MASTER OF SCIENCE (BOTANY) – FIRST SEMESTER

First Semester			
S. No.	**Name of Subject**	**Credits**	**Total Marks**
1	Phycology	5	100
2	Mycology	5	100
3	Introductory Microbiology	4	100
4	Introductory Plant Ecology	4	100
5	Practical	4	100
Total		**22**	

Subject Name: PHYCOLOGY

1. Principles and systems of classification.
2. Comparative account of algal pigments, food reserves, fllagellation, chloroplasts and eye spots; their taxonomic importance and molecular phylogeny.
3. **Cyanophyta:** Cell structure and thallus organisation, heterocyst and akinete development and their role, chromatic adaptation and reproduction.
4. **Chlorophyta:** Range of thalli, methods of reproduction and perennation, life cycles and alternation of generation.
5. **Phaeophyta:** Range of thallus structure, reproduction, life histories and alternation of generation.
6. **Rhodophyta:** Range of thallus structure, reproduction, life histories and alternation of generation, post-fertilization development and sites of meiosis.
7. A brief account of Xanthophyta, Chrysophyta, Bacillariophyta, Pyrrophyta, Euglenophyta, Eustigmatophyta, Prasinophyta, Prochlorophyta and Phycoviruses.
8. **Algae and human affairs:** Edible algae, algal biofertilizers, phycocolloids, algal blooms and phycotoxins.

Subject Name: MYCOLOGY

1. Introduction, scope and general principles of classification of fungi.
2. Myxomycotina: Plasmodiophorales.
3. Mastigomycotina: Chytridiales, Blastocladiales, Saprolegniales and Peronosporales.
4. Zygomycotina:Mucorales and Entomophthorales.
5. Ascomycotina: Endomycetales, Protomycetales, Taphrinales, Erysiphales, Eurotiales, Sphaeriales, Helotiales, Phacidiales and Pezizales.

6. Basidiomycotina: Uredinales, Ustilaginales, Lycoperdales, Nidulariales, Sclerodermatales, Phallales, Agaricales, Aphyllophorales, Tremellales and Auriculariales.
7. Dueteromycotina: Sphaeropsidales, Melanconiales, Moniliales and Mycelia sterilia.
8. Lichens: Thallus structure, reproduction and economic importance.

Subject Name: INTRODUCTORY MICROBIOLOGY

UNIT-I

Introduction to microbiology, scope of microbiology, microbiology in human welfare, bioterrorism. Microbial diversity: Microbial taxonomy and phylogeny. Major groups and their characteristics (Five kingdom system and three domain system of classification). Microscopy: Working principles of Light, Electron, Phase contrast and fluorescence microscopy.

UNIT-II

Bacterial- nutrition, growth, types of culture media, microbial growth, methods of isolation of pure culture, maintenance and preservation of microbial cultures, control of microorganisms,

UNIT-III

Genetics of bacteria: Genetic recombination - an overview; mechanisms of transformation, conjugation and transduction in bacteria; role of microorganisms in genetic engineering.

UNIT –IV

Virus-General characteristics; Classification and types of viruses, Viruses, Viroids, Virusoides, Prions, Replication of viruses – Lytic Cycle and Lysogenic Cycle (Bacteriophage), Transmission cycle of viruses

Subject Name: INTRODUCTORY PLANT ECOLOGY

UNIT-I

Definition, Principles and scope and significance of ecology, Vegetation patterns of the world: Life zones; major biomes and major vegetation types of the world, Biogeography, phytogeography; Ecosystem: Basic concept, scope and types; factor effecting ecosystem, Abiotic and Biotic components and their significance in ecosystem; Food chains and Food webs, Ecological pyramids, Energy flow.

UNIT-II

Plant Adaptations: Concept of limiting factors, Leibig's law of Tolerance, Law of Tolerance, Phenotypic plasticity, Ecotypes, Ecolines, Strategies of adaptation in plants.

UNIT-III

Population Ecology: Definitions, Attributes of population, Characteristics of population, Population growth density, Density dependent and Density independent factors, Age structure, Natality, Mortality, Biotic potential, Carrying capacity, Survivorship and age structure, Seasonal population fluctuation, Population dynamics, r and k selection.

UNIT-IV

Competition and coexistence, Intra-Specific Interactions, Interspecific Interactions, Mutualism and Commensalism, Prey-predator Interactions, Scramble and Contest Competition.

Ecological Succession: Types, Trends and Models of Succession; Concept of Climax Community; Theories on Climax, Ecotone and Edge Effect, Ecotypic differentiation, r and k strategies.

Subject Name: PRACTICAL

MASTER OF SCIENCE (BOTANY) – SECOND SEMESTER

Second Semester			
S. No.	**Name of Subject**	**Credits**	**Total Marks**
1	Higher Cryptogams, Gymnosperms and Angiosperms	5	100
2	Cytogenetics and Plant Breeding	5	100
3	Plant Physiology and Plant Biochemistry	4	100
4	Cell and Molecular Biology	4	100
5	Practical	4	100
Total		**22**	

Subject Name: HIGHER CRYPTOGAMS, GYMNOSPERMS AND ANGIOSPERMS

Unit I: Bryophytes

Origin, evolution, classification of Bryophyta. Comparative morphological, anatomical and reproductive study of gametophytes and sporophytes of Bryophytes. Evolution of sporophytes of Bryophytes. Bryophytes as pollution indicator and monitoring.

Unit II: Pteridophyte I

Origin and evolution of pteridophytes; Steller evolution and types of stele in pteridophytes, Telome concept. Heterospory and origin of seed habit in pteridophytes. Classification of vascular cryptogams.

Unit III: Pteridophyte II

Morphological, anatomical and reproductive diversity, soral evolution in ferns; gametophytic structure in eusporangiate and leptosporangiate forms and evolution of sex in pteridophytes.

Unit IV: Gymnosperms

Gymnosperms classification and salient features of major taxa; characteristics, affinities and relationships of Cycadofilicales, Bennettitales and Cordaitales. Characteristics, affinities and relationships of Ginkgoales, Coniferales, Taxales and Gnetales. Economic importance of Gymnosperms.

Unit V: Angiosperms

Systematics: Outline of classification of Angiosperms; Hutchinson, Takhtajan, Cronquist, merits and demerits,

Diagnostic characteristics, systematic phylogeny and economic importance of families: Magnoliaceae, Capparidaceae, Rosaceae, Apocynaceae, Asclepiadaceae, Convolvulaceae, Scrophulariaceae, Acanthaceae, Bignoniaceae, Lamiaceae, Verbenaceae, Polygonaceae, Euphorbiaceae, Orchidacae, Zingiberaceae, Araceae, Cyperaceae and Poaceae

Molecular approaches to plant taxonomy: Application of DNA markers in angiosperm taxonomy; molecular phylogeny

Subject Name: CYTOGENETICS AND PLANT BREEDING

Unit I:

General account, structure and function of chromosome, special chromosome.

Cell division –importance of cell division, cell cycle.

Mitosis-different stages.

Meiosis-different stages, role of meiosis in inheritance.

Chromatin organization and replication: Chromosome structure and packaging of DNA, mucleosome assembly and deassembly, histones, euchromatin and heterochromatin.

Cytogenetics of haploids: Haploidy/monoploidy, meiosis and breeding behaviour of haploids, uses of haploids in plant breeding, genetic and cytogenetic studies.

Unit II:

Mendel's law of inheritance, chromosomal theory of heredity.

Gene and gene interactions (epistasis, supplementary, complementary and duplicate genes), multiple alleles.

Linkage and crossing over, extra nuclear inheritance.

Sex chromosome and sex determination.

Chromosomal aberrations: structural and numerical, polyploidy: euploidy and aneuploidy, their importance in inheritance.

Mutation, Types of Mutation and Mutagens.

Unit III:

Cell signaling: cell surface receptor; G-protein coupled receptors; secondary messengers and signal transduction pathway.

Unit IV:

Principles: self-pollinated plants- selection, hybridization (techniques and consequences).

Principles: Cross pollinated plants: selection, heterosis and inbreeding depression.

Methods: self-pollinated plants- mass selection, pureline selection, pedigree selection, bulk method, backcross method.

Methods: cross pollinated plants-population improvement, hybrid and synthetic varieties.

Subject Name: PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY

Unit I

Fundamentals of enzymology: General aspects, international classification of enzymes, prosthetic groups and coenzymes, mechanism of catalysis, kinetics, Michaelis-Menten equation, bisubstrate reactions, active sites, factors contributing to the catalytic efficiency, regulatory enzymes, isozymes

Unit II

Water relations in plants: Unique physico- chemical properties of water, chemical potential and water potential of the plant. Ion uptake, mechanism of individual cells and roots interaction between ions. Transport and translocation of ions, solutes and macromolecules from soil, through cells, across membrane, through xylem and phloem, dual action of ATPases/pumps and modulation of their activity; specialized mechanisms for phosphorous and iron uptake. Mechanism of stomatal transpiration.

Unit III

Photosynthesis: Mechanism of photosynthesis, pigment protein complexes, mechanism of pigment system function, cyclic and non-cyclic electron flow, photophosphorylation; C3, C4 and CAM pathways of carbon fixation. C2 photorespiratory cycle. Formation of glycolate and its oxidation. Regulation of photorespiration and its significance; Plant growth regulators: Auxins, gibberellins, cytokinins, abscisic acid and ethylene; Physiological effects and mechanism of action of plant growth hormones

Unit IV

Physiology of flowering- Photoperiodism and vernalization.

Phytochrome: phytochrome as a photoreceptor, Phytochrome mediated responses. Germination and dormancy: Factors of seed and bud dormancy- Methods of breaking dormancy, germination stimulators and inhibitors; Stress physiology: Water stress, drought, frost, salinity and global warming

Subject Name: CELL AND MOLECULAR BIOLOGY

Unit I: Techniques in cell biology

Microscopy: Principles of microscopy, Light microscope: its principles and uses.

Phase contrast microscope, fluorescence microscope.

Electron microscope: Transmission electron microscope (TEM) and Scanning electron microscope (SEM).

Unit II:Cell components and their functions

Cell and cell organization.

Protoplast- physical and chemical nature, Structure and function of plasma membrane, Nucleus-structure, composition, function, chromatin structure in eukaryotes, Karyotype; Lampbrush and Polytene chromosome; heterochromatin, euchromatin

Cellular organelles (Mitochondria, Golgi bodies, Endoplasmic reticulum, Lysosome, Vacuoles).

Chloroplast: structure, function.

Cytoskeleton.

Unit III:Nucleic acid

Double helical structure of DNA; A, B, Z DNA; DNA replication in prokaryotes and eukaryotes; DNA damage and repair; DNA packaging; centromere, telomere; C-value paradox; Structure of RNA: mRNA, rRNA and tRNA; repetitive DNA; interrupted genes; gene families; transposons.

Unit IV: Protein synthesis

Machinary and mechanism of protein synthesis. Autogenous regulation of ribosomal protein synthesis. Operon concept, post transcription and translational modifications

Subject Name: PRACTICAL

MASTER OF SCIENCE (BOTANY) – THIRD SEMESTER

Third Semester			
S. No.	**Name of Subject**	**Credits**	**Total Marks**
1	Environmental Management and Biodiversity Conservation	5	100
2	Introductory Plant Pathology and Plant Protection	5	100
3	Introductory Plant Cell and Tissue Culture	4	100
4	Microbial Biogeochemistry	4	100
5	Practical	4	100
	Total	**22**	

Subject Name: ENVIRONMENTAL MANAGEMENT AND BIODIVERSITY CONSERVATION

UNIT-I

Introduction and scope of environmental management, Environmental impact assessment (EIA), Scheme of labelling of environment friendly product, ISO Certification, Environmental audit: energy audit, cost benefit analysis, Basic concepts of sustainable development, International summits and treaties related with ecology and environment.

UNIT-II

Environmental legislations: Status in India, Introduction of some Indian Environmental laws; The Biological Diversity Act 2002, The Wildlife (Protection) Act; The Forest (Conservation) Act, The Environmental (Protection) Act, 1986; IUCN categories of threat, Red Data book.

UNIT-III

Biological diversity: Basic concept, significance and magnitude; levels of biodiversity, uses of biodiversity: source of food medicine, raw materials, aesthetic, and ecosystem services; threats to biodiversity, species extinction, protected area network, Strategies for biodiversity conservation: Principles of biodiversity conservation, in-situ and ex-situ conservation strategies, Convention on Biological Diversity. Traditional approach to biodiversity conservation, TKDL.

UNIT –IV

Climate change, Global warming and effects and Greenhouse effect, Earth's natural greenhouse effect, Ozone depletion, Effects of rise in earth's temperature on forests, effects on agroecosystems; Mitigation and adaptation: carbon sink and carbon source.

Subject Name: INTRODUCTORY PLANT PATHOLOGY AND PLANT PROTECTION

UNIT -1

Historical and developmental aspects of plant pathology; Mode of infection and role of enzymes and toxins in plant disease;

Defense mechanisms of plants against infection: Pre-existing structural and chemical defense, induced structural and chemical defense, hypersensitive reaction, role of phytoalexins and other phenolic compounds.

Management of plant diseases: Cultural, chemical, biological, biopesticides, breeding for resistant varieties, plant quarantine, integrated pest management.

Post-harvest pathology: Fungal deterioration of food commodities, mycotoxins and health hazards, control measures

UNIT –II

Molecular plant pathology: Molecular aspects of host pathogen interactions - PR proteins, degradation of phytoalexins, systemic resistance mechanism; application of molecular biology to plant disease control - transgenic approach for crop protection, engineering chemicals that elicit defense response to plants.

UNIT –III

Major diseases in plants

(a) Cereals: Rice - blast disease, bacterial blight

(b) Vegetables: Chilly - leaf spot; Ladies finger - vein clearing disease.

(c) Fruits: Citrus - bacterial canker;

(d) Spices: Ginger - rhizome rot; Pepper - quick wilt

(e) Oil seeds: Coconut - grey leaf spot, bud rot disease.

(f) Rubber yielding: *Heveabraziliensis* - abnormal leaf fall, powdery mildew.

(g) Sugar yielding: Sugarcane - red rot

(h) Cash crops: Arecanut - nut fall disease.

Subject Name: INTRODUCTORY PLANT CELL AND TISSUE CULTURE

UNIT -1

Introduction; History of Plant Tissue Culture and Biotechnology; Scope and Importance of Biotechnology.

Principles of plant tissue culture: Organization of laboratory media composition and preparation, aseptic manipulation

UNIT –II

Cellular totipotency: Process and mechanism; Somatic embryogenesis and synthetic seeds: Induction and controlling factors; Organogenesis: Process and controlling factors;Haploids: Androgenic and gynogenic; obtention and promises; Somatic hybridization: Isolation, culture and fusion of protoplasts, regeneration of hybrids and cybrids.

UNIT –II

Somatic hybridization: Isolation, culture and fusion of protoplasts, regeneration of hybrids and cybrids; Clonal propagation: Micropropagation; Somaclonal and gametoclonal variation and

their selection; Transgenic plants: Method of transformation, selection, identification and applications; Germplasm conservation.
Industrial application of tissue culture.

Subject Name: MICROBIAL BIOGEOCHEMISTRY

UNIT -1

The tools of microbial genetics: Escherichia coli, Bacillus subtilis, bacteriophages (T4, lambda, Mu)
Mutation: Spontaneous and induced mutation, mutagens and mechanism of mutation, selection of auxotrophic and drug resistant mutants, suppressor mutations.
Insertion sequences: plasmids, mechanism of insertion, effects of insertion sequences and its importance.
Transposons: heritable properties conferred by transposons, physical organization of drug resistant transposons, genetic organization of TnA and its role in transposition.

UNIT –II

Gene expression and regulation: Regulation of virulent genes in pathogenic bacteria, heat shock regulon and signal transduction and Cps regulon
Microbial toxins: Microbial toxin types, biochemical and molecular basis of toxin production.

UNIT –III

Gene manipulation and production of novel commercial products, biopolymers, biosensors, biocatalysts
Bio fertilizers and its application: Algalization, rhizobia, Azolla-Anabaena system.

Subject Name: PRACTICAL

MASTER OF SCIENCE (BOTANY) – FOURTH SEMESTER

Fourth Semester			
S. No.	**Name of Subject**	**Credits**	**Total Marks**
1	Bioinformatics, Biostatistics and Computer Application	6	100
2	Biophysical Instrumentation and Biotechnology	5	100
3	SPECIAL PLAER (Any One) 1. Advance Plant Pathology and Plant Protection 2. Advance Plant Ecology 3. Advance Microbiology	6	100
4	Project work	5	100
Total		**22**	

Subject Name: BIOINFORMATICS, BIOSTATISTICS AND COMPUTER APPLICATION

Unit I:

Importance and scope of statistical methods in experiment. Mean, median, mode, standard deviation, standard error, variance, co-efficient of variation.

Probability distributions; sampling of data, random and non-random sampling; test of hypothesis.T-test, chi- square test, F- test of hypothesis.Analysis of variance, correlation and regression analysis. Goodness of fit.

Principles of design of experiments.

Unit II:

Definition, history, types of computers. Application of computer, basic components of computer.

Organization of digital computers- input devices, processing units.

Computer memory, primary memory, secondary memory, computer peripherals. Output devices.

Computers for preparation of manuscripts, drawings, graphs, charts, histograms.

Unit –III

Introduction to Bioinformatics; Scope and application.

Database; biological database - sequence and structural database (NCBI, PDB, Swiss Prot, KEGG and EBL).

Sequence analysis and comparison; Similarity and homology between sequences; sequence alignment – pair wise and multiple sequence alignment (BLAST, FASTA, Clustal W; phylogenetic relationship and EMBOSS).

Unit-IV

Digital computer – structural organization; operating system (DOS & Linux); Concept of languages of different levels.
Needle man – Wuncle and Smith-Wateman algorithm.
Drug design – history; analog design; in-silico drug design

Subject Name: BIOPHYSICAL INSTRUMENTATION AND BIOTECHNOLGY

Unit I

Principles and applications of bio instruments

Basic principles and applications of pH meter; UV-visible spectrophotometers; Centrifuges (Table top centrifuge and ultra-centrifuge); Gel Electrophoresis: SDS PAGE; Immunoassay systems, ELISA; X-ray crystallography; Chromatography: Principles and applications; Paper chromatography, Thin layer chromatography (TLC), Column chromatography; high performance liquid chromatography (HPLC); Blotting: Principles, types of blotting; PCR;Isoelectric Foccussing(IEF).

Unit II

Principles and tools of recombinant DNA technology

Restriction endonucleases; ligases; DNA modifying enzymes; Vectors: plasmids, phages, cosmids, artificial chromosome vectors; binary and shuttle vectors; cDNA and genomic libraries; Isolation of specific genes from bacteria and higher plants; cloning.

Unit III

Techniques of Genetic Engineering

Transfer of recombinant DNA into bacterial cells; transformation, selection (screening) of recombinants; Methods for Gene Transfer; Generation of Transgenic Plants and their identification; Polymerase Chain Reaction (PCR machine); Blotting techniques: Southern blotting; Northern blotting and Western blotting; Expression of cloned DNA;

Suggested books:

1. JH Zar (1999). Biostatistical Analyses. Dorling Kindersley (India Pvt Ltd), New Delhi.
2. John Townend (2002). Practical statistics for Environmental and Biological Scientists. John Wiley & Sons Ltd., Baffins Lane, Chichester, England.
3. Bajapai PK (2006). Biological Instrumentation and Methodology, New Delhi, S chand and co Ltd.
4. SS Rao and J Richard (2010). Introduction to Biostatistics and Research Methods.
5. Khan IA and Khanum A, Fundamentals of Biostatistics, 1994, 1st edition, Ukaaz publishers
6. Keen RE and Spain JD, 1992, Computer simulation in biology a basic introduction: John Wiley & Sons private Lmtd.
7. Medhi J, 1992, Statistical methods, Willey eastern Limited. Attwood TK and Parry- Smith
8. Bajpai PK (2012) Biological Instrumentation & methodology (Tools and Techniques of Biology),S Chand & Company Pvt Ltd, Ram Nagar, New Delhi-110055
9. Thieman WJ &Palladino MA (2009) Introduction to Biotechnology, Second Edition Pearson.
10. Satyanarayana U (2010) Biotechnology, Books and alied (P) Ltd. Kolkata. Lieber DC (2006) Introduction to Proteomics: Tools for New Biology; Humana Press, NJ

Subject Name: ADVANCED PLANT PATHOLOGY AND PLANT PROTECTION

Unit-I:
History of plant pathology, Concept of plant disease, Microorganisms as plant pathogen, and Losses due to plant diseases.

Unit-II:
Diagnosis or identification of Plant diseases, Koch's postulate and germ theory of diseases, pathogenesis and host range, stages of development of plant disease and disease cycle, dissemination of plant pathogens-air, water, soil, seeds, insect vectors, nematodes, mites, Pollen, nursery stock, overwintering and over summering of Pathogens. Entry of pathogens into the host: by mechanical force, chemical weapons, enzymatic activities, growth regulators. Defense mechanisms of plants against plant pathogens—preexisting structural and chemical defense, immunization-systemic and acquired resistance, Induced resistance inhibitors (production of phenolic substances), Phytoalexins.

Unit-III:
Epidemiology or epiphytotics, factors of epidemiology, patterns of epidemiology, disease forecasting. indexing Control of plant diseases, chemical and biological control , Integrated Disease Management (IDM) Quarantine Inspection. Changes in host physiology due to diseases (movement of water, permeability of cell membrane, transpiration, photosynthesis, respiration, plant reproduction, growth and transcription and translation).

Unit-IV :
Genetics of plant diseases, genes and disease, mechanism of variability, types of plant resistance to pathogens, Genetics of Virulence in pathogens and resistance in host, Enzymes, toxins and growth regulators in plant disease development.

Unit- V:
Symptoms, etiology, epidemiology and control measures and management of some important plant diseases of North East India. Aero mycology and plant diseases, Air sampling techniques., Soil and seed borne diseases, Rhizosphere and Rhizoplane, -Seed pathology.
Biotechnology and plant diseases – resistant gene identification and insertion in suitable host for crop improvement, strategies for development of disease resistance in plants.

Suggested Books:

1. Agrios,.G.N.; Plant Pathology5/e 2005,1997,1988,1978 First print in India 2006, Elsevier Inc.Reprint 2008.
2. Alexopoulos and W.Mims. John Wiley & Sons Inc. New york
3. Bessey,E.A. 1950 Taxonomy of Fungi The blackistone and Co. Philadelphia.
4. Bilgrami, K.S and Dube H.S (1976) A Text of modern Plant pathology Vikash Publishing House PVT. Ltd. New Delhi.
5. Butler,E.J. and Jones,S.G (1949): Plant pathology Mac Milan & Co.London.
6. Gauman E.A (1952):The Fungi: Translated by f.L.Wynd Hafner.New York.
7. Rangaswami, G and Mahadevan (1999) : Diseases of Crop plants in India Prantice Hall, India
8. Webster.J.1970:Introduction to Fungi. Cambridge University Press London.
9. Wolf F.A. and Wolf F.T. 1947 The Fungi. VolI .& vol II John Wiley and Sons Inc. New York

Subject Name: ADVANCED PLANT ECOLOGY

Unit I

Forest biodiversity: Concepts and dimensions of forest biodiversity, measures of forest diversity; functional attributes related to forest biodiversity; biodiversity in secondary forests; approaches to forest conservation. Ecophysiology of forest trees: Characteristic of tropical trees; shoot growth in forest trees; phenology of trees; forest seed dormancy and germination; regeneration ecology of forest trees.

Unit II

Invasion ecology: Introduction, ecological impacts of invasive species; remote sensing and GIS applications in forest ecology and conservation; climate change and forest; phenology of forest trees.

Unit III

Forest and forest environment: Structure of forest ecosystem; forest microclimate; Forest types of the world; forest types and forest cover of India with special reference to North East India; tree cover of India. Forest laws: Indian forest act; forest conservation act; forest rights act; social forestry; urban forestry; non timber forest products; pests and diseases of forest trees.

Unit IV

Forest ecosystem function: Primary productivity of forest ecosystems; methods of measurement; productivity patterns; litter production and decomposition; nutrient cycling and nutrient conservation strategies; Forest ecosystem management: History of forest management in India; joint forest management; forest fire; behaviour and effects; plantation forestry; application of remote sensing technique in forest ecology; deforestation and approaches to forestry conservation; sustainable forest management. Agrobiodiversity: Concept, management and conservation of agrobiodiversity, traditional ecological knowledge: concepts and management of biodiversity; local soil knowledge; national action plan for agrobiodiversity; on- farm conservation of plant genetic resources for food and agriculture; management of land races; agrobiodiversity hotspots; globally important agriculture heritage systems (GIAHS).

Unit V

Carbon storage and sequestration carbon management through biotic sequestration; forest ecosystems, wetlands; soil carbon sequestration; biofuels, carbon farming and carbon trading.

Subject Name: ADVANCED MICROBIOLOGY

Unit I:

Microbial Taxonomy and diversity: Bacteria, archaebacteria and their broad classification; eukaryotic microbes: yeasts, moulds, protozoa; molecular approaches to microbial taxonomy.
Microbial photosynthesis: oxygenic and anoxygenic photosynthesis. Chemosynthesis.
Microbial respiration, assimilative and disassimilative metabolism,

Unit II:

Soil microbiology: soil structure and function, factors affecting distribution of microbes. Microbial interactions with microbes, plants and animals, biogeochemical cycles.

Air microbiology: distribution of microbes in air, allergic disorders of air micro flora, sampling techniques, composition and concentration of air spores.
Water microbiology: Types of water, microbial components of water, water pollution, water treatment, bacteriological analysis of water, role and importance of aquatic microorganisms.

Unit III:

Genetic Recombination in Bacteria, models of recombination, Plasmid
Mutation: Types of mutation (physical and chemical), mutagenesis, molecular basis of mutations, frameshift mutations, transitions, transversions, site directed mutagenesis and its significance.

Unit IV:

Recombinant DNA technology: DNA manipulating enzymes, restriction endonuclease-specificity, sticky and blunt ends: cloning vectors- plasmids, phagemid, cosmids, advanced cloning vectors, their advantages and disadvantages; linker, adapters, homopolymer tailing. Application of rDNA technology, production of heterologous proteins. Production of insulin, human growth hormone. Gene therapy, inherited disorders, detection of gene defects, strategies of gene therapy, future prospects of gene therapy.

Unit V:

Industrial microbiology, Fermentation and fermentable microbes; Types of fermentation-solid state fermentation and submerged fermentation, Batch and continuous fermentation;Food microbiology: food spoilage, food poisoning, preservation of food.

Suggested books:

1. Microbiology by Lansing M Prescott, Donald A Klein, John P Harley, McGraw Hill
2. Principles of Microbiology by Ronald M. Atlas (1995), Amy Mc Cullen
3. Microbiology: Principles and Explorations by Jacquelyn Black
4. General Microbiology by Roger Y Stanier, John L Ingraham, Mark L Wheelis
5. Microbiology by Michael J Pelczar
6. Fundamental Principles of Bacteriology A J Salle
7. General Microbiology by Power and Daginawala, Himalaya Publishing House,
8. Foundations in Microbiology by Kathleen park Talaro, McGraw Hill. Science
9. Microbiology: An Introduction by Gerard J Tortora, Berdell R Funke, Christine L Case, DorlingKindersley (india) Pvt Ltd.
10. Microbiology by Stuart Walker, W B Saunders

Subject Name: PROJECT WORK