

**JAI PRAKASH UNIVERSITY  
CHAPRA**



REGULATION AND COURSES OF STUDIES

FOR

**Master of Botany**  
BASED ON SEMESTER SYSTEM  
w.e.f. The Session-2012-13

SYLLABUS

M.Sc. Botany (Semester system)

w.e.f. 2012-2013

Jai Prakash University, Chapra



### Semester – I

Subject/Paper Code	Subject	No. of Credit	Continuous Internal Assessment (CIA)	End Semester Exam (ESE)	Total
Bot-PG-11	Microbiology, Phycology, Mycology	5	30	70	100
Bot-PG-12	Bryophyta, Pteridophyta	5	30	70	100
Bot-PG-13	Paleobotany & Gymnosperm	4	30	70	100
Bot-PG-14	Practical – I (Based on Bot-PG-11,12,13)	6	30	70	100
		20	120	280	400

### Semester – II

Subject/Paper Code	Subject	No. of Credit	Continuous Internal Assessment (CIA)	End Semester Exam (ESE)	Total
Bot-PG-21	Taxonomy, Anatomy & Embryology	4	30	70	100
Bot-PG-22	Plant Physiology & Biochemistry	5	30	70	100
Bot-PG-23	Ethnobotany, Biodiversity & Biometry	5	30	70	100
Bot-PG-24	Practical – II (Based on Bot-PG-21,22,23)	6	30	70	100
		20	120	280	400



Semester – III					
Subject/Paper Code	Subject	No. of Credit	Continuous Internal Assessment (CIA)	End Semester Exam (ESE)	Total
Bot-PG-31	Plant Ecology & Environmental Biology	4	30	70	100
Bot-PG-32	Cell Biology & Cytogenetics	5	30	70	100
Bot-PG-33	Molecular Biology & Biotechnology	5	30	70	100
Bot-PG-34	Practical – III (Based on Bot-PG-31,32,33)	6	30	70	100
		20	120	280	400

Semester – IV					
Subject/Paper Code	Subject	No. of Credit	Continuous Internal Assessment (CIA)	End Semester Exam (ESE)	Total
Bot-PG-41	Elective Paper I	4	30	70	100
Bot-PG-42	Elective Paper II	4	30	70	100
Bot-PG-43	Practical – IV (Based on Bot-PG-41&42)	6	30	70	100
Bot-PG-44	Project Dissertation & Viva-voce	6	30	70	100
		20	120	280	400

NB: Each theory paper will be divided into five units.

Abbreviation- Bot = Botany, PG = Post Graduation, First letters (1,2,3&4) = No. of Semester,  
Second letters (1, 2, 3&4) = No. of Paper.



Elective (Special) Papers:

1. Cytogenetics & Crop Improvement
2. Applied Microbiology and Plant Pathology
3. Environmental Biology
4. Biotechnology
5. Plant Physiology & Biochemistry
6. Taxonomy & Ethnobotany
7. Phycology

NB: Only three Elective (Special) papers (Cytogenetics & Crop Improvement, Applied Microbiology & Plant Pathology and Environmental Biology) shall be available for option w.e.f. session 2012-2013. Remaining Elective papers will be started subject to availability of faculty and infrastructure.

M. Sc. Botany  
(Semester -I)

Bot-PG-11: Microbiology, Phycology, Mycology (5 Credits)

Time: 3hrs

Marks: 70

**There will be three sections in the paper. Section A & B will be compulsory.**

**Section A:** Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

**Section B:** Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

**Section C:** One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

### Unit I

Bacteria: Classification, Ultra structure, Reproduction and Genetic recombination Economic importance of bacteria

Viruses: History, Nature, Structure and Multiplication (Lytic and Lysogenic cycles), Transmission of viruses and Economic importance

A brief account of Mycoplasma, Rickettsiae, Viroids and Prions

Role of microbes in Agriculture and Industries.

### Unit II

Thallus organization, Cell ultra-structure and Reproduction in algae

Role of pigments, reserve food, cell wall, flagella, eye spot and pyreneoids in classification and evolution of algae.

Algal bloom, Algae as food, feed, biofertilizers and its use in industry.

Indian phycologists and their contributions



### Unit III

Classification, Structural diversity and reproduction in: Prochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta.

General Account, Classification, Distribution, Structure, Reproduction & Economic importance of Lichen.

### Unit IV

General characters of fungi, substrate relationship in fungi, cell ultra structure, unicellular and multicellular organization, cell wall composition, nutrition (saprobic, biotrophic, symbiotic), reproduction: vegetative, asexual and sexual; heterothallism, heterokaryosis and parasexuality

Classification of fungi: Recent trends

### Unit V

General account of Mastigomycetes, Zygomycetes, Ascomycetes, Basidiomycetes, Deuteromycetes

Phylogeny of fungi

Economic importance of fungi (in industry, medicine, food etc.)

Fungi as biocontrol agents

## M. Sc. Botany

(Semester -I)

**Bot-PG-12: Bryophyta and Pteridophyta (4 Credits)**

Time: 3hrs

Marks: 70

**There will be three sections in the paper. Section A & B will be compulsory.**

Section A: Question no.1 - Ten multiple choice questions, two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

### Unit I

Classification and general characters of Marchantiales and Jungermanniales, Anthocerotales, Sphagnales and Polytrichales

Vegetative propagation and perennation

### Unit II

Evolutionary trends in sporophytes

Mechanism of dehiscence of capsules and dispersal of spores

Conducting tissues in Bryophytes



Economic importance of Bryophytes

### Unit III

Origin and classification of Pteridophytes.

Detailed general features (vegetative and reproductive) of the following classes/orders:

Psilopsida - Psilotales

Lycopsidea - Lycopodiales, Selaginellales and Isoetales

Gametophytic variations and evolution in Lycopodiales

### Unit IV

Heterospory vs. seed habit, with special reference to Selaginellales

Stellar organization in Pteridophyta

Sphenopsida - Equisetales (only a brief account)

Pteropsida

Characterization, classification and distinction between Eusporangiate,

Protileptosporangiate and Leptosporangiate

### Unit V

Structure, reproduction and Phylogeny of the following:

Eusporangiate - Ophioglossales

Protileptosporangiate - Osmundales

Leptosporangiate - Marsiliales, Salviniiales and Filicales

Economic importance of Pteridophytes

M.Sc. Botany

(Semester -I)

Bot-PG-13: Paleobotany and Gymnosperm (4 Credits)

Time: 3hrs

Marks: 70

There will be three sections in the paper. Section A & B will be compulsory.

Section A: Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

### Unit I

Characteristic features, distribution and economic importance of gymnosperms Classification of Gymnosperms

Morphology, anatomy, reproductive structures and phylogeny of the following living order:

Cycadales



## Unit II

Morphology, anatomy, reproductive structures and phylogeny of the following living orders

Ginkgoales  
Taxales  
Coniferales,

## Unit III

General features, Distribution, Anatomy, Reproduction, Phylogeny and Economic importance of the following orders :

Ephedrales, Gnetales and Welwitschiales (Angiospermic features within the group)

## Unit IV

Comparative morphology, anatomy, reproductive structure and affinities of the following fossil groups:

Psilophytales  
Protolpidodendrales  
Lepidodendrales

## Unit V

Comparative morphology, anatomy, reproductive structure and affinities of the following fossil orders :

Cycadaeoidales  
Cordaitales  
Pentoxylales

**Bot-PG-14: Practical- I (Based on Bot-PG-11, 12 & 13) [6 Credits]**

**M.Sc. Botany**

**(Semester -II)**

**Bot-PG-21: Taxonomy, Anatomy & Embryology (4 Credits)**

Time: 3hrs

Marks: 70

There will be three sections in the paper. Section A & B will be compulsory.

Section A: Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

### Unit I

Classification: A historical account of different systems of classification: artificial, Natural and



Phylogenetic, alpha and omega taxonomy.

Contemporary Systems: Arthur Cronquist, Armen Takhtajan, Robert F. Thorne and Rolf M. T. Dahlgren and K. R. Sponne's, Advancement Index

#### Unit II

Concept of taxa: Species, sub-species, variety and form; genus, family and taxa of higher categories

Concept of character: 'Good' and 'Bad' characters, analytic and synthetic characters, qualitative and quantitative characters, correlation of characters,

Botanical nomenclature: Binomial systems and International Code of Botanical Nomenclature (ICBN)

#### Unit III

Modern trends in taxonomy, Experimental taxonomy, Cytotaxonomy, Biosystematics, Palynotaxonomy, Chemotaxonomy, Numerical Taxonomy/Taximetrics & Molecular Systematics

#### Unit IV

Differentiation- polarity, symmetry and factors affecting differentiation and morphogenesis

Meristems: Types and organization of apical meristem

Differentiation of epidermis with special reference to stomata

Anomalous secondary growth.

Nodal, Floral and Seed Anatomy and their evolution

Role of anatomy in taxonomy

#### Unit V

Development and types of ovule, megasporogenesis and organization of female gametophytes (embryosacs)

Pollen-Pistil interaction,

Double fertilization and post fertilization changes leading to formation of seed, development of embryo and endosperm.

Polyembryony and Apomixis

Experimental embryology.

### M.Sc. Botany

#### (Semester -II)

#### Bot-PG-22: Physiology & Biochemistry (5 Credits)

Time: 3hrs

Marks: 70

There will be three sections in the paper. Section A & B will be compulsory.

Section A: Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).



### Unit-I

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

Photosynthesis: Mechanism - Light and dark reaction, water oxidizing complex; carbon fixation in  $C_3$  and  $C_4$  plants, Photorespiration.

### Unit-III

Growth hormones and growth regulators

Mode of action and physiological role of: Auxin, Gibberellins and Cytokinin, Abscisic Acid, Ethylene.

### Unit-IV

Enzymes: Structure, Nature, Properties and classification. Cofactors, Coenzymes, Prosthetic groups, Allosteric enzymes.

Mechanism of enzyme action

Differences between enzymes, catalysts and hormones

Structure and Classification of Amino acid and Protein

### Unit-V

Structure and Classification of Carbohydrate and Lipids.

Biochemical Energetics: Glycolysis, TCA cycle, ETS, oxidative phosphorylation, Difference between oxidative phosphorylation and photophosphorylation

### M. Sc. Botany (Semester -II)

### Bot-PG-23: Ethnobotany, Biodiversity & Biometry (5 Credits)

Time: 3hrs

Marks: 70

There will be three sections in the paper. Section A & B will be compulsory.

Section A: Question no. 1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

### Unit I

Traditional Ethno botanical knowledge base: Traditional knowledge base of Indian ethnic and local communities and their practices

Ethno pharmacology: Medical and paramedical use of plants in aboriginal of pro-literate societies in the world

Ethno mycology: Medicinal use of Fungi

Ethno ecology: Use of local biodiversity by aboriginal people for sustenance



**Unit II**  
Biodiversity concept : Origin of the terms and its dimensions  
Importance of Biodiversity : Benefits to mankind and Ecological balance.  
Types of Biodiversity : Genetic, species and ecosystem diversity, Assessment and inventory based on recommendation of IUCN, Biodiversity conventions and Biodiversity Act 2002

**Unit III**

Patterns 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:

Natural, genetic and ecological causes; human impacts including development pressure; Habitat loss, encroachments and overexploitation of resources

Effect of loss of biodiversity on Environment and Mankind.

**Unit-IV**

Conservation of Biodiversity (Phytodiversity)  
Protocols for conservations, Traditional conservation practices  
*In situ and ex situ* conservation  
Patenting, intellectual property right, Bio safety protocols  
People's movements for biodiversity conservation

**Unit-V**

**Biometry**

Distribution and measurement of variation, Mean, Median, Mode, Standard deviation, standard error, coefficient of variability, test of significance-t test, F-test (analysis of variance); Measurement of correlation coefficient, Application of chi square test for testing hypothesis

**Bot-PG-24: Practical-II (Based on Bot-PG-21, 22 & 23) [6 Credits]**



## M.Sc. Botany

### (Semester -III)

Bot-PG-31: Plant Ecology and Environmental Biology (5 Credits)

Time: 3hrs

Marks: 70

**There will be three sections in the paper. Section A & B will be compulsory.**

Section A: Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks (10x2=20 marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions (4 x 5=20marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered (3 x 10=30 marks).

#### Unit-I

- (i) Population Ecology: Concept, Rate of population increase, r and k selection.
- (ii) Interactions among populations: Commensalism Amensalism, Mutualism, protocooperation and Symbiosis, Predation, Parasitism, Competition.
- (iii) Plant adaptations: Hydrophytes, Xerophytes and Halophytes.

#### Unit-II

- (i) Community Ecology: Qualitative, Quantitative and Synthetic characters.
- (ii) Methods of studying plant community: Quadrats, Transects, Bisect and Plotless methods.
- (iii) Community dynamics: Plant succession, Types, Recent theories and mechanism of plant succession.
- (iv) Modern concept of plant succession.

#### Unit-III

- (I) Ecosystem: Structure and Function.
- (II) Ecosystem energetics
- (III) Primary and Secondary Productivity, food chain and food web.
- (IV) Biogeochemical cycles (C,N and P cycling).

#### Unit-IV

- (i) **Environmental pollution:**  
Air, Water, Soil, and noise pollution: Source, Causes, Impact and control measures.
- (ii) Global warming; green house effect; Ozone depletion.
- (iii) Climate change ecology



### Unit-V

- (i) Environmental Awareness: Environmental Impact Assessment, IGBP programme, Social forestry and Chipko movement.
- (ii) Man and Biosphere programme (MAB); International Union for Conservation of Nature and Natural Resources (IUCN); United Nation Environment Programme (UNEP); World Environmental Day; Wildlife Preservation Act (1972); Indian Forest Conservation Act (1989).

### M.Sc. Botany (Semester -III)

### Bot-PG-32: Cell Biology & Cytogenetics (5 Credits)

Time: 3hrs

Marks: 70

There will be three sections in the paper. Section A & B will be compulsory.

Section A: Question no. 1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

### Unit-I

Cell theory and organization of Prokaryotic and Eukaryotic cell.

Ultra structure and function of the following:

Cell wall, Plasma membrane, Cytoplasm and cytoplasmic organelles (Plastids, Mitochondria, Endoplasmic reticulum, ribosomes, Golgi complex and Lysosomes), Peroxisomes and Centrosomes.

### Unit-II

Structure and Functions of Nucleus.

Cell division, Cell cycle and Apoptosis, Control mechanism, cytokinesis.

### Unit-III

Chromosome: Organization and special types

Mendelian genetics

Gene interaction

Sex determination

### Unit-IV

Extranuclear inheritance

Chromosomal aberration: Structural and Numerical alterations, its cytological and genetical behaviour

Mutations: Molecular mechanism, induction by physical and chemical mutagens



## Unit-V

Population Genetics

Microscopy: Phase contrast microscopy, Electron microscopy, Fluorescence microscopy

Microdensitometry

M.Sc. Botany  
(Semester -III)

Bot-PG-33: Molecular Biology and Biotechnology (5 Credits)

Time: 3hrs

Marks: 70

**There will be three sections in the paper. Section A & B will be compulsory.**

**Section A:** Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

**Section B:** Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

**Section C:** One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

## Unit-I

Nucleic acids: DNA as hereditary material, Structure and forms of DNA and RNA, double helix, supercoiling of DNA, packaging of DNA in Prokaryotes and Eukaryotes

DNA replication: Models & Mechanism.

DNA repair.

## Unit-II

Transcription: Concept of template surfaces, Transcriptions, Post-transcriptional processing and transport of RNA, Transcription factors

Genetic code: Characteristics and Cracking of code.

## Unit-III

Translation: In prokaryotes and eukaryotes.

Gene regulation; Induction and repression. Operon concept, Lactose and Tryptophan operons and their regulation.

Modern concept of Gene.

## Unit-IV

Biotechnology: History, Scope and Branches.

Cell and Tissue culture: Laboratory equipments; General techniques of aseptic manipulation; composition of culture media and its preparation

Callus culture, suspension culture and single cell culture



Organogenesis and adventive embryogenesis: fundamentals of morphogenesis, embryogenesis and androgenesis, Somamatic

Clonal propagation

Plant protoplasts: Isolation, culture methods and plant regeneration

Role of tissue culture in crop improvement

Techniques used in Biotechnology: Polyacrylamide and Agarose gel electrophoresis.

Blotting techniques (Southern, Northern and Western blotting).

Polymerase chain reaction and its applications

DNA sequencing: Various methods of DNA sequencing

#### Unit-V

Recombinant DNA technology: History and Scope

Restriction enzymes and DNA ligase.

Cloning vectors: Plasmids (natural, pBR322, Ti plasmid vectors), phages, cosmid, artificial chromosome vector

Method of DNA transfer in suitable host: transformation, electroporation, microinjection, particle gun method

Gel Electrophoresis, Blotting techniques.

DNA fingerprinting.

Bot-PG-34: Practical-III (Based on Bot-PG-31, 32 & 33) [6 Credits]

#### M.Sc. Botany (Semester-IV)

Bot-PG-41: Cytogenetics and Crop improvement I (4 Credits)

Time: 3hrs

Marks: 70

**There will be three sections in the paper. Section A & B will be compulsory.**

Section A: Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks (10x2=20 marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions (4 x 5=20marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered (3 x 10=30 marks).

#### Unit-I

Chromosome: Structure (Chemical composition & Different Models).

Accessory chromosomes-structure, cytological behaviour, Significance and effects

Structural changes in chromosomes



## Unit- II

Sex linked, sex influenced and sex limited traits  
Sex determination and differentiation  
Haploidy- Origin, production, cytological behaviour and genetic uses

## Unit- III

Aneuploidy - Origin, classification, production, cytological behaviour and genetic uses  
Polyploidy- Types, cytological, genetical and evolutionary significance  
A brief account of classical methods of plant breeding

## Unit- IV

Modern techniques of plant breeding: Hybrids Vs cybrids, protoplast fusion and somatic hybridization (parasexual hybridization techniques). A brief idea of Terminator gene technology  
Inbreeding depression; heterosis and heterosis breeding  
Breeding for diseases and drought resistance

## Unit- V

Breeding works done in India on Wheat and Rice  
Genetic basis of evolution and speciation  
Contributions of M.S. Swaminathan, Har Govind Khorana, Barbara McClintock, V. Ramakrishnan and R.P. Roy

M.Sc. Botany  
(Semester -IV)

Bot-PG-42: Cytogenetics and Crop Improvement II (4 Credits)

Time: 3hrs

Marks: 70

**There will be three sections in the paper. Section A & B will be compulsory.**

Section A: Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

## Unit-I

Evolution of karyotypes  
Chromosome banding pattern & Techniques.  
Chromosome map.



## Unit-II

Modern concept of gene  
Genetic code: Characteristics  
Transposons and controlling elements

## Unit III

DNA replication: Models and mechanism  
DNA repair and recombination  
Southern & Northern blotting, DNA finger printing

## Unit IV

Gene regulation in prokaryotes and eukaryotes  
Mutation-Molecular mechanism, induction by physical and chemical mutagens & its significance.  
Incompatibility

## Unit V

Centres of origin of cultivated plants: Primary and Secondary, Plant introductions  
Population genetics  
Human cytogenetics

M.Sc. Botany  
(Semester -IV)

Bot-PG-41: Applied Microbiology and Plant Pathology I (4 Credits)

Time: 3hrs

Marks: 70

There will be three sections in the paper. Section A & B will be compulsory.

**Section A:** Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

**Section B:** Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

**Section C:** One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

## Unit-I

Fermentation technology & its application  
Isolation, screening and strain improvement of industrial microorganism  
Types of fermentation: Batch, Continuous, Fed-batch, Solid state and submerged



## Unit II

Microbial Metabolites: Primary and secondary metabolites; Production of organic acids, amino acid, and Vitamin (Vitamin B12)

Production of antibiotics

Enzymes production and their commercial application: Amylases, Proteases and Renin

## Unit III

Microbial production of foods:

Fermented beverages: Production of Wine and Beer

Fermented foods: Soya sauce

Fermented dairy products: yoghurt and cheeses

## Unit IV

Application of Microbial technology in agriculture:

**Biofertilizer:** Types and applications; Nitrogen fixers: Rhizobium, Azospirillum, Azotobacter and Cyanobacteria; *Azola-Anabaena* association, Phosphate solubilizers, Plant growth promoting rhizobacteria (PGPR), Mycorrhiza

Biopesticides

## Unit V

Environmental Microbiology:

Treatment of solid wastes: Composting & Land filling

Wastewater treatment methods

Bioremediation

Biogas production

## M.Sc. Botany (Semester -IV)

Bot-PG-42: Applied Microbiology and Plant Pathology II (4 Credits)

Time: 3hrs

Marks: 70

**There will be three sections in the paper. Section A & B will be compulsory.**

Section A: Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

Section B: Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

Section C: One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).



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### Unit I

History, Importance of plant pathology, Types of plant diseases  
Host parasite relationship, interaction and mechanism of infection  
Role of Enzymes, Pathotoxin (Toxin) and Growth regulators in Pathogenesis.  
Biochemical defense mechanism in plants: Phytoalexins and Phenolic compounds  
Eminent Plant Pathologists and their contribution.

### Unit II

Chemical and biological management of plant disease control  
Disease dissemination and modern techniques for its forecasting  
Forest pathology and its impacts on conservation

### Unit III

Seed pathology with special reference to seed borne mycoflora, mycotoxin  
and its hazards  
Quarantine regulation and seed certification  
Role of biotechnology in plant pathology with special reference to tissue  
culture and genetic engineering

### Unit IV

Important diseases of the following crop with special reference to symptoms, etiology and control  
measures  
Cereals: Rust, Smut of Wheat, Blast of rice, Ear cockle & Tundu disease of Wheat, Karnal Bunt of  
Wheat, Smut of Maize, Ergot of Bajra, False Smut of Rice and Flag Smut of Wheat  
Fruits & Vegetables: Early & Late Blight of Potato, White Rust of Crucifers, Powdery mildew of  
cucurbits,  
Anthracnose & leaf spot of Mango, Black tip of Mango, Downy mildew of Grapes, Bunchy top of  
banana, Disease of Litchi.  
Pulses: Wilt of Arhar, Powdery mildew of Pea, Rust of Gram and Leaf spot of Moong

### Unit V

Important diseases of the following crops with special reference to  
symptom, etiology and control measures  
Oil seeds: Rust of linseed, Leaf spot of Sesame  
Fiber crop: Wilt of Cotton, Angular leaf spot of Cotton, Stem rot of Jute  
Spices & condiments: Stem gall of Coriander, Leaf spot of Turmeric,  
Smut of Onion, Die back & leaf curl of Chili, Mosaic of Garlic.  
Sugarcane: Wilt, Grassy shoot and Red rot disease of Sugarcane.  
Tea, Coffee & Tobacco: Blister blight of Tea, Leaf rust of Coffee &  
Leaf blight of Tobacco



**M.Sc. Botany  
(Semester -IV)**

Bot-PG-41 Environmental Biology-I (4 Credits)

There will be three sections in the paper. Section A & B will be compulsory.

**Section A:** Question no. 1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

**Section B:** Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

**Section C:** One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

**Unit I**

Biodiversity: Concepts, Types, Levels, Process of loss, values & uses, Economic appraisal, Conservation of endangered plant species.

Major and Minor diversity crisis, impact of past diversity crisis and control of biotic diversity.

**Unit II**

Structure and Function of tropical dry deciduous forest, Grassland, Savanna and Wetland ecosystems.

**Unit III**

Biogeochemical cycling

- (a) Concepts, Dimensions and Models.
- (b) Hydrological cycle
- (c) Global carbon cycle
- (d) Global nitrogen cycle
- (e) Sulphur cycle
- (f) Biogeochemistry

**Unit IV**

Landscape ecology: Concept, Structure, Process, change and relevance to management & conservation.

Biosphere Reserves.

**Unit V**

Ecological energetics of ecosystems:  
Energy utilization by green plants.



Primary production- its measurement and range,  
Secondary production, Ecological efficiency,  
Energy flow in ecosystems - Food chains &  
Food web, Trophic level, Analysis of  
Energy flow, classification, Energy Flow  
Models, loss and conservation of energy

**M. Sc. Botany  
(Semester -IV)**

**Bot-PG-42 Environmental Biology-II (4 Credits)**

There will be three sections in the paper. Section A & B will be compulsory.

**Section A:** Question no.1 - Ten multiple choice questions two from each unit and each carrying two marks ( $10 \times 2 = 20$  marks) will be set.

**Section B:** Question No. 2 will comprise five short answer type questions (one from each unit and each carrying four marks). Candidates will have to answer only four questions ( $4 \times 5 = 20$  marks).

**Section C:** One long answer type questions from each unit are to be set out of which any three questions are to be answered ( $3 \times 10 = 30$  marks).

**Unit I**

Water pollution :

- (a) Sources, impact and Control measures
- (b) Biology of waste water treatment
- (c) Eutrophication
- (d) Biodegradation of pollutants

**Unit II**

Air Pollution:

- (a) Source, Impact and Control measures
- (b) Acid rain: Air chemistry, Effect on Human systems, Forests, Lakes and Streams
- (c) Green house gases: Green house effect, Trends and Global balance of  $CO_2$ ,  $CCl_3F$ ,  $N_2O$  etc.
- (e) Environmental radiations: Sources and its effect on Humans, Plants and Animals
- (f) Ecotoxicology: Terrestrial and aquatic toxicology

**Unit III**

Ecological restoration of degraded ecosystems:

- (a) Concepts, Aims and Objectives



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- (b) Restoration of degraded forest, Agroecosystem, Savanna, Coal mine spoil, Grassland and Wetlands
  - (c) Post restoration system management
  - (d) Keystone species: Concept and related terms, Useful contribution and Conservation policy

#### Unit IV

Deforestation and Desertification:

- (a) Causes and Rates of deforestation
- (b) Local, Regional and Global effects of deforestation
- (c) Scope, Scale, Causes and process of deforestation

#### Unit V

- (a) Biological control
- (b) Biological Engineering for sustainable biomass production
- (c) Biosphere reserve
- (d) Biomass burning: Global biomass burning, Environmental impact and monitoring efforts.

Bot. PG - 43 Practical IV (Based on Bot-PG - 41, 42) [6 credits]

Bot PG-44, Project Dissertation & Viva-Voce (Based on Bot - PG 41, 42) [6 credits]

# Msc Botany Syllabus