Zygomycotina, Ascomycotina, Basideomycotina & Deuteromycotina
- COs5- Study the importance of mycorrhizae, fungal and viral disease of Bihar

Paper - III

Biology and Diversity of Algae, Bryophytes, and pterophytes

- COs1- Study the classification and general accounts and economic importance of Chlorophyceae, Charophyceae, Xanthophyceae, Bacillariophyceae, Phaeophyceae, and Rhodophyceae
- COs2- Understand the classification, structure, reproduction, and evolution with reference to Mestigomycotina, Zygomycotina, Ascomycotina, Basideomycotina & Deuteromycotina
- COs3- Understand the physiology spore germination, protonema differentiation and water conduction in Bryophytes
- COs4- Study the classification and general features of Psilotales Isoetales, Ophioglossales and Salviniiales
- COs5- Understand stem and fructification of Lepidodendrales, Sphenophyllales and Calamities

SEMESTER: II

Paper – V

Molecular Biology

- COs1- Study the structure and replication of genetic material, DNA damage, and repair, molecular basis of recombination
- COs2- Describe the ultrastructure of gene and Chromosome organization
- COs3- Understand transcription, translation and gene regulation in prokaryotes and eukaryotes
- COs4- Explain the properties of the genetic code

COs5- Define transposable elements and mechanism of transposition

Paper – VI

Biology and Diversity of Gymnosperm and Taxonomy of Angiosperms

COs1- Discuss the classification, structure, and reproduction in Cycadeales, Ephedrales, and Gnetales, general account of Cordaitales

COs2- Brief account of families Lyginopteridaceae, Pentoxylaceae, Caytoniaceae,

COs3- Discuss various system of angiosperm classification and their merits and demerits

Cos4- Define the role of cytology and anatomy in taxonomy, the importance of cytotaxonomy and numerical taxonomy

COs5- Explain the features of ICBN, rule of priority, valid publication, author citation, retention and rejection of names, the importance of Botanical gardens and herbaria

COs6- Explain floral variation and phylogeny of following orders; Magnoliales, Caryophyllales, Fabales, Alismatales, Cyperales

Paper – VII

Plant Physiology and Metabolism

Cos1- Understand the importance of following functions energy flow, Water relation, photosynthesis, enzymes and respiration, and nitrogen metabolism

COs2- explain the physiological effects of growth hormones and physiology of flowering

COS3- Discuss the structure and classification of carbohydrates, proteins, and lipids

COs4- Understand signal transduction

SEMESTER – III

Paper – IX

Plant Development and Reproduction

COs1- Understand the role structure and functional aspects of meristem, and cambium

COs2- Discuss the features of abnormal secondary growth, stomata, trichomes, and role of anatomy in systematic

COs3- Understand anatomical adaptation to different habitat

COs4- Discuss the transition phase of plants from vegetative to reproductive and gender expression in Monoecious and dioecious plants

COs5- Discuss developmental embryology and double fertilization

Paper – X

Principles of ecology

- COs1- understands Ecology and its types, environmental concepts-laws and limiting factors, ecological models
- COs2- Study of characteristics of the population, population size and exponential growth, limits of population growth, population dynamics, fertility rate, and the age structure
- COs3-Discuss competition and coexistence, intra and interspecific interactions
- COs4- Study of nature of the ecosystem, production and energy flow through an ecosystem and biogeochemical cycles
- COs5- Discuss biosphere and the impact of climate on biomass
- COs6- Discuss the major ecosystem of the world, natural resource, and their management
- COs7- Understand environment stress and their management, global climatic pattern and variations over time, climatic change, greenhouse gas, ozone layer depletion, and global warming
- COs8- Define pollution, biodegradation, and bioremediation
- Cos9- Study the policies and regulations of environmental issues, biodiversity act of India IUCN categories of threat and hot spot
- COs10- Discuss biodiversity assessment, conservation and management, and natural resource management in changing the environment

Paper – XI

Plant Resource Utilization

- COs1- Discuss the origin, evolution, cultivation, and use of food, forage and fodder crops, fiber crops, medicinal plants, vegetable and oil yielding plants, firewood timber and nonwood forest products
- COs2- Study of general accounts of the activities of, BSI, NBPGR, ICAR, CSIR, and DBT

SEMESTER – IV

Paper – XIII

Plant tissue culture & Biostatistics and Immunotechnology

- Cos1- Study the techniques of micro-propagation of important floriculture, agriculture, and medicinal plants
- COs2- Learn the techniques of in vitro germplasm conservation
- COs3- Study the causes and application of somaclonal variations
- COS4- Learn culture media preparation and role of different ingredient used in it

- COs5- Understand the importance of tissue culture in the production of secondary metabolites
- COs6- Understand mean, mode, median and probability
- COs7- Understand types of error, P value-ANOVA
- COs8- Study the fundamentals of Immunology, ELISA< ISH< FISH

Paper – XIV

Biotechnology and Genetic Engineering

- COs1- Learn the technique of isolation of DNA from plants and bacteria, southern blotting, polymerase chain reaction, strain improvement and production of antibiotics, gene transfer in bacteria & higher plants, selection of transformed cell
- COs2- Study DNA sequencing, different types of C-DNA library
- COs3- Study of restriction endonuclease, their nomenclature,details of restriction endonuclease II with recognition sites of important restriction endonucleases
- COs4- Discuss the importance of plasmid and phase vectors, their application in formation of recombinant DNA, enzymes used in recombinant DNA construction, DNA fingerprinting
- COs5- Study strain improvement and production of antibiotics
- COs5- Understand the basic concept of bioinformatics, functional genomics, protein profiling
- COs6- Study different types of tissue culture, somatic hybridization
- COs7- Explain the technique involved in mushroom cultivation and mycorrhizal biotechnology

Paper –XV

Elective paper

- COs1- Understand, study in details the topics selected by your choice
- Environmental biology,
 - Taxonomy and Ethnobotany
 - Cytogenetics and crop improvement
 - Biotechnology
 - Advanced pathology
 - Plant pathology deterrent