

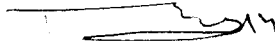
PROGRAMME PROJECT REPORT (PPR)

MSCBOT (M.Sc. BOTANY)

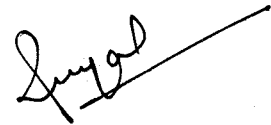
DEPARTMENT OF BOTANY

UTTARAKHAND OPEN UNIVERSITY

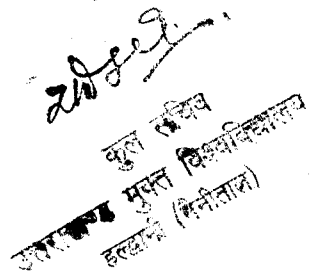
HALDWANI (NAINITAL)



DIRECTOR (I/C)
PROF.P.D.PANT
SCHOOL OF SCIENCES



COURSE COORDINATOR
DR. POOJA JUJAL
DEPARTMENT OF BOTANY



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हरद्वारी (नैनीताल)

Programme Project Report (PPR)
MSCBOT (M.Sc. Botany)
Department of Botany
Uttarakhand Open University

The content of the Programme Project Report are as:-

Name of Programme: M.Sc. Botany

(a) Programme mission and objectives: Uttarakhand state comprises of geographically constrained areas. A large number of learners cannot avail higher education due to the aforesaid geographical constraints. The learners can avail higher education through ODL (Open and Distance Learning) mode. The mission of the programme is to provide higher education to the learners in a way which is easily accessible. The programme on Botany is a programme that focuses on the plants. Through a series of academic courses, laboratory exercises and project/dissertation activities, students will be able to learn about the plants. Focus on the patterns and processes that enable anticipating understanding of plants and their environments at local, regional, and global scales, leading to strengths in the areas of ecology, evolution, and systematics.

Our vision is to conduct innovative research, teaching and outreach on the patterns and processes of life with a focus on plants and their environments.

(b) Relevance of the program with HEIs Mission and Goals: One of the mission of higher education particularly Open and Distance Learning Institutions is to provide greater opportunities of access to Higher Education with equity to all the eligible persons and in particular to the vulnerable sections. Another mission of the Higher education Institutions is to initiate policies and programmes for strengthening research and innovations, and encourage institutions - public or private to engage in stretching the frontiers of knowledge.

(c) Nature of prospective target group of learners: Those learners who wish to opt career in Botany for Government organizations, Teachers, in Laboratories etc will be the target group of

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learners. Also those learners who left their study due to some reasons. In addition to this, faculties are required to teach Botany at Under Graduate and Post Graduate level in conventional Universities and professional/ technical Universities or Colleges.

(d) Appropriateness of programme to be conducted in Open and Distance Learning mode to acquire specific skills and competence: The access to knowledge on the subject is not accessible easily to those aspirants who reside in far remote areas and those who belong to weaker and marginal sections of the society. Therefore, initiating such programme in Open and Distance Learning (ODL) mode will help aspirants particularly residing in far-flung areas and those who belong to weaker sections, to acquire skill and knowledge on the subject area.

(e) Instructional design:

i) Curriculum design: Before designing the programmes and courses in Botany, attempts were made to draw upon the literature produced by other academic and professional institutions in India and abroad. Due attention has been paid in balancing the theoretical knowledge with laboratory study, field survey/ studies, and Project work. The programme structure is as follows:

Programme Structure (M.Sc. Botany)

First Year

Paper-1-Biology and Diversity of Viruses, Bacteria and Fungi

BLOCK – I: VIRUSES

- Unit –1 : General Characters and Classification of Viruses
- Unit –2 : Chemistry and Ultrastructure of Viruses
- Unit –3 : Isolation and Purification of Viruses
- Unit –4 : Replication and Transmission of Viruses
- Unit –5 : General Account of Plant, Animal and Human Viral Disease

BLOCK – II: BACTERIA

- Unit –6 : General Account and Classification of Eubacteria, Archaeobacteria and Cyanobacteria
- Unit –7 : Ultra Structure, Nutrition and Reproduction of Bacteria
- Unit –8 : Economic Importance of Bacteria
- Unit –9 : Mycoplasma

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देहरादून (विश्वविद्यालय)

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BLOCK – III : FUNGI – I

- Unit –10 : General Characters and Classification of Fungi
- Unit –11 : Ultra Structure of Cell and Cell Wall Composition
- Unit –12 : Nutrition in Fungi
- Unit –13 : Reproduction in Fungi
- Unit –14 : Hetrothallism, Hetrokaryosis and Parasexuality

BLOCK – IV: FUNGI – II

- Unit –15 : Mastigomycotina and Zygomycotina
- Unit –16 : Ascomycotina, Basidiomycotina and Deuteromycotina
- Unit –17 : Fungi in Industry
- Unit –18 : Fungi in Agriculture and Forestry
- Unit –19 : Fungi as Human and Animal Parasites (Medical Mycology)
- Unit –20 : Fungi as Food

Laboratory Practical

Paper-1-Biology and Diversity of Viruses, Bacteria and Fungi

BLOCK-I: VIRUSES

- Unit-1-Methods of Sterilisation
- Unit-2-Preparation of Media
- Unit-3- Culturing Methods
- Unit-4-Staining Techniques
- Unit-5- Symptoms of Some Viral and Mycoplasmal Diseases

BLOCK-II: BACTERIA

- Unit-6-Models of Bacteriophage and HIV
- Unit-7- Transmission of Virus Diseases
- Unit-8- Isolation and Enumeration of Bacteria from Soil and Water
- Unit-9-Observation of Symptoms of Plant Diseases Caused by Bacterial Pathogens

BLOCK-III: FUNGI-I

- Unit-10- Isolation of Fungi from Soil, Water, Litter and Air
- Unit-11- Identification of Fungal Cultures slides and Specimens-I
- Unit-12- Identification of Fungal Cultures slides and Specimens-II
- Unit-13- Identification of Fungal Cultures slides and Specimens-III
- Unit-14-Mycothizal Colonization in Roots of *Parthenium* and *Tagetes*

BLOCK-IV: FUNGI-II

- Unit-15-Morphology of Plant Pathogens
- Unit-16- Study of Symptoms of Fungal Diseases.
- Unit-17-Morphology of Boutton, Oyster, Paddy Straw Mushrooms and *Amanita*

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- Unit-18- Identification of Ectomycorrhizal Fungi
 Unit-19- Identification of Arbuscular Mycorrhizal Fungi
 Unit-20-Genetics of Fungi (*Neurospora Ascus*)

Paper-2-Biology and Diversity of Algae, Bryophyta and Pteridophyta

BLOCK – I : ALGAE – I

- Unit –1 : General Characters and Classification
 Unit –2 : Thallus Organisation in Algae
 Unit –3 : Reproduction and Life Cycles of Algae
 Unit –4 : Life Histories of Some Genera of Chlorophyta – I
 Unit –5 : Life Histories of Some Genera of Chlorophyta – II

BLOCK – II : ALGAE – II

- Unit –6 : General Characters of Cyanophyta
 Unit –7 : General Characters of Some Genera of Xanthophyta And
 Bascillariophyta
 Unit –8 : General Characters and Life Histories of Some Members Of
 Phaeophyta
 Unit –9 : General Characters and Life Histories of Rhodophyta
 Unit –10 : Economic Importance of Algae

BLOCK – III: BRYOPHYTA

- Unit –11 : General Characters, Classification, Distribution and Economic
 Importance of Bryophytes
 Unit –12 : Marchantiales (Marchantia) and Fungermanniales (Pellia)
 Unit –13 : Anthoceratales (Anthoceros) and Sphagnales (Sphagnum)
 Unit –14 : The Evolution of Gametophyte
 Unit –15 : Evolution of Sporophyte

BLOCK – IV: PTERIDOPHYTA

- Unit –16 : General Characters and Classification of Pteridophytes
 Unit –17 : Structure and Life Histories of Psilotum, Lycopodium, Selaginella and
 Equisetum
 Unit –18 : Telome Theory and Stellar Evolution
 Unit –19 : Hetrospory and Seed Habit
 Unit –20 : Fossil Pteridophytes (Rhynia, Psilophyton and Calamites)

Practical

Paper-2-Biology and Diversity of Algae, Bryophyta and Pteridophyta

BLOCK-I: ALGAE-I

- Unit-1- *Nostoc*, *Lyngbya*, *Spirulina* and *Tolypothrix*
 Unit-2- *Chlamydomonas*, *Volvox*, *Chlorella* and *Ulva*

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Unit-3- *Enteromorpha*, *Oedogonium*, *Cosmarium* and *Caulerpa*

Unit-4- *Ectocarpus*, *Dictyota* and *Sargassum*

Unit-5- *Gelidium*, *Gracilaria*, *Cyclotella* and *Navicula*

BLOCK-II: ALGAE-II

Unit-6- Collection and Identification of Algae in and Around Local Area

Unit-7- Observation of Algal Blooms and Bioindicators of Water Quality

Unit-8- Preparation of Culture Media for Micro Algae

Unit-9- Preparation of Herbarium for Macro Algae

BLOCK-III: BRYOPHYTA

Unit-10- *Marchantia* and *Targionia*

Unit-11- *Plagiochasma* and *Fimbriaria*

Unit-12- *Pellia* and *Porella*

Unit-13- *Anthoceros* and *Notothylas*

Unit-14- *Funaria* and *Polytrichum*

BLOCK-IV: PTERIDOPHYTA

Unit-15- *Lycopodium* and *Selaginella*

Unit-16- *Psilotum* and *Isoetes*

Unit-17- *Osmunda* and *Gleichenia*

Unit-18- *Ophioglossum* and *Adiantum*

Unit-19- *Marsilea*

Unit-20- *Salvinia* and *Azolla*

Paper-3-Gymnosperms, Taxonomy of Angiosperms and Anatomy

BLOCK – I : GYMNOSEPERMS

Unit –1 : Distribution, General Characteristics, Classification and Economic Importance of Gymnosperms

Unit –2 : Morphology and Anatomy of Cycadales, Ginkgoales, Conferales, Taxales and Gnetales

Unit –3 : Reproductive Structure of Cycadales, Ginkgoales, Conferales, Taxales and Gnetales

Unit –4 : Development of Male and Female Gametophytes

Unit –5 : Fossil Gymnosperms

BLOCK – II : TAXONOMY OF ANGIOSPERMS – I

Unit –6 : Origin and Phylogeny of Angiosperms

Unit –7 : International Code of Botanical Nomenclature

Unit –8 : Systems of Classification

Unit –9 : Recent Trends in Plant Taxonomy

Unit –10 : Biosystematics

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BLOCK – III: TAXONOMY OF ANGIOSPERMS – II

- Unit –11 : General Account of Ranales, Centrospermales and Amentiferae
- Unit –12 : General Account of Tubiflorae, Helobiales and Poales
- Unit –13 : Flora and Vegetation of Andhra Pradesh
- Unit –14 : Herbarium Methodology and Herbaria
- Unit –15 : Biodiversity and Conservation

BLOCK – IV: ANATOMY

- Unit –16 : Apical Meristems of Root and Shoot
- Unit –17 : Tissues & Tissue Systems
- Unit –18 : Primary Structure of Root Stem and Leaf
- Unit –19 : Secondary Growth
- Unit –20 : Wood Anatomy

Practical

Paper-3-Gymnosperms, Taxonomy and Anatomy of Angiosperms

BLOCK-I: GYMNOSPERMS-I

- Unit-1- *Zamia* and *Ginkgo*
- Unit-2- *Thuja* and *Pinus*
- Unit-3- *Araucaria* and *Taxus*
- Unit-4- *Ephedra* and *Gnetum*

BLOCK-II: GYMNOSPERMS-II

- Unit-5- *Lyginopteris*
- Unit-6- *Medullosa*
- Unit-7- *Ptilophyllum* and *Glossopteris*
- Unit-8- *Pentoxylon*

BLOCK-III: TAXONOMY OF ANGIOSPERMS

- Unit-9- Study of the locally available plants and recording of the intraspecific variation
- Unit-10- Description and Identification at Family, Genus and Species Levels using Floras-I
- Unit-11- Description and Identification at Family, Genus and Species Levels using Floras-II
- Unit-12- Identification of Key Characters in a Group of Species of a Genus
- Unit-13- Construction of Indented and Bracketed keys for the Given Material
- Unit-14- Nomenclatural Problems
- Unit-15- Herbarium Techniques

BLOCK-IV: ANATOMY OF ANGIOSPERMS

- Unit-16- Study of Meristematic and Permanent Tissues and Tissue Systems
- Unit-17- Secondary Growth in Roots and Stems
- Unit-18- Leaf Anatomy
- Unit-19- Anomalous Secondary Growth

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Unit-20-Wood Structure

Paper-4-Biochemistry and Plant Physiology

BLOCK – I : BIOCHEMISTRY – I

- Unit –1 : Principles of Thermodynamics
- Unit –2 : Enzymes
- Unit –3 : Carbohydrates
- Unit –4 : Lipids

BLOCK – II : BIOCHEMISTRY – II

- Unit –5 : Amino Acids
- Unit –6 : Proteins
- Unit –7 : Nucleic Acids
- Unit –8 : Structure and Function of Membranes

BLOCK – III : PLANT PHYSIOLOGY – I

- Unit –9 : Plant Water Relations
- Unit –10 : Mineral Nutrition
- Unit –11 : Photosynthesis – I
- Unit –12 : Photosynthesis – II

BLOCK – IV : PLANT PHYSIOLOGY – II

- Unit –13 : Respiration – I
- Unit –14 : Respiration – II
- Unit –15 : Nitrogen and Sulphur Metabolism
- Unit –16 : Plant Growth Regulators

BLOCK – V : PLANT PHYSIOLOGY – III

- Unit –17 : Mechanism of Hormonal Regulation of Plant Growth And Development
- Unit –18 : Physiology of Flowering and Vernalisation
- Unit –19 : Seed Dormancy and Germination
- Unit –20 : Stress Physiology

Practical

Paper-4-Biochemistry and Plant Physiology

BLOCK-I: BIOCHEMISTRY-I

- Unit-1- Estimation of Fructose by Resorcinol Method
- Unit-2- Estimation of Amino acids by Ninhydrin Method
- Unit-3- Estimation of Protein by Biuret Method
- Unit-4- Separation and Identification of Amino acids by using TLC Method

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BLOCK-II: BIOCHEMISTRY-II

- Unit-5- Determination of Amylase Activity
- Unit-6- Determination of Catalase Activity
- Unit-7- Estimation of Reducing sugars
- Unit-8- Determination of Iodine number of Edible Oils

BLOCK-III: PLANT PHYSIOLOGY-I

- Unit-9- Determination of Water Potential using Gravimetric Method
- Unit-10- Effect of Temperature on Membrane Permeability
- Unit-11- Determination of Total and Titrable Acidity
- Unit-12- Determination of Stomatal Frequency and Index
- Unit-13- Stomatal Response to Promoters and Inhibitors
- Unit-14- Separation of Chloroplast pigments by Solvent Extraction Method

BLOCK-IV: PLANT PHYSIOLOGY-II

- Unit-15- Determination of Absorption Spectra of Chlorophylls
- Unit-16- Estimation of Chlorophyll a, Chlorophyll b and Total Chlorophyll in Leaves of C₃ and C₄ plants
- Unit-17- Determination of Rate of Respiration of Germinating Seeds by Continuous Current Method
- Unit-18- Estimation of Nitrogen by Micro-Kjeldahl's Method
- Unit-19- Estimation of Indole Acetic Acid (IAA)
- Unit-20- Determination of Seed Viability

M.Sc. Second Year

Paper-1-Cell Biology, Genetics, Biostatistics and Ecology (BOT-551)

BLOCK – I : CELLBIOLOGY

- Unit –1 : Principles and Application of Light, Phase Contrast, Fluorescence and Electron Microscopy
- Unit –2 : Ultra Structure and Function of Plant Cell and Organelles
- Unit –3 : Chromosome
- Unit –4 : Special Types of Chromosome
- Unit –5 : Cell Cycle and Apoptosis

BLOCK – II: GENETICS

- Unit –6 : DNA
- Unit –7 : Genetic Code
- Unit –8 : Brief Overview of Mendelian Inheritance
- Unit –9 : Chromosomal Aberrations
- Unit –10 : Mutations

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BLOCK – III: BIOSTATISTICS

Unit –11 : Mean Variance

Unit –12 : Application of Computers in Biology

BLOCK – IV: PLANT ECOLOGY – I

Unit –13 : Principles, Concepts and Levels of Ecology

Unit –14 : Community Characteristics

Unit –15 : Biodiversity

Unit –16 : Ecosystem

BLOCK – V PLANT ECOLOGY – II

Unit –17 : Global Biogeochemical Cycles of C, N₂ and S

Unit –18 : Climate, Soil, Vegetation Pattern of India

Unit –19 : Climate Change and Green House Gases

Unit –20 : Environmental Pollution

Practical

Paper: 1- Cell Biology, Genetics, Biostatistics and Ecology

BLOCK-I: CELL BIOLOGY

Unit-1- Observation of Cell and Cell Organelles

Unit-2- Squash Preparation of Onion Root tips to study Mitosis

Unit-3- Smear preparation of Maize or Onion Flower Buds to Study Meiosis

Unit-4-Karyotype Analysis

BLOCK-II: GENETICS

Unit-5-Problems on Monohybrid Cross

Unit-6-Problems on Dihybrid Cross

Unit-7-Problems on Trihybrid Cross

Unit-8-Genetics Mapping in Eukaryotes

BLOCK-III: BIOSTATISTICS

Unit-9-Designing of Experiments and Random Sampling

Unit-10-Problems on Means and Variation

Unit-11- Problems on F-Ratio and Critical Differences (CD)

Unit-12- Problems on Chi-Square

Unit-13- Problems on ANOVA

BLOCK-IV: ECOLOGY

Unit-14-Determine the Minimum Size Quadrats by Species Area Curve

Unit-15-Determination of Quantitative Characters by Random Quadrats Methods

Unit-16-Evaluation of Life Form Classes of Local Flora

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- Unit-17-Morphology and Anatomy of Common Hydrophytes and Xerophytes
- Unit-18-Interpretation of Environmental Data and Climatogram and Plotting Techniques
- Unit-19-Mechanical Analysis of Soil, Soil pH, Soil Moisture and Water Holding Capacity
- Unit-20-Estimation of Chlorides, Carbonates, Bicarbonates and Dissolved Oxygen in Clean and Polluted Water, BOD, COD

Paper-2-Medicinal Plants and Embryology of Angiosperms (BOT-552)

BLOCK – I: MEDICINAL PLANTS – I

- Unit –1 : Role of Plants in Medicine, Origin and Development and Different Systems of Medicine
- Unit –2 : General Account of Phytochemistry of Medicinal Plants
- Unit –3 : Morphology, Active Principles and Medicinal Value – I
- Unit –4 : Morphology, Active Principles and Medicinal Value – II

BLOCK – II: MEDICINAL PLANTS – II

- Unit –5 : Cultivation of Medicinal Plants
- Unit –6 : Pharmacognosy and Adulteration of Plant Drugs
- Unit –7 : Ethnobotany – History, Scope and Importance
- Unit –8 : Conservation of Medicinal Plants

BLOCK – III: EMBRYOLOGY OF ANGIOSPERMS – I

- Unit –9 : Structure of Anther and Development of Male Gametophyte
- Unit –10 : Structure of Ovule and Development of Female Gametophyte
- Unit –11 : Fertilization
- Unit –12 : Sexual Incompatibility

BLOCK – IV: EMBRYOLOGY OF ANGIOSPERMS – II

- Unit –13 : Development of Endosperm
- Unit –14 : Development of Embryo
- Unit –15 : Apomixis
- Unit –16 : Polyembryony

BLOCK – V: EMBRYOLOGY OF ANGIOSPERMS – III

- Unit –17 : Parthenocarpy
- Unit –18 : Experimental Embryology
- Unit –19 : Applications of Embryology in Taxonomy Agriculture and Horticulture
- Unit –20 : Principles and Applications of Palynology

Practical

Paper: 2- Medicinal Plants and Embryology of Angiosperms

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BLOCK-I:- MEDICINAL PLANTS-I

- Unit-1- Analysis of Morphological attributes in selected medicinal plants
- Unit-2- Identification of Crude Drugs using Anatomical Characters
- Unit-3- Identification of Crude Drugs using Physical properties
- Unit-4- Qualitative Analysis of Crude Drugs for Different Phytochemicals

BLOCK-II:- MEDICINAL PLANTS-II

- Unit-5-Antimicrobial Studies and Determination of MIC (Minimum Inhibitory Concentration)
- Unit-6- Anatomical Studies of Medicinal Plants
- Unit-7- Histochemical Analysis of Medicinal Plants
- Unit-8- Collection of Ethnobotanical information of Local Medicinal plants

BLOCK-III:- EMBRYOLOGY-I

- Unit-9-Study of Ovules and Ovaries and their identification
- Unit-10-Pollen Grain Analysis by Acetolysis
- Unit-11-Pollen Germination Studies
- Unit-12-Estimation of Pollen Fertility

BLOCK-IV:- EMBRYOLOGY-II

- Unit-13-Study of Endosperm Haustoria
- Unit-14-Study of Embryos
- Unit-15-Study of Protandry and Protogyny
- Unit-16-Study of Heterostyly

BLOCK-V:- EMBRYOLOGY-III

- Unit-17- Fundamentals of Microtome technique
- Unit-18- Preparation of permanent slides
- Unit-19-Anther Culture
- Unit-20-Callus Culture

Paper-3-Applied Mycology and Plant Pathology (BOT-553)

BLOCK – I : DIVERSITY, TAXONOMY AND UTILIZATION OF FUNGI

- Unit –1 : General Account and Diversity of Fungi
- Unit –2 : Fungal Taxonomy
- Unit –3 : Mycorrhizae
- Unit –4 : Edible Mushrooms: Medicinal and Nutritional Value
- Unit –5 : Mushroom Cultivation
- Unit –6 : Fungi as Biopesticides

BLOCK – II : FUNGAL BIOTECHNOLOGY

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- Unit -7 : Scope and Techniques of Fungal Biotechnology
- Unit -8 : Fungal Enzymes and Metabolites
- Unit -9 : Industrial production of Penicillin, Citric Acid and Alcohol
- Unit -10 : Fungi in Relation to Pollution
- Unit -11 : Fungi in Biodegradation

BLOCK - III : PRINCIPLES OF PLANT PATHOLOGY

- Unit -12 : History and Concepts of Plant Pathology
- Unit -13 : Classification and Symptomatology of Fungal, Bacterial, Viral, Phytoplasmal And Nematode Diseases
- Unit -14 : Host - Pathogen Interaction - I
- Unit -15 : Host - Pathogen Interaction - II
- Unit -16 : Control of Plant Diseases

BLOCK - IV : DISEASES CAUSED BY BACTERIAL, VIRUSES PHYTOPLASMA AND SPIROPLASMAS

- Unit -17 : Plant Diseases Caused by Bacteria, Viruses, Phytoplasma and Spiro plasmas
- Unit -18 : Plant diseases of Cereals, Pulses and Oil Seeds
- Unit -19 : Plants Diseases of Fruits and Vegetables
- Unit -20 : Plant diseases of Cash Crops and Plantation crops

Practical

Paper-3-Applied Mycology and Plant Pathology (BOT-553)

BLOCK - I: APPLIED MYCOLOGY - I

- Unit -1 : Sterilization Methods, Preparation of Media and Stains
- Unit -2 : Isolation Techniques
- Unit -3 : Single Spore Isolation, Pure Culture and Conservation of Fungal Germplasm
- Unit -4 : Fermentation Methods
- Unit -5 : Isolation of *Trichoderma Viride* and *Tharzianum* and their Evolution as Biocontrol Agents

BLOCK - II: APPLIED MYCOLOGY - II

- Unit -6 : Collection and identification of Ectomycorrhizae
- Unit -7 : VAM Fungal Root Colonization, Evaluation and Quantification in *Parthenium* and *Castor*.
- Unit -8 : Isolation of Keratinophilic fungi
- Unit -9 : Observation of Hyperparasites and Common Entomogenous Fungi
- Unit -10 : Testing of Some Isolates of *Penicillium* species against Pathogenic Bacteria.

BLOCK - III: PLANT PATHOLOGY

- Unit -11 : Observation of Plant Disease Symptoms Caused by Bacteria, Viruses and Fungi
- Unit -12 : Observation of Fungal Pathogens and their Identification
- Unit -13 : Isolation of Plant Pathogens and Pure Culture Preparation
- Unit -14 : Establishing Koch's Postulates for Evaluation of Pathogenicity

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- Unit -15 : Evaluation of Disease Index and Crop Loss
- Unit -16 : Evaluation of culture filtrates for cellulose, pectinase and Protease and amylase
- Unit -17 : Estimation of Protein and Amino Acids
- Unit -18 : Spawn Preparation of Edible Mushrooms (Oyster), Bed Preparation and Mushroom Production
- Unit -19 : Evaluation of Fungicidal Efficacy
- Unit -20 : Collection of Materials with Diseases

Paper-4- Plant Molecular Biology and Biotechnology (BOT-554)

BLOCK - I : MOLECULAR BIOLOGY - I

- Unit -1 : Genome
- Unit -2 : Genome Organization in Higher Plants
- Unit -3 : Chloroplast and Mitochondrial Genomes
- Unit -4 : Structure and Organization of Eukaryotic Genes
- Unit -5 : Gene Expressions in Eukaryotes
- Unit -6 : Regulation of Gene Expression in Eukaryotes

BLOCK - II : MOLECULAR BIOLOGY - II

- Unit -7 : Restriction Endonucleases
- Unit -8 : Modifying Enzymes Used in Molecular Cloning
- Unit -9 : Cloning Vectors
- Unit -10 : Genomic and DNA Libraries
- Unit -11 : Polymerase Chain Reaction
- Unit -12 : Molecular Markers

BLOCK - III : BIOTECHNOLOGY - I

- Unit -13 : Introduction to Plant Tissue Culture and in vitro Morphogenesis
- Unit -14 : Anther, Pollen and Ovule Culture
- Unit -15 : Cryopreservation of Plant Cells and Tissues and Germplasm storage
- Unit -16 : Protoplast Culture and Somatic Hybridization

BLOCK - IV: BIOTECHNOLOGY - II

- Unit -17 : Transgenic Plants
- Unit -18 : Plant Genomics and Proteomics
- Unit -19 : Plants Metabolomics
- Unit -20 : Intellectual Property Rights and Bio-safety

Practical

Paper: 4- Plant Molecular Biology and Biotechnology

BLOCK-I-: MOLECULAR BIOLOGY-I

- Unit-1-Isolation of Plasmid DNA from Bacteria and Agarose Gel Electrophoresis of DNA
- Unit-2- Production of Component Cells and Bacterial Transformation

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Unit-3- Isolation of Plant Genomic DNA

Unit-4- Restriction Endonuclease digestion of Plasmid and Genomic DNA

Unit-5-Isolation of Plant RNA

BLOCK-II:- MOLECULAR BIOLOGY-II

Unit-6- Quantification of DNA, RNA and Reassociation Kinetics of DNA

Unit-7-Polymerase Chain Reaction

Unit-8- Southern, Northern and western blotting

Unit-9-RAPD Analysis

Unit-10-Gene Cloning

BLOCK-III:- BIOTECHNOLOGY-I

Unit-11- Preparation of Media, surface sterilization and inoculation of explants

Unit-12-Initiation of Callus and Suspension Cultures

Unit-13-Plant Regeneration from Callus Cultures

Unit-14-Micropropagation-of-Plants

Unit-15-Protoplast Isolation and Culture

BLOCK-IV:- BIOTECHNOLOGY-II

Unit-16-Genetic Transformation of plants using *Agrobacterium tumefaciens*

Unit-17- Induction of Hairy Root Cultures using *Agrobacterium rhizogenes*

Unit-18- Direct Gene Transformation of Plants using Biolistic Gun

Unit-19-Sequence Alignment

Unit-20- Exploring Genebank Database and Blast Search

iii) **Duration of the programme:** Minimum duration of programme is two (02) years and maximum duration if six (06) years

iv) **Faculty and support staff requirement:** One Academic Associate is available in Department of Botany, School of Science. However, One Permanent Faculty will be required for more efficient conduction of the programme.

v) **Instructional delivery mechanism:** The programme will be offered in the Open and Distance Learning (ODL) mode. Guided self study using print (SLM) and electronic media; lecture/ counseling sessions; special counseling sessions and group interactions in Workshop at cluster level; self-reliant study activities; individual / group work assignment; Project work; Lab sessions and excursion. The delivery material will include printed SLM, assignment, Face to face

counseling at the designated study centres during Saturday and Sundays. Laboratory workshop will be conducted for 10 days at designated Study Centres.

f) Procedure for admission, curriculum transaction and evaluation

Admission: Twice in a year

Eligibility: Bachelor of Science with Botany as one of the subject at UG level.

Fee structure: Rs. 19750/- per annum

Evaluation norms: A learner will be evaluated through continuous evaluation (Assignments) and term end evaluation (Term end examination) at the end of semester. Continuous evaluation will carry 20% weightage whereas term end evaluation will carry 80% weightage

g) Requirement of the laboratory support and Library Resources: In order to carry out laboratory exercises, laboratory is compulsory requirement of the programme and in order to meet this requirement, the laboratory facilities of study centres will be utilized. She/he will be provided laboratory manual as per the need of the programme. Similarly for library, a learner may utilize the resources available at the designated study centre.

i) Cost estimates for development of the programme

Activities	Units / Pages	Amount (Rs.)
A. Masters Level Programmes (First Year And Second Year)		
1. Unit Writing (@ Rs. 6000/ unit)	346 Units	2076000.00
2. Typing (@ Rs.20/ per page)	8650 Pages (Per unit approx. 25 pages)	173000.00
3. Editing (@ Rs.3000/ unit)	346 units	1038000
3. Postal Expenses (Approx.)	-	5000.00
	Total	3292000.00

i) Quality assurance mechanism and expected programme outcomes: The programme will help in the development of professionally skilled, in general, and in corporate sector, in particular.

The programme will be implemented through only those Government Degree Colleges/ Universities / Institutions which have facilities for conducting laboratory counseling. In addition to this University will organize Laboratory workshop in designated places once (year/semester) for additional back up to the students so that competent and skilled human resource is produced. Further, the Programme and SLM developed will be continuously upgraded and necessarily be revised after a period of 5 years

Programme outcomes:

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- Bridge the flow of information between civil society, professionals, corporates, and policy and decision-makers

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कुल सचिव
मुक्त विश्वविद्यालय
वाराणसी (भारत)

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