

Post Graduate Programme

M.Sc. (Botany)

PAPER	SUBJECT	MARKS ESE + CIA	Cr. Hr. CR (T + P)	PAPER CODE
SEMESTER – I				
Paper – I	Microbiology and Important diseases	70 + 30	5 (5 + 0)	BOT 511
Paper – II	Phycology and Mycology	70 + 30	5 (5 + 0)	BOT 512
Paper – III	Bryophyte and Pteridophyte	70 + 30	3 (3 + 0)	BOT 513
Paper – IV	Practical	50 + 50	5 (0 + 5)	BOT 514
Total –			18 (13+5)	
SEMESTER – II				
Paper – V	Taxonomy and Diversity of Seed plant : Gymnosperms & Angiosperms	70 + 30	5 (5 + 0)	BOT 521
Paper – VI	Cell biology, Cytogenetics & Molecular Biology	70 + 30	6 (6 + 0)	BOT 522
Paper – VII	Plant Anatomy and Development, Reproduction and Plant resources utilization & conservation	70 + 30	5 (5 + 0)	BOT 523
Paper – VIII	Practical	50 + 50	6 (0 + 6)	BOT 524
Total –			22 (16+6)	
SEMESTER – III				
Paper – IX	Plant Ecology & Environmental Science	70 + 30	4 (4 + 0)	BOT 531
Paper – X	Physiology and biochemistry	70 + 30	6 (6 + 0)	BOT 532
Paper – XI	Biotechnology Genetic Engineering & Biostatistics	70 + 30	6 (6 + 0)	BOT 533
Paper – XII	Practical	50 + 50	6 (0 + 6)	BOT 534
Total –			22 (16+6)	
SEMESTER – IV				
Paper – XIII Elective Paper – I	Cytogenetics & crop improvement/ Biotechnology/ Plant Pathology/ Plant Physiology and Biochemistry/ Environmental Science	70 + 30	5 (5 + 0)	BOT 541
Paper – XIV Elective Paper – II	Cytogenetics & crop improvement/ Biotechnology/ Plant Pathology/ Plant Physiology and Biochemistry/ Environmental Science	70 + 30	4 (4 + 0)	BOT 542
Paper – XV	Practical	50 + 50	5 (0 + 5)	BOT 543
Paper – XVI	Project Work & Project defense	75 + 25	4 (0 + 4)	BOT 544
Total –			18 (9+9)	

Post Graduate Programme

M.Sc. (Botany)

SEMESTER – I.

Paper	Paper Code	Subject type	Topic	Total Marks (ESE + CIA)
I.	Bot511	Core compulsory theory	Microbiology and Important diseases	70 + 30 = 100
II.	Bot512	Core compulsory theory	Phycology and Mycology	70 + 30 = 100
III.	Bot513	Core compulsory theory	Bryophyte and Pteridophyte	70 + 30 = 100
IV.	Bot514	Practical	Based on Bot511, Bot512 and Bot513	50 + 50 = 100
Total :				400

SEMESTER – II.

Paper	Paper Code	Subject type	Topic	Total Marks (ESE + CIA)
I.	Bot521	Core compulsory theory	Taxonomy and Diversity of Seed Plant: Gymnosperms & Angiosperms	70 + 30 = 100
II.	Bot522	Core compulsory theory	Cell biology, Cytogenetics & Molecular biology	70 + 30 = 100
III.	Bot523	Core compulsory theory	Plant Anatomy and Development, Reproduction and Plant resources utilization & conservation	70 + 30 = 100
IV.	Bot524	Practical	Based on Bot521, Bot522 and Bot523	50 + 50 = 100
Total :				400

SEMESTER – III.

Paper	Paper Code	Subject type	Topic	Total Marks (ESE + CIA)
I.	Bot531	Core compulsory theory	Plant Ecology & Environmental Science	70 + 30 = 100
II.	Bot532	Core compulsory theory	Physiology and biochemistry	70 + 30 = 100
III.	Bot533	Core compulsory theory	Biotechnology Genetic engineering & Biostatistics	70 + 30 = 100
IV.	Bot534	Practical	Based on Bot531, Bot532 and Bot533	50 + 50 = 100
Total :				400

SEMESTER – IV.

Paper	Paper Code	Subject type	Topic	Total Marks (ESE + CIA)
I.	Bot541	Elective Paper I	Cytogenetics and crop improvement/Biotechnology/Plant Pathology/Plant Physiology and Biochemistry/Environmental Science	70 + 30 = 100
II.	Bot542	Elective Paper II		70 + 30 = 100
III.	Bot543	Practical	Based on Paper Bot541 and Bot 542	70 + 30 = 100
IV.	Bot544	Project Work and Project defense		50 + 50 = 100
Total :				400

Post – Graduate Previous

SEMESTER – I

PAPER – I

BOT 511 5 (5 + 0) Microbiology and Important diseases

In all nine questions are to be set. Candidates are required to answer any five questions. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Salient features of Archaeobacteria, Eubacteria and Cyanobacteria.
2. Structure of bacterial cell.

Unit – II.

3. Bacteria recombination, conjugation, transduction and transformation.
4. Nutrition, Reproduction and Economic Importance of bacteria.

Unit – III.

5. Mycoplasma – history, cell structure and diseases caused.
6. Rickettsiae – history, cell structure and classification.

Unit – IV.

7. Viruses – history, structure, nature, replication, transmission, classification and economic importance.
8. Structure and multiplication of bacteriophage and TMV.

Unit – V.

9. Roles of Microbes in Agriculture and Industry.
10. Cyanobacteria – Biological nitrogen fixation, isolation and purification.
11. Important viral diseases.

SEMESTER – I

PAPER – II

BOT 512 5 (5 + 0) Microbiology and Important diseases

In all nine questions are to be set. Candidates are required to answer any five questions not selecting more than two from any section. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

SECTION “A” (Phycology)

Unit – I.

1. Algae in diverse habitats (Fresh Water, terrestrial and marine of Indian coasts).
2. Criteria in algal classification, outline classification of algae as proposed by Fritsch (1935) and Smith (1995).
3. Economic uses of Algae.

Unit – II.

4. Range of thallus organization and mode of reproduction in:
(a) Cyanophyta (b) Chlorophyta (c) Charophyta (d) Bacillariophyta
(e) Phaeophyta (f) Rhodophyta
5. Origin and Evolution of sex in Algae.
6. Evolutionary trend.

SECTION “B” (Mycology)

Unit – III.

1. Introduction and general characteristics.
2. Reproduction in fungi: Asexual, sexual and parasexual.

Unit – IV.

3. Classification of fungi with special reference to the systems proposed by Ainsworth (1973), Alexopoulos and Mims (1979).
4. Structural diversity and reproduction in Ascomycetes, Basidiomycetes and deuteromycetes.

Unit – V.

5. Mycotoxin – A general account.
6. Cultivation of edible mushroom.

SEMESTER – I

PAPER – III

BOT 513 3 (3 + 0) Bryophyte and Pteridophyte

In all nine questions are to be set. Candidates are required to answer any five questions not selecting more than two from any section. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

SECTION “A” (Bryophyte)

Unit – I.

1. General features, origin and classification of Bryophytes.
2. Mechanism of dehiscence and spore dispersal.
3. Vegetative reproduction in Bryophytes.

Unit – II.

4. Salient features of the following classes Hepaticopsida Anthocerotopsida and Bryopsida.
5. Evolution of Gametophytes in Bryophytes.
6. Evolutionary trends in Sporophytes of Bryophytes. Origin of land plants.

SECTION “B” (Pteridophyte)

Unit – III.

1. General account and reproduction.
2. Classification.
3. Stelar organization.

Unit – IV.

4. Heterospory and seed habit.
5. Telome concept.

Unit – V.

6. Salient features of the following orders:

- (a) Psilophytales (b) Psilotales (c) Lepidodendrales (d) Isoetales
(e) Sphenophyllales (f) Ophioglossales (g) Filicales

SEMESTER – I

PAPER – IV

(Practicals) (Based on Bot-511, 512 and 513)

BOT 514 5 (0 + 5)

Time – 6 hours

Full marks – 50

1. Preparation of Bacterial culture (Nutrient agar).
2. Bacterial staining.
3. Study of different forms of bacteria.
4. Study of different plant diseases.

Preparation of temporary slides and identification of materials

a) Phycology (based on Bot511)

(Algae)

Nostoc, Anabaena, Gleotrichia, Hydrodictyon, Microcystis, Lyngbya, Cladophora, Pithophora, Chaetomorpha, Draparnaldiopsis, Mougeotia, Ectocarpus, Dictyota, Batrachospermum, Polysiphonia.

b) Mycology (based on bot511)

(Fungi)

Protomyces, Phyllactinia, Peziza, Melampsora, Uromyces, Puccinia, Alternaria, Helminthosporium, Curvularia, Fusarium.

c) Bryophyte (based on bot512)

Marchantia, Plagiochasma, Targionia, Dumortiera, Cyathodium, Anthoceros, Notothylas, Sphagnum, Polytrichum, Pogonatum.

d) Pteridophyte (based on bot512)

Psilotum, Lycopodium, Selaginella, Isoetes, Equisetum, Ophioglossum, Marsilia, Azolla, Salvinia.

Study of Fossil Slides

Rhynia, Calamites Sigillaria, Lepidocarpon, Lyginopteris, Cycadeoidea, Cordaites.

SEMESTER – II

PAPER –V

BOT 521 5 (5 + 0) Taxonomy and Diversity of seed plants.

In all nine questions are to be set. Candidates are required to answer any five questions not selecting more than two from any section. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full Marks – 70

SECTION “A” (Gymnosperms)

Unit – I.

1. Classification of Gymnosperms.
2. Fossil (Geological) records, process of fossilization and type of fossils.

Unit – II.

3. Salient features and phylogeny of following fossil orders:
(a) Caytoniales (b) Pentoxylales (c) Cordiales

Unit – III.

4. General features, distribution, phylogeny and economic importance of following orders:
(a) Ginkgoales (b) Ephederales (c) Gentales

SECTION “B” (Angiosperms)

Unit – IV.

1. Origin and evolution of Angiospermic flower.
2. Taxonomic tools : Herbarium and Botanical gardens.
3. Salient features of the International code of Botanical Nomenclature.

Unit – V.

4. System of classification – Bentham and Hooker, Hutchison, Cronquist, Takhtajan, with relative study of merits and demerits.
5. Distinctive taxonomic features of the angiospermic orders :
(a) Magnoliales (b) Ranales (c) Orchidales (d) Caryophyllales

SEMESTER – II

PAPER –VI

BOT 522 6 (6 + 0) Cell Biology, Cytogenetic and Molecular Biology.

In all nine questions are to be set. Candidates are required to answer any five questions, at least one from each section. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full Marks – 70

SECTION “A” (Cell Biology)

Unit – I

1. Tools and techniques in cell biology with special reference to electron Microscopy, Fluorescence Microscopy, Microdensitometry, flow cytometry and autoradiography.

2. Ultrastructure, function, biogenesis and special aspects, if any :
- | | | | |
|---------------------|---------------------|---------------|---------------------------|
| (a) Plasma membrane | (b) Golgi apparatus | (c) Lysosomes | (d) Endoplasmic reticulum |
| (e) Chloroplasts | (f) Mitochondria | (g) Ribosome | (h) Nucleus |

SECTION "B" (Cytogenetics)

Unit – II

3. Chromosomal aberration and their role in evolution.
4. Polyploidy and an euploidy and its role in evolution.
5. Mutation : types, basis and role in crop improvement.

Unit – III

6. Sex determination in plants.
7. Genetic mapping.
8. Genetic recombination in eukaryotes.
9. Interaction of genes.

Unit – IV

10. Eukaryotic chromosomal organization and special types of chromosomes.
11. DNA and RNA : Structure, function types and replication.
12. Transcription and RNA processing.

SECTION "C" (Molecular Biology)

Unit – V

13. Transposable element in Prokaryotes and eukaryotes.
14. Fine Structure, analysis of gene.
15. Genetic code.
16. Positive and negative regulation of genes.

SEMESTER – II

PAPER –VII

BOT 523 5 (5 + 0) Plant Anatomy and Development Reproduction and Plant resources Utilisation and conservation

In all nine questions are to be set. Candidates are required to answer five questions, at least one from each section. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full Marks – 70

SECTION "A" (Anatomy and Development)

Unit – I.

1. Anatomy in relation to taxonomy.
2. Organisation of shoot apical meristem (SAM).
3. Organisation of root apical meristem (RAM).
4. Differentiation of epidermis with special reference to stomata.
5. Nodal anatomy.

SECTION "B" (Reproduction)

Unit – II.

1. Classification of endosperm and its development.
2. Polyembryony.
3. Apomixis.
4. Embryosac : Classification and Development.

SECTION "C" (Morphogenesis)

Unit – III.

1. Principles and techniques of tissue culture.
2. Haploid culture (Anther and ovule culture).
3. Protoplast culture and its role.
4. Embryo culture.

SECTION "D" (Plant resources utilization and conservation)

Unit – IV.

1. Plant Biodiversity : concept status in India, utilization and concerns.
2. Green revolution.
3. Principles and strategies for plant conservation : in-situ conservation, ex-situ conservation.

Unit – V.

4. Centre of origin of cultivated crops.
5. Origin, Evolution, Systematic position, Cultivation and uses of :
 - (a) Food and Fodder crops
 - (b) Fiber crops
 - (c) Medicinal plants
 - (d) Oil yielding plants.

SEMESTER – II

PAPER –VIII

BOT 524 6 (0 + 6) Based on Bot521, 522 and 523.

Time – 6 hours

Full Marks – 70

The following materials are to be studied :

a) Gymnosperm

1. *Gingko biloba, Cephalotaxus, Taxus, Ephedra, Gnetum.*
2. *Cordaites, Pentoxylon.*

b) Taxonomy

1. Field work and herbarium technique.
2. Collection, identification, description and illustration of plants of local flora.

c) Anatomy

1. *Study of anatomical peculiarities of : Dracena, Bougainvillea, Tinospora, Nyctanthus, Boerhaavia, Tecoma, Achyranthus.*
2. Study of different types of stomata.
3. Study different types of epidermal hairs.

c) Embryology

1. Study of pollen viability by acetocarmine test.
2. Stigma squash.
3. Embryo dissection.
4. M.S. Basal medium – preparation.
5. Protocol of Inoculation.

d) Plant resources

1. Morphology, Systematic position and uses of the following : Few beverages, Cotton fibres, Cereals, Pulses, Fruits, Medicinal Plants, Paper.

e) Cytogenetics

1. Squashing and identification of stages of mitosis and meiosis.
2. Study of permanent slides of different stages of mitosis and meiosis, Chromosomal bridge – Dicentric and Acentric chromosomes, Autotetraploid, Biography of Scientists.
3. Preparation of stains.
4. Emasculation of flower buds.
5. Numericals based on interaction of genes and uses of chi square test in it.

Post – Graduate Final Botany

SEMESTER – III

PAPER – IX

BOT 531 4 (4 + 0) Plant Ecology and Environmental Science

In all nine questions are to be set. Candidates are required to answer any five questions. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. The environment – Physical environment, biotic environment, biotic and Abiotic interaction.
2. Community Ecology – Nature of community, structure and attributes of community, level of species diversity and its measurement.

Unit – II.

3. Ecosystem Ecology – Ecosystem; structure and function, energy flow and mineral cycling (C,N,P), Primary production and decomposition, terrestrial (forest, grassland) and aquatic (freshwater, marine, ecosystem).

Unit – III.

4. Morphological and anatomical adaptations of Hydrophytes and Xerophytes.
5. Succession – Hydrosere and Xerosere.

Unit – IV.

6. Phytogeographical regions of India.
7. Environmental pollution – Air, water, Noise, Radio active, causes of pollution.

Unit – V.

8. Applied Ecology – Effect of water and soil pollution on plants and ecosystems, methods of their control, air quality index.
9. Climate change – Greenhouse gases (CO₂, CH₄, N₂O, CFC, etc.) source, trend and role, ozone depletion, global warming, sea levels rise United Nation Framework convention on climate change.

SEMESTER – III

PAPER – X

BOT 532 6 (6 + 0) Plant Physiology and Biochemistry.

In all nine questions are to be set. Candidates are required to answer five questions not selecting more than two from any section. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

SECTION “A” (Plant Physiology)

Unit – I.

1. Transpiration : Structure, development and distribution of stomata, modern concepts of stomatal movement.
2. Absorption of mineral : Transport across the biomembrane, passive transport, active transport (Na-K pump, AT pase pump).

Unit – II.

3. Growth Hormones : IAA, GA Cytokinin, ABA and Ethylene.
4. Seed Germination : Physiology and Biochemistry.
5. Physiology of Flowering : Photoperiodism.

SECTION “B” (Biochemistry)

Unit – III.

1. Enzymes : Classification, nature, properties and mechanism of action.
2. Biological oxidation : glycolysis, TCA cycle, Pentose phosphate pathway Oxidative Phosphorylation.

Unit – IV.

3. Photosynthesis : Physiology and Biochemistry of cycle and non-cyclic Photophosphorylation, C3, & C4 cycles, photorespiration.

Unit – V.

4. Fat metabolism.
5. Protein synthesis : In prokaryotes & eukaryotes.

SEMESTER – III

PAPER – XI

BOT 533 6 (6 + 0) Biotechnology, Genetic-Engineering and Biostatistics.

In all nine questions are to be set. Candidates are required to answer five questions. Selecting at least one from each section. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

SECTION “A” (Biotechnology)

Unit – I.

1. Host controlled restriction and modification, restriction endonuclease : nomenclature and target sites.
2. Cloning vectors : Plasmids, bacteriophage, Cosmid and shuttle vectors, Ti and Ri plasmid and Transduction.

Unit – II.

3. Southern, Northern, Western and South-western hybridization, dot and slot Blots.
4. DNA Sequencing maxam-Gilbert method, sanger’s method, chemical synthesis of oligo nucleotides.

SECTION “B” (Genetic Engineering)

Unit – III.

5. Gene cloning principles and techniques, construction of genomic and c-DNA library, Transgenic plants in Molecular farming.
6. Chloroplast transformation and its utility.

Unit – IV.

7. Microbial Genetic manipulation : Bacterial transformation, selection of recombinants and transformants, genetic improvement of industrial and N₂ fixer microbes.
8. Isolation and purification of genes, gene targeting, recombinant selection and screening.

SECTION "C" (Biostatistics)

Unit – V.

9. Brief history of statistics and concept of statistical analysis in Biology.
10. Brief account of central tendency measures – Mean, mode, median, standard deviation, standard error, student 't' test, coefficient of variance (cv), probability, correlation trends.
11. Presentation of biological data in tables, graphs, histograms and pie chart.
12. An elementary idea about Bioinformatics.

SEMESTER – III

PAPER – XII

BOT 534 6 (0 + 6) Practical based on Bot531, 532 and 533.

Time – 6 hours

Full marks – 50

Practical Based on Bot-531 (Ecology and Environmental Science)

1. Determination of minimum size of quadrat by "species area curve" method.
2. Determination of frequency of species in grassland and preparation of frequency diagram.
3. Determination of density and relative density in grassland.
4. Determination of biomass of primary produce in grassland.
5. Determination of dissolved O₂ in water sample collected from different localities.
6. Determination of chloride of different water samples.
7. Study of morphological and Ecological adaptations among hydrophytes and erophytes.

Practical Based on Bot-532 (Physiology and biochemistry)

1. To separate chlorophyll pigments by paper chromatography technique.
 2. To separate anthocyanin pigments by paper chromatography.
 3. To separate amino acids extracted from pulps by thin layer chromatography (TLC).
 4. To separate sugars extracted from pulp by TLC.
 5. To determine the effect of different quality of light on the rate of photosynthesis.
 6. To determine effect of CO₂ concentration on the rate of Photosynthesis.
 7. Quantitative estimation of sugar using U.V. spectrometer.
- To test the physiological role of auxins by Avena cloeptides assay.

Practical Based on Bot-533 (Biotechnology, Genetic Engineering and Biostatistics)

1. Preparation of basal media.
2. Inoculation technique.
3. Micro propagation technique.
4. Study of callus differentiation.

Biostatistics

1. To find out :-
Goodness of fit of non-mendelian (interaction) ratio : 9:7, 13:3, 15:1.

SEMESTER – IV

PAPER – XIII

Elective Paper – I.

BOT 541 5 (5 + 0) Plant – Physiology and Biochemistry.

In all nine questions are to be set. Candidates are required to answer any five questions.

Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Transpiration (a) Stomatal structures and types, (b) Physiology of stomatal movement in light of Modern concept.
2. Translocation in plants : (a) Mechanism of Ascent of Sap, (b) Mechanism of Pholem transport.
3. Mineral nutrition : (a) Essential Elements and Their Deficiency symptoms, (b) Mineral salt absorbtion.

Unit – II.

4. Seed physiology : (a) Physiological and Biochemical changes during seed development, (b) Seed dormancy: Physiology and Biochemistry of seed dormancy and various protocol for Breaking seed dormancy, (c) Physiology and Biochemistry of seed germination.

Unit – III.

5. Plant Growth Regulators: Discovery, Biosynthetic pathways, Mechanism of action and physiological Roles (i) Auxins, (ii) Gibberellins, (iii) Ethylene (iv) Abscisic acid.

Unit – IV.

6. Senescence and circadian Rhythms : (a) Biochemical changes during senescence of leaves, (b) Regulation of circadian Rhythms, (c) Programme cell death (PCD).
7. Movements : (a) Classification of Movements, (b) Phototropism, (c) Geotropism, (d) Nastic movements.
8. Physiology of flowering : (a) Photoperiodism, (b) Vernalization.
9. Stress physiology ; (a) water deficit : Drought, (b) Excess water : Flooding, (c) Salivity stress.

Unit – V.

10. General principle and Techniques of plant tissue culture.
11. Plant cell, tissue and organ culture, Anther and Embryo culture.
12. Protoplast isolation and culture : Cybrid & Hybrid.
13. Somatic Embryogenesis.
14. Micropropagation.

SEMESTER – IV

PAPER – XIV

Elective Paper – II.

BOT 542 4 (4 + 0) Plant Physiology and Biochemistry.

In all nine questions are to be set. Candidates are required to answer any five questions.

Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Enzymes : (a) Nomenclature and classification, (b) Cofactors and co-enzymers, (c) General properties of enzymes, (d) Mechanism of enzyme Action, (e) Enzymes and their regulations.
2. Law of thermodynamics : (a) Second law of thermodynamics, (b) Free energy, (c) Chemical reaction.

Unit – II.

3. Mitochondrial physiology : (a) Citric Acid Cycle, (b) Oxidative Phosphorylation, (c) Pentose phosphate pathway (d) Glyoxylate cycle.

Unit – III.

4. Chloroplast physiology : (a) Light Harvesting and transfer of energy, (b) Carbon assimilation : C₃ photosynthetic cycle (c) C₄ photosynthetic cycle, (d) CAM pathway, (e) Photorespiration.

Unit – IV.

5. Carbohydrates : Classification, Nomenclature, structure, Biosynthesis of Monosaccharides and Polysaccharides.
6. Amino Acids : structure, types and Biosynthesis.

Unit – V.

7. Lipid Metabolism : (a) Enzymatic degradation of fat, (b) B – Oxidation of Fatty acids, (c) Biosynthesis of fatty acids.
8. Nucleic acid : nature, structure of DNA and RNA's.
9. Phytochrome : Occurrence, chemistry and Photomorphogenesis.

SEMESTER – IV

PAPER – XIII

Elective Paper – I.

BOT 541 5 (5 + 0) Plant Pathology.

In all nine questions are to be set. Candidates are required to answer any five questions.

Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. History of plant diseases : Beginning of Modern plant Pathology, contribution of Antom de Bary, K.C. Mehta, S.D. Sadavasivan, MJ. Trimulachari, K.S. Bilgrami.

Unit – II.

2. (I) Resistance to disease : True resistance (Horizontal and Vertical). Apparent resistance (Disease escape and tolerance) (II) Plant disease control : Chemical (Inorganic and organic), Biological control.

Unit – III.

1. Dispersal of plant pathogen : direct transmission and indirect transmission (II) Defence mechanism : (a) morphological or structural defence mechanisms, (b) Biochemical defence mechanisms.

Unit – IV.

2. (I) Role of enzymes in disease development cell wall degrading enzymes : Cellulolytic, pectolytic proteolytic enzymes. (II) Toxins : Concepts, types and role in pathogenesis.

Unit – V.

1. (I) Entry points of seed infection, (II) Mechanism of transmission of seed pathogen, (III) Quarantine for seed (principles and procedure).

SEMESTER – IV

PAPER – XIII

Elective Paper – II.

BOT 542 4 (4 + 0) Plant Pathology.

In all nine questions are to be set. Candidates are required to answer any five questions.

Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. (I) Classification of plant diseases, (II) Physiologic specialization, Koch's Postulates growth, reproduction, survival and dispersal of plant pathogen. Factors influencing infection, colonization and development of symptoms.

Unit – II.

2. Symptomology and epidemiology : Identification of diseases based on symptoms (external and internal), epidemiology (slow and rapid) epiphytotic, disease forecasting.

Unit – III.

3. Mycotoxins : structure and formation of mycotoxins patulin, Aflatoxin sporidesmin.

Unit – IV.

4. History symptoms etiology, disease cycle, controls of the following diseases caused by fungi:
 - (i) Rice (Blast, Brown spot)
 - (ii) Wheat (Rust Bunt Powdery mildew and Ear cockle)
 - (iii) Sugarcane – Red rot.
 - (iv) Potato – Early and late blight.
 - (v) Mustard – Alternaria leaf spot and white rust.
 - (vi) Chilly die back.

Unit – V.

5. History symptoms etiology, disease cycle control of the following bacterial and viral disease – (i) Maize stalk rot (ii) Citrus greening (iii) Grassy shoot disease (iv) Yellow vein Mozaic of Bhindi.

SEMESTER – IV

PAPER – XIII

Elective Paper – I.

BOT 541 5 (5 + 0) Cytogenetics and Crop improvement.

In all nine questions are to be set. Candidates are required to answer any five questions. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Linkage and crossing over.
2. Multiple alleles and isoalleles.
3. Sex linked, sex – Influenced and sex limited traits.

Unit – II.

4. Interaction of genes.
5. Cytoplasmic inheritance.
6. Chromosome – Definition, morphology, structure, chemical composition, Euchromatin and heterochromatin.

Unit – III.

7. Organisation of eukaryotic genome, size and content, modern concept of gene, gene amplification.
8. Sex determination in plants.

Unit – IV.

9. Chromosomal aberrations.
10. Polyploidy – types, induction and role in crop improvement.
11. Mutation – types, induction and role in crop improvement.

Unit – V.

12. Methods of breeding in self-pollinated crops, Merits and demerits.
13. Methods of breeding for vegetatively propagated crops.
14. Methods of breeding for disease resistance.
15. Hybrid vigour and its role in crop improvement.

SEMESTER – IV

PAPER – XIV

Elective Paper – II.

BOT 542 4 (4 + 0) Cytogenetics and Crop improvement.

In all nine questions are to be set. Candidates are required to answer any five questions. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. DNA replication, types and mechanism in Prokaryotes and Eukaryotes.
2. RNA – types, structure, synthesis and function.
3. Genetic code, properties, deciphering of genetic code.

Unit – II.

4. Protein synthesis in Prokaryotes and Eukaryotes.
5. Positive and negative regulation of genes.
6. Introns, exons and RNA splicing mechanism.

Unit – III.

7. DNA sequencing.
8. C-value paradox, repetitive DNA sequence, satellite DNA, Genomic DNA.
9. Recombinant DNA technology and P.C.R.

Unit – IV.

10. Northern, Southern and Western blotting.
11. Genetic recombination in bacteria and viruses.
12. Isolation, sequencing and synthesis of genes.

Unit – V.

13. Vectors – types and classification.
14. Restriction enzymes.
15. Gene transfer methods and transgenic plants.

SEMESTER – IV**PAPER – XIII****Elective Paper – I.****BOT 541 5 (5 + 0) Environmental Science.**

In all nine questions are to be set. Candidates are required to answer any five questions.

Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Fundamentals of Environmental studies – (I) Definition, scope and importance. (II) Need for public awareness (a) Institution in environment, (b) People in environment. (III) Concept of Atmosphere, Hydrosphere, Lithosphere and Biosphere.

Unit – II.

2. Biodiversity – Definition, values at Global National and Local level, Hotspot, threat to biodiversity, endangered and endemic species of India.

Unit – III.

3. Natural resources – (i) Renewable and non – renewable (ii) Forest – wealth (iii) Energy resources.
4. Wetlands – types and utility.

Unit – IV.

5. Social issues and the environment : (I) Water conservation, rain water harvesting, water shed management, environmental ethics, climate change. (II) Wetland reclamation. (III) Environmental protection Act.

Unit – IV.

6. Environmental quality monitoring.
7. Disaster management – Flood, Earthquakes and Cyclones.

SEMESTER – IV

PAPER – XIV

Elective Paper – II.

BOT 542 4 (4 + 0) Environmental Science.

In all nine questions are to be set. Candidates are required to answer any five questions. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Environmental pollution – Air, water, Noise and Radio – active pollution, Causes of pollution.
2. Effects of air, water and soil pollution on plants and ecosystems, methods of control.

Unit – II.

3. Monitoring of air pollution – Air quality index.
4. Bioremediation – Plant assisted bioremediation in aquatic system.

Unit – III.

5. Climate change – (a) Green house gases – source, trend and sole, (b) Consequences of climate change – global warming and sea level rise, (c) National Action Plan on climate change, (d) Conference of parties to United Nations, Framework convention on climate change (COP to UNFCCC), (e) Carbon credit, (f) Ozone depletion, COP to Vienna convention.

Unit – IV.

6. Endangered plant species and conservation practices, Convention on Biological diversity.

Unit – V.

7. Invasive plant species in terrestrial and aquatic systems. Impact on indigenous flora.

SEMESTER – IV

PAPER – XIII

Elective Paper – I.

BOT 541 5 (5 + 0) Biotechnology.

In all nine questions are to be set. Candidates are required to answer any five questions. Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Tissue culture laboratory facilities, culture media and their composition.
2. Micro-propagation, Anther culture.

Unit – II.

3. Protoplast isolation, purification, culture, protoplast fusion and regeneration.
4. Transposable genetic elements in plants, their significance in development and Evolution.

Unit – III.

5. Isolation of chromosomal and plasmid DNA, digestion and gel electrophoresis, Isolation of protein from plant source and SDS – PAGE.
6. Different kinds of plasmids their application, episome.

Unit – IV.

7. Gene transfer, methods in plants : target cells for transformation, vectors for Gene transfer (based on Ri plasmids), Co-integrated intermediate and helper plasmids, binary vectors, selectable and scorable markers.

Unit – V.

8. Types and application of restriction endonuclease.
9. Southern, Western, Northern and dot blotting.

Unit – V.

SEMESTER – IV

PAPER – XIV

Elective Paper – II.

BOT 542 4 (4 + 0) Biotechnology.

In all nine questions are to be set. Candidates are required to answer any five questions.

Question no. 1 is compulsory. Prior to this examination there will be internal assessment of 30 marks.

Time – 3 hours

Full marks – 70

Unit – I.

1. Genomic and cDNA libraries.
2. DNA sequencing.

Unit – II.

3. Isolation and synthesis of genes.
4. Molecular markers and their uses.
5. Molecular probe preparation, labeling and uses.

Unit – III.

6. Virus as Vectors, CaMV, TMV, BAC, YAC, MI3 based vectors.
7. Protein – kinds, protein synthesis and modeling.
8. Polymerase chain reaction and its application, DNA chips.

Unit – IV.

9. Gene transfer methods, direct gene uptake by protoplasts, PEG stimulated microinjection, electroporation, liposome mediated DNA delivery.
10. Transgenic plants for crop improvement, resistance to herbicides and insecticides.

Unit – V.

11. Basic Bioinformatics.
12. Bioremediation- including phytoremediation.
13. Biodiversity and Biotechnology.

SEMESTER – IV

PAPER –XV

BOT 543 5 (0 + 5) Practical.

Practical based on Bot541 & 542 (Plant Physiology and Biochemistry)

Time – 6 hours

Full marks – 50+50

1. Estimation of chlorophyll a, b and total chlorophyll by using spectrophotometer.
2. Extraction of lipids from plant material and determination of their saponification value.
3. Extraction and Characterisation of caffeine.
4. Estimation of Ascorbic acid by titration / calorimetry.
5. Measurement of Amylase activity.
6. Electrophoretic separation of proteins.
7. Measurement of catalase activity.
8. Quantitative estimation of sugar/ phenols by using HPLC.

SEMESTER – IV

PAPER – XV

BOT 543 5 (0 + 5) Practical.

Practical based on Bot541 & 542 (Cytogenetics and Corp improvement)

Time – 6 hours

Full marks – 50 + 50

1. Preparation of cytological stain-acetocarmine and feulgen.
2. Germination, pretreatment and fixation of cytological materials.
3. Study of various stages of mitosis.
4. Karyotype analysis and histogram preparation.
5. Study of various stages of meiosis and calculation of chiasma frequency.
6. Cytological demonstration of translocation heterozygotes and paracentric Inversion.
7. Cytological demonstration of multivalent.
8. Plants breeding experiments.
9. Genetic problems.
10. Practical record.

SEMESTER – IV

PAPER – XV

BOT 543 5 (0 + 5) Practical.

Practical based on Bot541 & 542 (Biotechnology)

Time – 6 hours

Full marks – 50 + 50

Biotechnology Plant tissue culture

1. Laboratory practices and aseptic technique used in tissue culture labs.
2. Preparation of stock solution for plant tissue culture.
3. Preparation of tissue culture (plant) media.
4. Technique of inoculation, preparation of explants and their cloned propagation.
5. Subculturing of plantlets.
6. Anther culture.

7. Trial of adjuvant singly or in combination for the regeneration of plants.

Microbial technology

1. Laboratory practices and aseptic technique in microbial lab.
2. Preparation of culture media.
3. Isolation of antibiotic resistant mutant by replica planting Technique.
4. Biochemical characterization of mutant.
5. Isolation of DNA from bacteria and plant tissue.
6. Agrose gel Electrophoresis of DNA.
7. Estimation of protein by Lawry's method.
8. Centrifugal separation of proteins.
9. PAGE of protein.

SEMESTER – IV

PAPER – XV

BOT 543 5 (0 + 5) Practical.

Practical based on Bot541 & 542 (Plant pathology)

Time – 6 hours

Full marks – 50 + 50

1. Study of Host Parasite interaction of common plant disease and identification of the pathogen.
2. Study of fungi associated with post harvest rot of vegetables and Fruits.
3. Preparation of some solid and liquid synthetic and non synthetic media for culture.
4. Study of modes of germination of spores / conidia of fungi.
5. Calibration of microscope and measurement of spores.
6. Camera Lucida drawing of fungal spores.
7. Study of working of Autoclave, hot air oven, incubator, pH meter.
8. Preparation of Bordeaux mixture.

SEMESTER – IV

PAPER – XV

BOT 543 5 (0 + 5) Practical.

Practical based on Bot541 & 542 (Environmental Science)

Time – 6 hours

Full marks – 50 + 50

1. Experiments based on phytosociological characters (frequency, density & abundance).
2. Determination of water holding capacity and moisture content of soil.
3. Determination of dissolved O₂/CO₂ content / turbidity / pH/ Chloride / conductivity of water sample.
4. Determination of B.O.D. and C.O.D.
5. Ecological adaptations.

SEMESTER – IV

PAPER – XVI

BOT 544 05 (0 + 5)

Full marks – 75 + 25

Dissertation based on Elective Paper.

- (a) Preparation of Dissertation
- (b) Defense of dissertation

marks – 75

marks – 25

BOOKS RECOMMENDED

Books	Author	Publication
Advance in plant physiology	Khanna & sshaitri	A.P.H. Publication
An Introduction to plant Physiology	R. Sharma	Campus Book
Modern plant Physiology	R.K. Sinha	Narosa
Plant Physiology	Raiz and Zeiger	Panima
Plant tissue culture	Bhojwani and Ranzdan	Elseveer
An introduction to Plant Anatomy	R. Sharma	
Plant Pathology	P.D. Sharma	Narosa
Gymnosperm and Paleobotany	S.K. Singh	Campus Book
The Gymnosperm	Biswas and Johari	Narosa
Lab manual of Biochemistry	J. Jayaram	Scientific Publishers
Phycology	Lee	
Algae	O.P. Sharma	Tata McGrowhill
Algae of Western Great Lakes Area	G. W. Prescott	
Phycology	H.C. Bold	
Fresh Water Algae of United States	G.M. Smith	
The structure and reproduction of Algae Vol. – I & Vol. – II	F.E. Frtsch	
Bryophyta	Vasistha	
Himalayan Liverworts	Kashyap, S.R.	
Interrelationship of Bryophytes	Cavers	
Embryophyta	Campbell	
Plant diseases	R.S. Singh	Oxford IBH
Fungi	S.K. Singh	
An Introduction Mycology	Mehrotra/Aneja	
A.T.B. Fungi	A.K. Singh & Seema Shrivastava	
Plant Pathology	Agrios	
Fungi of India	Bilgrami/Jamaluddin/Rizwi	
Diseases of Corp Plants in India	G. Rangaswami	
Environmental Science	D.K. Asthana/ Meera Asthana	
Gymnosperm	Biswas/ Johri	Narosa
A.T.B. Microbiology	Dubey/ Maheshwari	S Chand
Cell & Molecular Biology	De Robertis & DeRobertis	
Plant Embryology	H.P. Sharma	S. Chand & Co.
Genetic (classical to modern)	P.K. Gupta	Rastogy
Cell Biology	C.B. Pawan	Himalaya Publication House

Introduction to Bryophyte	A. Rashid	Vikash
Biochemistry	Rawn	Panima
Biotechnology – Principle & Application	R.C. Rastogi	Narosa
Cell	Presscot	
Genetics	Pierce	Freeman
Biochemistry	Voet/ Voet	Wiley
Evolution	Strick Berger	Jhones & Burtlett
Genetics	P.K. Gupta	Rastogi
Genetics	Striker Berger	
Systematic Botany	Bhattacharya	Narosa
Recent Trend in Biotechnology	Hari Kumar	
Text Book of Biochemistry	Develin	
Text Book of Biotechnology	H.K. Das	
Molecular Biology	Sambamurty	Narosa
Biotechnology	Purohit	
Cell Physiology	Giese	
Biotechnology	Rai & Bhat	Narosa
Environmental Science	S.C. Santra	
Taxonomy of Angisperms	Pandey and Mishra	