

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 |
| 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 |
| | | | | | 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.

| 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 | |

| 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 | |

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

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

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, Virioids 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 pyrenoids in classification and evolution of algae.
Algal bloom, Algae as food, feed, biofertilizers and its use in industry.
Indian phycologists and their contributions

Evolutionary trends in sporophytes
 Mechanism of dehiscence of capsules and dispersal of spores
 Conducting tissues in Bryophytes

Unit II

Classification and general characters of Marchantiales and Jungermanniales, Anthocerotales, Sphagnales and Polytrichales
 Vegetative propagation and perennation

Unit I

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).

Time: 3hrs

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

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

Marks: 70

Economic importance of fungi (in industry, medicine, food etc.)
 Fungi as biocontrol agents

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

Unit V

Classification of fungi: Recent trends

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

Unit IV

importance of Lichen.

General Account, Classification, Distribution, Structure, Reproduction & Economic

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

Unit III

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, Salviniaceae and Filicales

Economic importance of Pteridophytes

M.Sc. Botany

(Semester - I)

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

Time: 3hrs

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

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-II, 12 & 13) [6 Credits]
M.Sc. Botany
(Semester -II)
Bot-PG-21: Taxonomy, Anatomy & Embryology (4 Credits)

Marks: 70

Time: 3hrs

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

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

Time: 3hrs

Bot-PG-22: Physiology & Biochemistry (5 Credits)
M.Sc. Botany
(Semester -II)

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).

Phylogenetic, alpha and omega taxonomy.
 Contemporary Systems: Arthur Cronquist, Armen Takhtajan, Robert F. Thorne and Rolf M. T. Dahlgren and K. R. Sporne'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.

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)

Marks: 70

Time: 3hrs

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

Traditional Ethno botanical 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

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

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

Biometry

Unit-V

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-IV

Patterns of loss of Biodiversity:
 Cause of biodiversity loss and extinction:
 endangered, vulnerable and threatened species.
 Extinct,
 Red lists, Red Data Book and Green Book, Red Data Categories:
 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 III

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 II

M.Sc. Botany

(Semester -III)

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

Time: 3hrs

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).

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

Unit-I

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

Extranuclear inheritance
 Chromosomal aberration: Structural and Numerical alterations, its cytological and genetical behaviour
 Mutations : Molecular mechanism, induction by physical and chemical mutagens

Unit-IV

Chromosome: Organization and special types
 Mendelian genetics
 Gene interaction
 Sex determination

Unit-III

Structure and Functions of Nucleus.
 Cell division, Cell cycle and Apoptosis, Control mechanism, cytokinesis.

Unit-II

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-I

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).

Marks: 70

Time: 3hrs

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

(Semester -III)

M.Sc. Botany

- (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).

Unit-V

Population Genetics
Microscopy: Phase contrast microscopy, Electron microscopy, Fluorescence microscopy
Microdensitometry

Unit-V

M.Sc. Botany
(Semester -III)
Bot-PG-33: Molecular Biology and Biotechnology (5 Credits)

Marks: 70

Time: 3hrs

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

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

Somatic

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

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

Unit-I

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

Marks: 70

Time: 3hrs

M.Sc. Botany
(Semester -IV)
Bot-PG-42: Cytogenetics and Crop Improvement II (4 Credits)

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

Unit- V

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

Unit- IV

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

Unit- III

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

Unit- II

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 cyto genetics

**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 (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

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

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).

Time: 3hrs

Marks: 70

Bot-PG-42: Applied Microbiology and Plant Pathology II (4 Credits)
 M.Sc. Botany
 (Semester -IV)

Environmental Microbiology:
 Treatment of solid wastes: Composting & Land filling
 Wastewater treatment methods
 Bioremediation
 Biogas production

Unit V

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 IV

Microbial production of foods:
 Fermented beverages: Production of Wine and Beer
 Fermented foods: Soya sauce
 Fermented dairy products: yoghurt and cheeses

Unit III

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 II

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 (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

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 (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).

Water pollution :

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

Unit I

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 CO₂, CCl₃F, N₂O etc.
- (e) Environmental radiations: Sources and its effect on Humans, Plants and Animals
- (f) Ecotoxicology: Terrestrial and aquatic toxicology

Unit II

Unit III

- (a) Ecological restoration of degraded ecosystems:
Concepts, Aims and Objectives

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

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

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

Unit V

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

Unit IV

- (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