

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 BIOTECHNOLOGY

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 Focussing(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. Bajpai 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. Voll .& 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, archaeobacteria 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

Note: The Normal Rule and Regulation pertaining to the Examination and other issues will be applicable in Faculty of Science as per Arunachal University of Studies Act 2012, Subsequent Statute and Rules & Regulations.