SYLLABUS

FACULTY OF SCIENCE

M.Sc. BOTANY
(Semester Program)

M.Sc. (PREVIOUS) EXAMINATION, 2025-26
M.Sc. (FINAL) EXAMINATION, 2026-27

POST-GRADUATE STUDIES IN BOTANY
(Semester Program) 2025-2027

POST-GRADUATE COURSE: A DESCRIPTION

The academic program at M.Sc. level is through a semester examination scheme. The course work includes lectures, seminars and laboratory work. It shall be compulsory for all students to attend at least one long distance excursion for field study and collection of plant materials for class work in addition to 3 to 4 local excursions.

The full course comprises of four semesters spread over two-year duration. The list of courses offered in each semester is as follows:

M.Sc. Botany: Program Structure and Examination scheme

Semester - I

Paper Code	Paper Name	Code	L	T	P	Total Credits	Theory/ Practical	Internal	Max. Marks	Minimum Passing marks (%)
BOT6.5AECT100	**General Introduction to Flora and Herbarium techniques**	**AEC**	**2**	**0**	**0**	**2**				Non-CGPA S/NS*
BOT6.5DCCT101	**Phycology and Microbiology**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT102	**Diversity of Bryophytes and Pteridophytes**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT103	**Plant Ecology, Phytogeography and Environmental monitoring**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT104	**Biochemistry and Plant Metabolism**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCP105	**Lab-1 (101 and 104)**	**DCC**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
BOT6.5DCCP106	**Lab-2 (102 and 103)**	**DCC**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
					Total Credits	**26**	**Total Marks**		**600**	

Semester-II

Paper Code	Paper Name	Code	L	T	P	Total Credits	Theory/ Practical	Internal	Max. Marks	Minimum Passing marks (%)
BOT6.5VACT200	**National and Human Values**	**VAC**	**2**	**0**	**0**	**2**				Non-CGPA S/NS*
BOT6.5DCCT201	**Mycology and Plant Pathology**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT202	**Gymnosperms and Palaeobotany**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT203	**Plant Resource Utilization and Ethnobotany**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT204	**Plant Physiology**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCP205	**Lab-1 (201 and 204)**	**DCC**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
BOT6.5DCCP206	**Lab-2 (202 and 203)**	**DCC**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
					Total Credits	**26**	**Total Marks**		**600**	

Semester-III

Paper Code	Paper Name	Code	L	T	P	Total Credits	Theory/ Practical	Internal	Max. Marks	Minimum Passing marks (%)
BOT6.5SDCT300	**Basic Communication Skills**	**SDC**	**2**	**0**	**0**	**2**				Non-CGPA S/NS*
BOT6.5DCCT301	**Angiosperm Taxonomy**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT302	**Genetics, Plant Breeding and Biometry**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DSET303A OR BOT6.5DSET303B OR BOT6.5DSET303C OR BOT6.5DSET303D	**Advanced Plant Pathology-I Advanced Plant Ecology-I Advanced Plant Physiology-I Advanced Plant Biotechnology-I**	**DSE**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DSET304A OR BOT6.5DSET304B OR BOT6.5DSET304C OR BOT6.5DSET304D	**Advanced Plant Pathology-II Advanced Plant Ecology-II Advanced Plant Physiology-II Advanced Plant Biotechnology-II**	**DSE**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCP305	**Lab-1 (301 and 302)**	**DCC**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
BOT6.5DSEP306	**Lab-2 (303 and 304)**	**DSE**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
		Total Credits				**26**	**Total Marks**		**600**	

Semester-IV

Paper Code	Paper Name	Code	L	T	P	Total Credits	Theory/ Practical	Internal	Max. Marks	Minimum Passing marks (%)
BOT6.5SDCT400	**Academic Writing and Paper Presentation**	**SDC**	**2**	**0**	**0**	**2**				Non-CGPA S/NS*
BOT6.5DCCT401	**Plant Development and Reproduction Biology**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCT402	**Molecular Biology and Biotechnology**	**DCC**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DSET403A OR BOT6.5DSET403B OR BOT6.5DSET403C OR BOT6.5DSET403D	**Advanced Plant Pathology-III Advanced Plant Ecology-III Advanced Plant Physiology-III Advanced Plant Biotechnology-III**	**DSE**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DSET404A OR BOT6.5DSET404B OR BOT6.5DSET404C OR BOT6.5DSET404D	**Advanced Plant Pathology-IV Advanced Plant Ecology-IV Advanced Plant Physiology-IV Advanced Plant Biotechnology-IV**	**DSE**	**3**	**1**	**4**	**4**	**80**	**20**	**100**	**36 28 (Theory) 8 (internal)**
BOT6.5DCCP405	**Lab-1 (401 and 402)**	**DCC**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
BOT6.5DSEP406	**Lab-2 (403 and 404)**	**DSE**	**0**	**0**	**4**	**4**	**80**	**20**	**100**	**36 28 (Practical) 8 (internal)**
		Total Credits				**26**	**Total Marks**		**600**	

- L: Lecture, T: Tutorial, P: Practical.
- DCC: Discipline Centric Compulsory Course, DSE: Discipline Specific Elective Course.

- AEC: Ability Enhancement Course, VAC: Value Added Course, SDC: Skill Development Course.
- Non-CGPA courses are practice-based courses having two credits each and assessed internally (no examination conducted by the university). The credit, credit points and grades will reflect separately in the mark sheet under non-CGPA courses. The college will send the satisfactory (S) or not-satisfactory (NS) credentials of the student to the university.
- Aggregate passing marks are 36% in each paper.
- Each theory paper will be of 4h per week and lab work (practical) 24 h per week (each lab of 12 h).
- Internal examination will be conducted at institution level as per instructions and a proper record will be maintained and posted to MGSU within a specified time.
- A board of two examiners will be formed at the institution level for internal practical examination.
- A board of two examiners will be formed (one external and one internal examiner) to conduct external practical examination. The duration of external practical examination will be 4 h.
- For internal laboratory work (practical) in each semester seminar/project/survey/tour should be conducted and should be considered during evaluation.
- There will be three sections in each theory examination paper:
  - Section A: 10 questions each carrying 2 marks (one MCQ and one fill-in-the-blank from each unit).
  - Section B: 5 questions each carrying 6 marks (two questions from each unit with an internal choice of attempting one question with answer limit of 150 words).
  - Section C - 5 questions each carrying 10 marks (one question from each unit out of which three questions to be attempted with word limit of 400 words).
- The marks of internal assessment should be given on the basis of two term tests (should be conducted within a minimum gap of 40 days), regular class tests, seminars, quizzes, botanical association activities etc.).

SEMESTER – I

Paper - BOT6.5DCCT101
PHYCOLOGY AND MICROBIOLOGY

UNIT - I

Phycology: Algae in diversified habitats (terrestrial, fresh water, marine); Range of thallus organization, cell structure, reproduction, sexuality in Algae. Criteria for classification of Algae: pigments, reserve food & flagella. Major classifications up to orders.

UNIT - II

Salient features of Protochlorophyta, Chlorophyta, Charophyta, Xanthophyta, Phaeophyta, Rhodophyta and Cyanophyta with reference to following genera:—
Cyanophyta: *Anabaena, Rivularia*
Chlorophyta: *Nitella, Bulbochaete, Closterium, Acetabularia.*
Xanthophyta: *Botrydium.*
Phaeophyta: *Sargassum.*
Rhodophyta: *Ceramium.*

UNIT - III

General characteristics of Euglenophyta, Dinophyta, Bacillariophyta, Chrysophyta and Cryptophyta. Cyanobacteria: Salient features and biological importance.

Nitrogen fixation in Algae, algal biofertilizers & algal blooms. Economic importance of algae with special reference to food, feed and major uses in industry.

UNIT - IV

Microbiology: Archaebacteria and Eubacteria: General account, ultra structure, nutrition, reproduction, biology and economic importance.

General account of immunology, types of immunity, allergy and its types, properties of antigens and antibodies, serology, brief account of biofilms & biosensors.

UNIT - V

Viruses: Characteristics and ultra structure of virions, chemical nature, replication, transmission and economic importance. **Phytoplasma**:general characteristics and role in causing plant diseases. Viroids and Prions.

Reference Books:

1. An introduction to Algae – Morris, Cambridge Univ. Press, U.K.
2. Introductory Phycology – H.D. Kumar, Affiliated East West Press Ltd.,New Delhi.
3. Phycotalk Vol. I and II - H. D. Kumar Rastogi Publ., Meerut.
4. Recent Advances in Phycology - H.D. Kumar Rastogi Publ., Meerut.
5. Aquatic Biology in India - Kachroo P. Bishan S. Mahendra Pal Singh, Dehradoon
6. The structure and reproduction in the Algae –Vol. I & II, F.E. Fritsch,Cambridge, Uni. Press.
7. Cryptogamic Botany –Vol. I , G.M. Smith,Tata Mac Graw HillPublication ,New Delhi.
8. Advances in Phycology— edited by B.N. Verma, APC PublicationIndia.
9. Phaeophyceae in India –J.N. Mishra, ICAR Publication ,New Delhi.
10. Sea weeds and their uses –V.J.Chapman
11. Microbiology and Pathology – S.S. Purohit, Agro Bot. Jodhpur.
12. Microbiology – Palezar, Chand and King, McGraw Hills, London.

Paper - BOT6.5DCCT102
DIVERSITY OF BRYOPHYTES AND PTERIDOPHYTES

UNIT- I

Bryophytes: Origin of Bryophytes (including fossil record), primitive versusadvanced features, evolutionary lines, classification. Study of gametophytes and sporophytes of liverworts: *Takakia, Calobryum*, *Sphaerocarpus*, *Porella* and *Marchantia.*

UNIT - II

Study of gametophytes and sporophytes of Anthocerotales, Sphagnales, Andreales and Bryales with reference to following genera:*Anthoceros,Notothylas, Sphagnum, Andreaea* and *Buxbaumia.*

UNIT - III

Economic importance of Bryophytes with special reference to ecology, pollution indicators and monitoring, geobotanical prospects.

Pteridophytes: General features, alternation of generation, Apomicitic life cycle: Apogamy, apospory & vegetative apomixis. Evolution of stele, Heterospory and seed habit.

UNIT - IV

Systematics, Reproduction and Phylogeny of the following:

Rhyniopsida: *Rhynia, Horneophyton*

Psilopsida: *Tmesipteris, Psilotum*

Lycopsida *lsoetes, Lepidodendron*,

Sphenopsida: *Sphenophyllum, Equisetum*

UNIT - V

Brief account and life cycle of the following:

Pteropsida: *Ophioglossum* Osmundales: *Osmunda* Gleicheniales: *Gleichenia*

Salviniales: *Salvinia*.

Soral evolution, Telome concept.

Reference Books:

1. Economic importance of G ymnosperms & Bryophyta – N.S.Parihar, Central Book Depot, Allahabad.
2. Bryophyta – N.S. Parihar, Central Book Depot, Allahabad.
3. Biology and Morphology of Pteridophytes, N.S. Parihar, Central Book Depot, Allahabad.
4. Bryophytes – P. Puri , Atma Ram & Sons, Delhi.
5. The Morphology of Pteridophytes – Sporne, B.I. Publishing Pvt.Ltd. Bombay.
6. The interrelationships of the Bryophyta-Frank Cavers,Folk stone, Kent England.
7. Cryptogamic Botany Vo. I and II - Smith McGraw Hill BookComp., New York.
8. An introduction to Pteridophyta -A. Rashid, Vikas Publ. House,New Delhi.

Paper - BOT6.5DCCT103
PLANT ECOLOGY, PHYTOGEOGRAPHYAND ENVIRONMENTAL MONITORING

UNIT- I

Introduction of ecology, ecosystem (composition, structure), habitat and ecological niches.

Functions of Ecosystem: Trophic structure, food chain, food web, energy flow, ecological pyramids. Ecosystem productivity and its measurement, Biogeochemical cycles.

UNIT- II

Plant succession: Causes, process, types.

Community structure, development and characters (analytical and synthetic).

Ecological adaptations: Morphological, anatomical and physiological adaptations in hydrophytes, xerophytes and halophytes.

UNIT- III

Pollution: Sources, causes and control of air, water, soil & noise pollution. Effect of environmental pollution on plants, animals and human beings. Environmental impact assessment (EIA).

UNIT- IV

Phytogeography: Plant dispersal and migration. Continuous and discontinuous distribution of plants and geographical barriers. Types and areas of natural distribution, factors affecting distribution. Plant indicators.

Phytogeography of India and Rajasthan: Major habitats, vegetation types.

Major type of biomes and their characteristics.

UNIT- V

Brief account of the following: Afforestation and people's involvement, Social Forestry, Agro forestry, Silvipastures and Wind Breaks. Natural and wildlife resources and their management. Endangered plants and their conservation: National Parks, Wild Life Sanctuaries, Biosphere Reserves and Green Belt. Wild LifePreservation Act (1972) and Indian Forest Conservation Act. (1980). InternationalBiological Programme (IBP), Man and Biosphere (MAB), International Union for Conservation of Nature and Natural Resources (IUCN) and United Nations Environmental Programme (UNEP).

Reference Books:

1. *Concepts in Indian Ecology* - David N. Sen, Vishal Publishing Co.,Jalandhar.
2. Ecology and Field Biology - R.L. Smith, Harper Collins, New York

3. Fundamentals of Ecology - Odum, Saunders, Philadelphia
4. Basic Ecology— Odum, Saunders, Philadelphia.
5. Ecology, Principles and Applications. Chapman and Reiss, CambridgeUniv. Press, Cambridge, U.K.
6. Concepts of Ecology - Kermondy, Prentice Hall of India Pvt. Ltd., NewDelhi.
7. Modern Concepts of Ecology - H.D. Kumar,Vikas Publishing House.
8. Aims and Methods of Vegetation Ecology-Muller Dombois andEllenberg.
9. Ecology- Ambushta,CBS Publication.
10. Global Environmental agreements- Asha Joshi,Gunilla Reisch Pub.
11. Forest Ecology in India- Neena Ambre, Foundation Books.

Paper - BOT6.5DCCT104
BIOCHEMISTRY AND PLANT METABOLISM

UNIT - I

Carbohydrates: Occurrence, classification, structure and functions of monosaccharides, oligosaccharides, polysaccharides (starch, cellulose, pectin and chitin).

Lipids: Structure, biosynthesis, α and β oxidations. Glyoxylate cycle.

UNIT - II

Amino acids: Structure, classification and properties.

Proteins: Occurrence, properties, structure (primary, secondary, tertiary and quaternary) and functions. Chemical bonds involved in protein structure.

Enzymes: Structure, properties, enzyme kinetics, nomenclature and classification, mode of action, factors affecting enzyme activity; Coenzymes, allosteric enzymes, isozymes.

UNIT - III

Photosynthesis: Composition and characterization of photo systems I and II; electron flow through cyclic and non-cyclic photophosphorylation.

Carbon reaction of photosynthesis: C_3, C_4 and CAM pathway.

Photorespiration: Mechanism and significance.

UNIT – IV

Bioenergetics: Laws of thermodynamics, concept of free energy, entropy and enthalpy, Energy Coupled Reactions, Structure of ATP and other high energy molecules.

Respiration: Types of respiratory substrates and their utilization in respiration. Glycolysis, TCA cycle and oxidative photophosphorylation, Chemiosmotic regeneration of ATP.

UNIT - V

Tools and techniques: Principle and applications of spectrophotometry and chromatography (adsorption, partition, ion exchange, gel filtration, paper, column, gas liquid and HPLC).

Reference Books:

1. Plant metabolism Dennis, Turpin, Lefebure and Layzell, LongmanEssex, England.
2. Biochemistry and Physiology of Plant Hormones Moore, SpringerVerlag, New York, U.S.A.
3. Biochemistry. Lubert Stryer, W.H. Freeman and Comp., New York.
4. A Text book of Plant Physiology and Biochemistry, S.K. Verma, S.Chand & Comp., New Delhi.
5. Plant Biochemistry - Bonner and Varner, Academic Press, New York.
6. Biochemistry –Lehringer, Freman & Co. Ltd.
7. Biochemistry –A.K.Bery, Plant Biochemistry –edited P.M. Dey.
8. J.B. Harborne, AcademicPress, New York.

PRACTICAL MARKING SCHEME: SEMESTER I

Paper - BOT6.5DCCP105 (Lab 1)

1. Phycology	10
2. Microbiology	10
3. Plant Biochemistry	
(a) Major	14
(b) Minor	6
4. Spot (6): Three-Paper-Bot 101 Three-Paper-Bot 104	24
5. *Viva-voce*	8
6. Records	8
7. Internal assessments (Excursion Report/ Seminar/ Regularity/Discipline/Term Test)	20
Total	**100**

Paper - BOT6.5DCCP106 (Lab 2)

1. Bryophytes	10
2. Pteridophytes	10
3. Ecology(Field study-Quantitative and Analytical characters)	8
4.Ecological Anatomy-Adaptation	6
5. Phytogeography India/World	6
6. Spot (6) Three-Paper-Bot 102 Three-Paper-Bot 103	24
7. *Viva-voce*	8
8. Records	8
9. Internal assessments (Excursion Report/ Seminar/Regularity/ Discipline/Term Test)	20
Total	**100**

SEMESTER – II

Paper - BOT6.5DCCT201

MYCOLOGY AND PLANT PATHOLOGY

UNIT- I

Mycology: Introduction, scope and general principles of classification of fungi. Heterothallism, Heterokayrosis and Parasexual cycle.

Role of fungi in industries with reference to production of alcohol, organic acids, antibiotics, food and fodder. Fungi as biocontrol agents. Mushroom cultivation, Mycorrhiza application in agriculture and plant growth.

UNIT- II

Comparative study of following sub-divisions:

1. Plasmodiogymnomycotina: *Physarum*
2. Haplomastigomycotina: *Synchytrium*
3. Diplomastigomycotina: *Peronospora*
4. Zygomycotina: *Pilobolus*
5. Ascomycotina: *Chaetomium*
6. Basidiomycotina: *Puccinia*
7. Deuteromycotina: *Fusarium*

UNIT- III

Plant Pathology: Symptomatology and identification of diseases with reference to fungal, bacterial and viral infections. Disease control by physical, chemical and biological methods, resistant varieties, IPM (Integrated Pest Management). Crop rotations & plant quarantine.

UNIT- IV

Etiology and control of the following crop diseases:

Late blight of potato, Green ear disease of bajra, Downy mildew of grapes.

Peach leaf curl, Powdery mildew of cucurbits, Ergot of cereals.

Black stem rust of wheat, Rust of linseed, Loose smut of wheat, Smut of bajra.

UNIT- V

Etiology and control of the following crop diseases:

Early blight of potato, Tikka disease of groundnut, Red rot of sugarcane, Wilt of cotton.
Citrus canker, Bacterial blight of rice, Tundu disease of wheat, Angular leaf spot of cotton.
Mosaic of tomato and tobacco, Yellow vein mosaic of bhindi, bunchy top of banana.

Reference Books:

1. Introductory Mycology – Alexopolus, John Wiley and Sons Ind.
2. An Introduction to Mycology – Mehrotra and Aneja, New AgeIntermediate Press.
3. Introduction to Fungi – Webster, Cambridge Univ. Press.
4. Diseases of India – Rangaswami and Mahadevan, Prentice Hall ofIndia Pvt. Ltd., New Delhi.
5. Plant Diseases - R.S. Singh, Oxford and IBH Publishing.
6. Plant Pathology – Agrios, Academic Press, London.
7. Plant Pathology – Mehrotra, Tata McGraw Hill, New Delhi.
8. Microbiology and Pathology – P.D. Sharma, Rastogi Publication,Meerut.
9. Fundamentalsof Plant Pathology – V.N. Pathak Agro Botanica,Jodhpur.
10. A text book of modern Plant Pathology – Bilgrami and Dubey, VikasPublication, New Delhi.

Paper - BOT6.5DCCT202
GYMNOPERMS AND PALAEOBOTANY

UNIT- I

Gymnosperms: General account, classification of gymnosperms.

Morphology, anatomy, reproduction and interrelationship of:

Pteriodospermales: *Glossopteris*, Bennettitales: *Cycadioidea, Williamsonia.*

Pentoxylales: General account.

UNIT- II

General account, morphology, anatomy, reproduction and phylogenetic position of:

Cycadales: *Cycas*, Ginkgoales: *Ginkgo*, Coniferales: *Pinus* and Taxales: *Taxus*.

UNIT- III

General account, morphology, anatomy, reproduction and phylogenetic position of:

Ephedrales: *Ephedra*, Welwitschiales: *Welwitschia*, Gnetales: *Gnetum*.

UNIT- IV

Palaeobotany: Types of fossils, process of fossilization, techniques to study fossils. Applied aspects of palaeobotany.

UNIT- V

Geological time scale, Distribution of living and fossil Gymnosperms in India. Origin and evolution of Gymnosperms.
Economic importance of Gymnosperms.

Reference Books:

1. Economic importance of G ymnosperms & Bryophyta – N.S.Parihar, Central Book Depot, Allahabad.
2. Paleobotany and the evolution of Plants – Stewart and RothWell, Cambridge Univ. Press.
3. Gymnosperms –Bhatnagar and Moitra, New AgeInternational Pvt. Ltd., New Delhi.
4. Gymnosperms – O.P. Sharma, Pragati Prakshan, Meerut.
5. Morphology of Gymnosperms – Coulter and Chamberlain,Central Book Depot., Allahabad.
6. Gymnosperms: Structure and Evolution - C.J. ChamberlainDover Pub., New York.
7. Paleobotany and Plant evolution- Iqbal Hussain ABD Publ.,Jaipur.

Paper - BOT6.5DCCT203
PLANT RESOURCE UTILIZATION AND ETHNOBOTANY

UNIT- I

Origin, history and cultivation of:

Cereals: Wheat, Maize, Rice, Barley, Bajra.

Legumes: Gram, Pea, Pigeon pea, Lentil, Moong bean.

Nuts: Cashew nut, Almond, Walnut.

UNIT- II

Origin, history and cultivation of:

Vegetables: Carrot, Radish, Potato, Onion, Cauliflower, Cucumbers, Tomato.

Fruits: Apple, Grapes, Mango, Banana, Guava, Papaya, Pineapple.

Beverages: Coffee, Tea, Cocoa.

UNIT- III

A general account of following:

Spices and Condiments: Ginger, Turmeric, Cinnamon, Clove, Saffron, Capsicum, Pepper, Fennel, Cumin, Coriander, Cardamom.
Fats and Oils: Mustard, Sesame, Groundnut, Coconut, Soybean, Sunflower.
Fibres: Jute, Cotton, Flex, Hemp.
Timber plants: Teak, Sal, Shisham, Deodar, Pine.

UNIT- IV

A general account of following:

Medicinal Plants: Rauwolfia, Quinine, Opium, Ephedrine, Belladona, Ocimum, Convolvulus, Adhatoda, Aloe, Azadirachta, Balanites.

Industrial Plants: Tannins and dyes, Rubber and other latex products, Gums and resins, Sugar and starch.

Wood Conversion products: Paper, Rayon, Plastic, Cork.

UNIT- V

Ethnobotany: Introduction, history, aims, objectives and scope.

Methods of study of ethnobotany. Ethnobotany of Rajasthan and India.

Ethnic groups of Rajasthan, major tribes and their life styles. Sacred groves and plants used in rituals. Shifting cultivation and consequential damage to forest ecosystem.

Reference Books:

1. Economic Botany- Hill, Mac Graw Hill Book Comp.
2. Economic Botany- Pandey, S. Chand and Com., New Delhi.
3. Sharma, O.P. 1996. Hill's Economic Botany (Late Dr. A.F. Hill, adapted by O.P. Sharma). Tata McGraw Hill Co. Ltd., New Delhi.
4. Kochar, S.L. 1998. Economic Botany of the Tropics, 2nd edition, Macmillan India Ltd., Delhi.
5. Ethnobotany of India, 5-Volume Set, (eds.) T. Pullaiah, K. V. Krishnamurthy & Bir Bahadur. Apple Academic Press.
6. Manual of Ethnobotany, 2nd Revised Edition (2010)
   by S.K. JAIN (Author). Scientific Publishers.
7. Pimentel, D. and Hall, C.W. (eds) 1989. Food and Natural Resources, Academic Press, London-New York.
8. Wagner, H., Hikino, H. and Famswarth, N. 1989. Economic and Medicinal Plant Research, Vols. 1-3, Academic Press, London.

Paper - BOT6.5DCCT204
PLANT PHYSIOLOGY

UNIT - I

Plant Water relations: Water potential and its components (solute potential, pressure potential, matric potential); Intercellular water transport, bulk movement of water. Soil Plant Atmosphere Continuum (SPAC). Stomatal regulation of transpiration, anti-transpirants, internal water deficit and its physiological implications.

UNIT - II

Uptake of minerals: Active and passive uptake of minerals, Donnan's equilibrium, cytochrome pump mechanism and carrier hypothesis, role of calmodulin. Importance of foliar nutrition and use of chelates. Solute transport.

UNIT - III

Nitrogen Metabolism: Sources of nitrogen to plants. N_2 cycle, biological nitrogen fixation, reduction of nitrate, reductive amination and transamination.

UNIT - IV

Growth: Growth kinetics. Plant movements.

Growth Regulators: Auxins, Gibberellins, Cytokinins, Abscisic acid and ethylene- discovery, chemical nature, biosynthesis, bioassay, physiological effects and mode of action.

UNIT - V

Physiology of Flowering: Photoperiodism and role of phytochrome in flowering, vernalisation.
Seed dormancy and germination, fruit ripening,
Circadian rhythms, physiology of senescence and ageing, programmed cell death.

Reference Books:

1. Introduction to Plant Physiology - Hopkins, John Wiley and Sons, NewYork, USA.
2. Plant Physiology. Salisbury and Ross, Wadsworth Publ. Co.,California, USA.
3. Plant Physiology Taiz and Zeiger, Sinauer Associates, Inc Pub.Massachusetts, USA.
4. Biochemistry and Physiology of Plant Hormones Moore, SpringerVerlag, New York, U.S.A.
5. Plant Physiology, Devlin. Yan Nostrand Reinhold Comp. New York.Affiliated East West Press Pvt. Ltd., New Delhi.
6. Plant Physiology C.P. Malik, Kalyani Publishers, New Delhi.
7. A Text book of Plant Physiology and Biochemistry, S.K. Verma, S.Chand & Comp., New Delhi.
8. Physiology of Plant Growth and Development. Edited M.B. WilkinsMcGraw Hill, London.
9. Introduction to Plant Physiology - G.R. Noogle & G.J. Fritz PrenticeHall of India Pvt. Ltd., New Delhi.
10. Introduction to Plant Physiology. Mayer, Anderson, Bohning,Frantianne D.Van Nostrand Camp.

PRACTICAL MARKING SCHEME: SEMESTER II

Paper - BOT6.5DCCP205 (Lab 1)

1. Mycology	10
2. Plant Pathology	10
3. Plant Physiology	
(a) Major	14
(b) Minor	6
4. Spot (6) Three – Paper Bot 201 Three – Paper Bot 204	24
5. *Viva-voce*	8
6. Records	8
7. Internal assessments (Excursion Report/ Seminar/Regularity/ Discipline/Term Test)	20
Total	**100**

Paper - BOT6.5DCCP206 (Lab 2)

1. Gymnosperms	12
2. Palaeobotany	8
3. Economic Botany	12
4. Ethnobotany	8
5. Spot (6) Three-Paper – Bot 202 Three-Paper – Bot 203	24
6. *Viva-voce*	8
7. Records	8
8. Internal assessments (Excursion Report/ Seminar/Regularity/ Discipline/Term Test)	20
Total	**100**

SEMESTER- III

Paper - BOT6.5DCCT301
ANGIOSPERM TAXONOMY

UNIT- I

Taxonomy: Botanical exploration: B.S.I., its organization and role, Plant explorations. Herbarium methodology-collection and preservation of plant specimens, World and Indian herbaria. Plant identification-taxonomic keys.

UNIT- II

Botanical nomenclature: ICBN rules, articles, recommendations and amendments of code. Botanical literature: Monographs, lcones, floras and important periodicals with emphasis on Indian floristic. Effective and valid publications.

UNIT– III

Systems of plants classification: Phenetic versus phylogenetic systems; cladistics in taxonomy. Classification: relative merits and demerits of major systems of classifications-Bentham and Hooker, Engler & Prantle, Cronquist and Takhtajan.

UNIT- IV

Role of following branches of Botany in Taxonomic evidence: Morphology, Anatomy, Palynology, Embryology, Cytology, Photochemistry, Nucleic acid hybridization as a tool in taxonomy. Phylogeny of angiosperm: Origin, evolution and inter-relationships in dicots and monocots.

UNIT-V

Salient features, floral diversity, diversity of families and phylogeny of the following orders: Ranales, Centrospermae, Amentiferae, Tubiflorae and Helobieae. Families of heterotrophic nature (parasitic, saprophytic and insectivorous).

Reference Books:

1. Diversity and Classification of Flowering Plants- Takhtajan, ColumbiaUniv. Press, New York.
2. Taxonomy of Angiosperms - V.N. Nair, TMH Publishing Comp. Ltd.,New Delhi.
3. Taxonomy of Angiosperms - Kshetrapal and Tyagi, RBD Pub., Jaipur.
4. Introduction to Principles of Plant Taxonomy-Sivarajan, Oxford & IBH Publishing Co., New Delhi.
5. Plant Systematic - Gurcharan Singh, Oxford & IBH Publishing Co.New Delhi.
6. An introduction to Taxonomy of Angiosperms - Shukla and Mishra,Vikas Publ. House Pvt. Ltd., New Delhi.
7. Modern Plant Taxonomy- N.S. Subranmanyam, Vikas Publ. HousePvt. Ltd., New Delhi.

Paper - BOT6.5DCCT302
GENETICS, PLANT BREEDING AND BIOMETRY

UNIT- I

Mendel's laws of inheritance, Gene interaction, non-mendelian inheritance (polygenic inheritance, cytoplasmic inheritance), Sex determination in plants.

UNIT-II

Crossing over: Molecular mechanism, chromosomal evidence, genetic factors affecting frequency of crossing over. Genetic control of meiosis.

Linkage and chromosomal mapping.

UNIT-III

Plant breeding: Introduction and objectives. Breeding methods in self-pollinated, cross-pollinated and vegetatively propagated crops. Pedigree analysis.

UNIT-IV

Polyploidy, role of polyploidy in evolution and plant breeding.

Heterosis and inbreeding depression, genetic basis of heterosis. Production of hybrid vigour and its applications in plant breeding.

UNIT- V

Biometry: Mean, mode and median, standard deviation; Co-efficient of variation, skewness and kurtosis. Probability, binominal distribution, positive negative binominal distribution. Chi-square test.

Correlation and regression analysis: concept and uses. Test of Significance.

Reference Books:

1 Gene VII - Lewis, Oxford Univ. Press, New York, USA.
2. Genetics - Russel, The Benjamin Publ. Comp. Ltd., USA.
3. Cell Biology and Genetics K.C. Agarwal, Nidhi Publisher, Bikaner.
4. Plant Cell Biology: Structure and Function – Gunnning and Steer, Jonesand Barlett Publ. Boston, Massachusetts.
5. Genetics- A.M. Winchester, Oxford and IBH Publishing Co. New Delhi.
6. Cell and Molecular Biology- De Robertis (Indian Edition) VergheseComp., Bombay.
7. Plant Breeding -V.L Chopra, Oxford& BH Pub. Co. Pvt. Ltd.
8. Elementary principles of Plant Breeding - H .K. Chaudhary, Oxford &IBH Pub. Co. Pvt. Ltd.

BOT6.5DSET303A
ADVANCED PLANT PATHOLOGY–I

UNIT- I

History of plants pathology. The nature, origin and evolution of parasitism. Disease cycle: Perennation, production of primary inoculum, dispersal of plant pathogens. Seed transmission diseases. Soil microorganisms, host pathogenicity and virulence.

UNIT- II

Host pathogen interactions: Invasion and establishment of pathogen in host tissues. Infection and post infection development. Factors affecting infection. Host selective toxins and non-host selective toxins. Phytotoxins and vivotoxins. Role of growth regulators in plant disease development.

UNIT- III

Effect of pathogen on host physiology: Absorption, translocation and transpiration, cell water relations, photosynthesis, respiration, nucleic acid metabolism, protein metabolism, growth regulators.

UNIT- IV

Genetics of plant disease: Pathogenicity and host resistance/susceptibility at gene level. Gene mutations, recombination, heterokaryosis. Genetic resistance: vertical resistance and horizontal resistance. Gene for gene concept.

UNIT- V

Environment and plant disease development: Effect of temperature, moisture, light, soil and nutrition.

Defense mechanism: Structural defense and biochemical defense. Phytoalexins, SAR (Systemic Acquired Resistance), ISR (Induced Systemic Resistance).

BOT6.5DSET304A
ADVANCED PLANT PATHOLOGY-II

UNIT- I

Histopathology: Calibration of microscope and spore measurement (sporometry). Use of electron microscope in histopathological investigations.

Non-parasitic diseases: Mineral deficiency, mineral excess, air pollutants, oxygen deficiency and water stress (water deficit and water excess).

UNIT- II

Fungal diseases: Symptomatology and disease identification. Classification of plant pathogenic fungi.

Etiology and control of following diseases:

Wart disease of potato, late blight of potato.

Damping off of seedlings, downy mildew of crucifers and grapes.

Green ear disease of bajra, soft rot of roots.

UNIT- III

Etiology and control of following disease:

Leaf curl of peach, stem gall of coriander.

Powdery mildew of grapevines, Ergot of bajra.

Rots and wilts of vegetable crops.

UNIT- IV

Etiology and control of following diseases:

Black stem rust of wheat, rust of linseed.

Loose smut of wheat, kernel bunt and flag smut of wheat.

Bunt of rice, covered smut of barley.

UNIT- V

Etiology and control of following diseases:

Ascochyta blight of gram, early blight of potato.

Tikka disease of groundnut, red rot of sugarcane.

Brown leaf spot of rice, stripe disease of barley.

Wilt of cotton.

BOT6.5DSET303B
ADVANCED PLANT ECOLOGY–I

UNIT - I

Environment: Holistic environment, Climatic, Edaphic, Topographic and Biotic factors and their interactions with plants. Air pressure belts, Ocean and Land-Air currents. Population and community ecology and their characters (analytic and synthetic) Succession in plant communities. Plant interaction with other organisms within community.

UNIT-II

Ecosystem: structure, function and types Forest, grassland, desert, fresh water, marine water. wetland, natural, manmade, urban and rural ecosystem. Flow of energy, biogeochemical cycles, evolution of ecosystem, system analysis and its applications. Concept of ecosystem, resistance and resilience, natural and anthropogenic ecological perturbations and their impact on plants and ecosystems.

UNIT-III

Ecosystem restoration. Ecology of plant invasion. Allelopathy. Ecological management: concept of sustainable development including millennium development goals and sustainable development goals. Sustainability indicators.

UNIT-IV

Solid, water and hazardous waste management: collection, transportation, processing and recovery. E-waste. Fly ash. Plastic waste. Ocean waste

UNIT-V

Environment, risk and impact assessment: air quality assessment, vehicular emission norms in India, National river conservation plan, types of water. Environment economics. Carbon sequestration, carbon credit, carbon trade, carbon tax.

BOT6.5DSET304B
ADVANCED PLANT ECOLOGY–II

UNIT-I

Hot desert of the world: formation, topography, distribution and characteristics including flora and fauna.

UNIT-II

Cold desert of the world: types (Tundra, Alpine, Taiga, Arctic and Antarctic) formation, topography, distribution and characteristics including flora and fauna.

UNIT-III

Rajasthan; geology (rock sequences), physical division (desert, Arawali and hilly areas, eastern besin, south east Hadoti region) and geographical regions described by various authors specially V.C. Mishra and R. L. Singh.

UNIT-IV

Water resources management in Rajasthan; Drainage system and lakes (dams), underground water (problems and conservation). Natural and forest, minerals. live stock resources and rangeland condition of Rajasthan

UNIT-V

Adaptations of plants and animals matching the desert environment.. Ecology of grazing land and impact of overgrazing. Threatened plants of Rajasthan and their conservation strategies; Biosphere reserve, National park, Conservation reserve, wildlife sanctuary.

BOT6.5DSET303C
ADVANCED PLANT PHYSIOLOGY–I

UNIT- I

Carbohydrates: Classification, synthesis of sucrose and starch.

Respiration: Anaerobic respiration and fermentation, aerobic respiration, oxidative pentose phosphate cycle (HMP pathway), Photorespiration.

UNIT- II

Photosynthesis: Photosynthetic pigments (Chlorophylls, carotenoids): structure and synthesis, functions. Light reaction and carbon reactions of photosynthesis (C_3 and C_4 pathways).

UNIT- III

Proteins: Structure, properties, classification and functions.

Enzymes: Nomenclature and classification, structure, properties, mechanism of action, inhibition, promotion, activation. Coenzymes, isozymes.

UNIT- IV

Nitrogen metabolism: Overview, biological nitrogen fixation, nodule formation and nod factors; Mechanism of nitrate uptake and reduction. Ammonium assimilation, amino acid synthesis.

Sulphur metabolism: Sulphate uptake, transport and assimilstion.

Lipid metabolism: Classification, saturated and unsaturated fatty acids, fatty acid oxidation.

UNIT- V

Tools and techniques: Principal and applications of electrophoresis, ultra-centrifugation, isoelectric focusing, immobilized pH gradient, ELISA and RIA.

BOT6.5DSET304C
ADVANCED PLANT PHYSIOLOGY–II

UNIT- I

Auxins: Discovery, structure, biosynthesis, mode of action, physiological functions and bioassay.

UNIT- II

Gibberellins: Discovery, structure, biosynthesis, mode of action, physiological functions and bioassay.

Cytokinins: Discovery, structure, biosynthesis, mode of action, physiological functions and bioassay..

UNIT- III

Synthetic growth retardants: Structure, mode of action and physiological effects.

UNIT- IV

Abscisic acid: Discovery, structure, biosynthesis, mode of action, physiological functions and bioassay.

Ethylene: Discovery, structure, biosynthesis, mode of action, physiological functions and bioassay.

UNIT-V

Role of Growth regulators in modern agriculture and horticulture.

Brief account of brassinosteroids, polyamines, jasmonic acid, salicylic acid and nitric oxide signaling in plant defence. Hormone mutants.

BOT6.5DSET303D
ADVANCED PLANT BIOTECHNOLOGY–I

UNIT- I

Concept and scope of plant Biotechnology Plant tissue culture: A historical perspective.

UNIT- II

The phenomenon of morphogenesis, morphogenetic factors forin vitro regeneration. Organogenesis and somatic embryogenesis.

UNIT- III

Micro propagation technology, meristem culture, haploids, anther- pollenculture and their uses.

UNIT- IV

Management of micro propagated plants in laboratory and net houses. Commercial feasibility and advantages of micro propagation.

UNIT- V

Role of plant biotechnology in crop improvement, horticulture, forestry and conservation of biodiversity.

BOT6.5DSET304D
ADVANCED PLANT BIOTECHNOLOGY–II

UNIT- I

Basic concept about recombinant DNA technology. Commonly used gene cloning vectors: plasmid, cosmids and phages.

UNIT- II

A brief account of YAC, BAC, HAC.Restriction: endo nucleases and other enzymes needed in genetic engineering.

UNIT- III

Gene transfer in plants, agro bacterium mediated gene transfer. Crown gall disease, the tumour inducing principle and Ti

plasmid, incorporation of T- DNA into plant cells.

UNIT- IV

Direct gene transfer methods for producing transgenic plants, DNA mediated transformation of protoplasts, electroporation, balistic methods used for gene transfer. Herbicide, insect résistance plants.

UNIT- V

Biotechnology and society, socio-economic aspects. Uses of cloned genes in agriculture, medicine and industry.

PRACTICAL MARKING SCHEME: SEMESTER III
BOT6.5DCCP305 (Lab 1)

1. Taxonomy	20
2. Genetics	10
3. Plant Breeding	4
4. Biometry	6
5. Spot (6) three-Paper-Bot 301 Three-Paper-Bot 302	24
6. *Viva-voce*	8
7. Records	8
8. Internal assessments (Excursion Report/ Herbarium of Local Flora/ Seminar/Regularity/ Discipline/Term Test)	20
Total	**100**

BOT6.5DSEP306 (Lab 2)

1.	Question from Paper 303:	(A) Major	13
		(B) Minor	07
2.	Question from Paper 304:	(A) Major	13
		(B) Minor	07
3.	Spot (6):	Three from Paper 303 Three from Paper 304	24
4.	*Viva-voce*		8
5.	Records		8
6.	Internal assessments (Excursion Report/Seminar/Regularity/Discipline/Term Test)		20
		Total	**100**

SEMESTER-IV

BOT6.5DCCT401
PLANT DEVELOPMENT AND REPRODUCTION BIOLOGY

UNIT - I

Floral anatomy: general account. Origin and evolution of flower. Stamen- Origin and evolution from foliar to reduced condition. Carpel evolution: Conduplicate, involute, appendicular and recepticular concepts, specialized carpels, poly and syncarpy, semi-inferior and inferior ovary. Evolution and types of placentation.

UNIT - II

Ultra structure and functions of primary and secondary xylem.Ultra structure and function of phloem. Structural variability in leaves and trichomes. Anatomy of dicotyledonous and monocotyledonous seeds. Unique features of plant development.

UNIT - III

Reproduction: Microsporangium, structure and function of wall layers, ultra functional changes in tapetum and meiocytes, role of callose, role of tapetum in pollen development, development of male gametophyte. Anther culture and haploid plants. Mega sporangium (ovule) – types and evolution, mega sporogenesis, embryo sac types, structure of egg, synergids, and antipodal cells.

UNIT - IV

Pollination: structure and histochemical details of style and stigma. Self and interspecific incompatibility. Barriers to fertilization, methods of overcoming incompatibilities. *In-vitro* pollination and its uses.

UNIT-V

Fertilization: discharge and movement of sperms, syngamy and triple fusion, post fertilization changes in embryo sac. Endosperm: Development types, haustoria, cytology and function of endosperm. Embryo development and embryo culture. Polyembryony: types, natural, induced importance. Apomixes: Type and importance. Parthenocarpy.

Reference Books:

1. An introduction to Embryology of Angiosperm - P. Maheshwari, NewDelhi.
2. Recent Advances in the Embryology of Angiosperms-P. Maheshwari,New Delhi.
3. The E mbryology of Angiosperms - Bhajwani and Bhatnagar, VikasPub. House, New Delhi.
4. Morphology of Vascular Plants - A.J. Eames, Tata McGraw Hill Publ.Co. Ltd., New Delhi.
5. Morphology of Angiosperms -A J Eames, McGraw Hill BookComp. Ltd., New York.
6. The Morphology of Angiosperms - Sporne, K.P. Churamani for B.I.Publications, New Delhi.
7. Morphology of Vascular Plants-D.W. Bierhorst Macmillan Comp.,New York.
8. Morphology of Angiosperms - A.J. Eames, Mc Graw Hill Book Comp.,New York.

BOT6.5DCCT402
MOLECULAR BIOLOGY AND BIOTECHNOLOGY

UNIT - I

Molecular Biology: The discovery of DNA, evidences for DNA as genetic material, types of DNA, closed super coiled DNA, denaturing and renaturing of DNA, DNA hybridization.

DNA Replication: mechanism, enzymes, evidences in support of semi-conservative replication.

UNIT - II

RNA: Structures and types.

Transcription, control at initiation and termination, attenuation, heterogenous RNA: processing, capping and tailing.

Gene structure and function: lac operon, tryptophan operon.

UNIT - III

Genetic engineering: Principles and applications.

Techniques employed in recombinant DNA technology: Isolation and purification of DNA, Electrophoresis, DNA sequencing, Southern and Northern blotting, PCR and its applications.

Basic concepts about C-DNA, gene and genomic library.

UNIT - IV

Gene transfer techniques: Vector mediated gene transfer, plasmids, cosmids, phages, YAC, BAC and HAC. Vectorless direct gene transfer. Cloning strategies.

Gene transfer in plants: Agrobacterium mediated gene transfer. Crown gall disease, the tumour inducing principle and T_i plasmid, incorporation of T- DNA into plant cells.

Transgenic plants: applications and achievements.

UNIT - V

Plant tissue culture: Introduction, history, tools, techniques and applications. Micropropagation, callus culture, cell suspension culture, haploid culture, somatic embryogenesis.

Protoplast culture: Isolation, purification and culture, protoplast fusion, Cybrids, somatic hybrids and somaclonal variations.

Biotransformation; Production of useful compounds through cell-culture, biofermentors.

Reference Books:

1. Molecular Biology of the Cell-Albert, Lewis, Raff, Robert andWatson, Garland Publishing Inc., New York.
2. Molecular Biology of the Gene - J.D. Wastson,
3. Molecular Biology and Biotechnology, Nidhi Publisher, Bikaner
4. Molecular Cell Biology- Lodish, Berk, Zipursky, Matsudaira, Baltimoreand Darnell, Freeman and Co., New York, USA.
5. Methods in Plant Molecular Biology and Biotechnology, CRC Press,Boca Raton, Florida.
6. Plants tissue Culture-Bhojwani and Rajdan. Theory and practice. ElsevierScience Publ., New York, USA.
7. Plant Tissue Culture : Applications and limitations-Elsevier Sci. Publi.,New York, USA.
8. Plant Cell and Tissue Culture-Vasil and Thorpe, Kluwer AcademicPublishers, Netherland.
9. Elements of Biotechnology – P.K. Gupta, Rastogi Publication, Meerut.

BOT6.5DSET403A
ADVANCED PLANT PATHOLOGY-III

UNIT - I

Disease diagnosis: Traditional approach and molecular diagnostics.

Disease assessment: Determination of disease severity and crop yield, critical point model and multiple point model.

Plant disease forecasting methods and devices.

Plant disease epidemics, Computer simulation of epidemics.

UNIT - II

Disease management: Principles, cultural practices and physical methods, chemical treatments, fungicides, biological control. IDM – Integrated Disease Managememt, host resistance and production of disease resistant varieties, biopesticides and nanopesticides, plant quarantine.

UNIT - III

Tissue culture techniques and its applications in plant pathology. Techniques of isolation, purification, culture and inoculation of pathogen. Raising virus free plants in cultures. PCR in plant pathology.

UNIT - IV

Nematology: Classification, identification, morphology and anatomy of plant pathogenic nematodes.

Nematode diseases: Ear cockle of wheat, root knot of vegetables, molya disease of wheat.

UNIT - V

Cecidology: Classification, anatomy, mechanism and physiology of insect galls.

Some insect induced plant galls of Rajasthan: Pongamia leaf gall, cordial leaf gall, Ziziphus stem gall, Prosopis stem gall.

BOT6.5DSET404A
ADVANCED PLANT PATHOLOGY-IV

UNIT- I

Classification and nomenclature of plant pathogenic bacteria.

Symptomatology, morphology, physiology and pathogenicity of bacteria.

Mechanism of infection and disease development in plants by bacteria.

UNIT- II

Bacterial diseases: crown gall disease of vascular plants, citrus canker.

Angular leaf spot of cotton, red strip of sugarcane.

Bacterial blight of rice, tundu disease of wheat.

Bacterial wilt of solanaceous plants.

UNIT- III

Virology: General characteristics, symptomatology, synthesis and mutation.

Isolation, purification and culture of virus.
Mode of viral infection and transmission of plant viruses.

UNIT- IV

Viral diseases: Mosaic of tomato and tobacco, yellow vein mosaic of bhindi.

Cucumber mosaic disease, viral disease of potato.

Papaya leaf curl disease, bunchy top of banana

UNIT- V

General introduction of mycoplasma, phytoplasma, spiroplasma and fastidious vascular bacteria (RLOs).

Diseases: Little leaf of brinjal, phyllody of sesame.

Sugarcane ratoon stunting, sandal spike.

Citrus stubborn disease.

Reference Books:

1. Diseases of India – Rangaswami and Mahadevan, Prentice Hall of India, Pvt. Ltd., New Delhi.
2. Plant Diseases - R.S. Singh,Oxford and IBH Publishing.
3. Plant Pathology – Mehrotra, Tata McGraw Hill, UK.
4. Microbiology and Pathology – P.D. Sharma, Rastogi Publication, Meerut.
5. Principles of Seed Pathology – V.K. Agarwal and J.B.Sissclair Vol.1& II. CBS Publishers and distributors.
6. Plant Pathology – G. N. Agrios. Academic Press, London and New York.
7. Seed Pathology – P. Neergaarde Vol. 1 & 2. The Macmillan Press Ltd.,London.
8. Vistas in Seed Biology –T. Singh and P.C.Trivedi. Vol.1 & 2 Prinwell,Jaipur and Hyderabad.
9. Seed Pathology – D. Suranarayana , Vikas Publishing House Pvt. Ltd.
10. Plant Pathology – Tar, Mac Millan, London.
11. Ad. Trities in Plant Pathology ,Vol. I,II,III –Horsfall andDimond, Academic Press, London.
12. Plant Diseases –David S. Ingram and Noel Robertson ,Callins.
13. Plant Pathology Concept and Laboratory Exercises –Robert N. Trigiana,CRC Press.
14. Host Pathogen interaction in Plant Diseases –J.E.Vander Plank, AcademicPress, New York.

BOT6.5DSET403B
ADVANCED PLANT ECOLOGY-III

UNIT-I

Production ecology; organic production in different types of ecosystem, Process and magnitude of production, primary and secondary productivity and methods of estimates of productivity. Laws of thermodynamics -heat transfer.

UNIT-II

Natural resources; Types, exploitative and conservation of forest, soil, water, air and energy. Introduction to world biome. Biodiversity-ecosystem stability relationship. Biodiversity of India. Hot spots. Threats to biodiversity (endangered flora and fauna), biodiversity indices and gradient. conservation of biodiversity: ex situ and in situ.

UNIT-III

Ramsar sites and conventions. CBD (convention of biological diversity). Wildlife protection act, Forest conservation act, Earth summit and different international and national laws related conservation of biodiversity and their amendaments. Assessment of natural resources; remote sensing and GIS. Factors affecting species diversity, edge effect.

UNIT-IV

Pollution: Air, water, soil, noise and thermal, Global warming and climate change. Effect of green house effect: CO_2, CH_4, N_2O, CFC, Ozone layer and hole. PM (Particulated matter) 2.5 and 10. Toxic chemicals. Risk management. National action plan for climate changes. State action plan for climate changes. Rajasthan state forest policy.

UNIT-V

Role of international organizations (IUCN, UNEP, UNESCO). Red Data Book, Water Prevention and Control of Pollution Act, Environmental Protection Act, 1986, Prevent and Control of Pollution Act, 1981, Environmental Impact Assessment (EIA),

Environmental Impact Statement (EIS), Environment management plan (EMP), Environment Education, Awareness and Ethics. Overview of environmental laws of India and their amendment's.

BOT6.5DSET404B
ADVANCED PLANT ECOLOGY-IV

UNIT - I

Rajasthan: Climate, climatic regions according to Köppen, Thornthwaite, Trewartha. Vegetations types. Power resources.

UNIT - II

Rajasthan: Soil resources, erosion, reclamation. Sand dunes types, stabilization. Land utilization, Cropping pattern and problems. Agroclimatic zones, Various projects related to irrigation.

UNIT - III

Rajasthan: Desert as a ecosystems. Special area developmental programme. Desertification; expansion, hazards and their management. Role of AFRI AND CAZRI and various organization to combat desertification.

UNIT - IV

Rajasthan: Effect of abiotic and biotic factors on desert vegetation and distribution. Productivity, cycles and balances. Saline tracts and halophytes. Effect of Indira Gandhi Canal project to Rajasthan vegetation, irrigation and climate.

UNIT - V

Phenology of the desert plants, root investigation, reproduction capacity, seed output, germination, dormancy and viability. Ethnobotany and tribal communities of Rajasthan.

Reference books:

1. *Environment and Plant Life in Indian desert,* David N Sen, Department of Botany, University of Jodhpur, Jodhpur, India.
2. Terrestrial plant ecology –M.G.Barbour,J.H. Burk and W.D.Pitts,Benjamin/Cumming Publication Company, California.
3. Ecology – M. Begon,J.L.Harper and C.R.Townsend ,Blackwell science,Cambridge.
4. Population, environment and development – R.K. Pachausri and L.F. Qureshy,Tyeri, Newdelhi.
5. Population biology of plants – J.L. Harper,.Academic press, Londonand New York.
6. Introduction to plant ecology – Maurice Ashby, Mac Millan Uni. OfWisconsin
7. Readings in conservation ecology –G.W. Cox, Applelon Century Crofts, Michigan.
8. Plant ecology– .E. Weaver , Ecological Society of America.
9. Forest ecology of India –G.B.Singh, Rawat Publications.
10. Ecology of natural resources –Francois Ramade,John Wiley & SonsLtd.
11. Plants and environment –Daubenmire,
12. Environmental bioloy–K.C.Agarwal,Agrobotanical Pub..
13. Environmental pollution–Timmy Katyal, Anmol Pub.
14. Environment and pollution—Ambasht , CBS Publications.
15. Environmental pollution and health hazard in India –R. Kumar ,Anishpublication home.
16. Indian forest ecology –G.S.Puri, Oxford IBH.

BOT6.5DSET403C
ADVANCED PLANT PHYSIOLOGY–III

UNIT- I

Alkaloids: Distribution, classification, structure, biosynthesis and functions of alkaloids (pyridine, piperidine, pyrrolidine, quinoline, isoquinoline, indole and purine group alkaloids).

UNIT- II

Phenolic compounds: Distribution, classification, structure, biosynthesis and functions of phenolic compounds (coumarins, flavonoids, tannins, lignins).

UNIT- III

Terpenoids: Distribution, classification, structure, biosynthesis and functions of terpenoids (isoprenoids) and steroids (brassinosteroids, saponins, saponogenins, sterols, steroidal alkaloids).

UNIT- IV

A general account of distribution, classification, structure, biosynthesis and functions of polyketides and non-ribosomal peptides.

UNIT- V

A general account of distribution, classification, structure, biosynthesis and functions of glycosides.

Vitamins: Structure and functions.

BOT6.5DSET404C
ADVANCED PLANT PHYSIOLOGY–IV

UNIT- I

Plant Photoreceptors: Discovery, distribution and structure of phytochromes, cryptochromes and phototropins, their photomorphogenetic responses, photochemical and biochemical properties.

UNIT- II

Photophysiology of light induced responses, cellular localization. Brief account of molecular mechanism of action and signaling pathways of photomorphogenetic receptors. Coaction of photoreceptors, responses to UV-radiations.

UNIT- III

Control of flowering: Photoperiodism, vernalization; chemical control of flowering (flowering signal and hormonal regulation).

Circadian rhythms in plants. Seed germination and dormancy. Juvenility and senescence.

UNIT- IV

Plant responses to abiotic stress: water deficiency, salinity, flooding, metal toxicity, freezing, high temperature, high light intensity and oxidative stress.

UNIT- V

Plant defense mechanisms against biotic stress (plant pests, pathogens, nematodes).

Role of plant hormones in plant response to stress(ABA and Polyamines). Photoinhibition and physiological activities affected by stress.

Reference books:

1. Introduction to Plant Physiology –W.G. Hopkins, John Wiley & Sons, Inc. New York USA.
2. Biochemistry and Physiology of Plant Hormones –T.C.Moore, Springerand Verlag, Naw York, USA.
3. Plant Physiology–L.Taiz and E.Zeiger, 2nd edition, Sinauer Associates.In. Publisher, Massachusetts, USA.
4. Plant Physiology–F.B. Salisbury and C.W.Ross, 4th edition, Wadsworth Publishing Co. , California.
5. Photoperodism in Plants –B.Thomas and D.Vince pure, IInd edition, Academic press, Sandiego, USA.
6. Plant Physiology—S. Mukharji and A.K.Gosh
7. Plant Physiology –D.Hess, Springer Berlin.
8. Plant Physiology –F.C.Steward, Academic Press, New York.
9. Introduction to Plant Physiology - Hopkins, John Wiley and Sons, NewYork, USA.
10. Plant Physiology. Salisbury and Ross, Wadsworth Publ. Co., California,USA.
11. Plant metabolism Dennis, Turpin, Lefebure and Layzell, Longman Essex,England.
12. Plant Physiology Taiz and Zeiger, Sinauer Associates, Inc Pub.Massachusetts, USA.
13. Plant Physiology, Devlin. Yan Nostrand Reinhold Comp. New York.Affiliated East West Press Pvt.Ltd., New Delhi.
14. Plant Physiology C.P. Malik, Kalyani Publishers, New Delhi.
15. A Text Book of Plant Physiology and Biochemistry S.K. Verma, S.Chand & Comp., New Delhi.
16. Physiology of Plant Growth and Development Edited M.B. WilkinsMcGraw Hill, London.

BOT6.5DSET403D
ADVANCED PLANT BIOTECHNOLOGY-III

UNIT- I

Somatic embryogenesis- concepts, prospects and uses. Hybrid embryo rescue technique,

UNIT- II

Production of rare hybrids, *in vitro* pollination. Use of somatic embryogenesis in crop improvement.

UNIT- III

Somatic hybridization and cybridization techniques and uses. Concepts about male sterility and their uses in crop improvement.

UNIT- IV

Selection and characterization of mutant cell lines, auxotrophic mutants. Tissue culture as a source of genetic variability.

UNIT- V

Somaclonal variations, basic concepts and its applications. Protoplast production- concepts and applications.

BOT6.5DSET404D
ADVANCED PLANT BIOTECHNOLOGY–IV

UNIT- I

Southern, Northern and Western blotting technique. PCR: its principles and uses. Gene concepts and molecular biology of gene.

UNIT- II

Transcription and translation in prokaryotes and eukaryotes. Nitrogen fixing genes and their genetic manipulation.

UNIT- III

Ant-sense RNA, principles and applications. Male sterility: types and uses. Molecular farming.

UNIT- IV

Secondary metabolites and strategies to increase their production in tissue culture.

UNIT-V

Transgenic plants: Production and applications. Plant biotechnology and Intellectual Property rights (IPR).

Reference Books:

1. Introduction to Biotechnology –W.J.Thieman and M. A. Palladino,Publisher Benjain Cummings.
2. Plant Biotechnology –Randheer Singh, ISBN.
3. Plant Biotechnology Methods in tissue culture and gene transfer –R.Keshav Chand & K.V.Peter,ISBN
4. Plant Conservation Biotechnology –Ranjeet Kaur Bhalla, ISBN.
5. Plant Biotechnology and Biodiversity Conservation –U.Kumar & A.K.Kumar, Agrobios Jodhpur.
6. Advances in Applied Biotechnology –P.Parihar & L.Parihar, Agrobios,Jodhpur.
7. Text Book of Biotechnology –Preeti Gupta ,ISBN.
8. Introduction to Plant Biotechnology –H.S.Chawla, Amazon.
9. Recent Advances in Plant Biotechnology –A.Kirakosyan &P.B.Kaufman.
10. Biotechnology fundamentals and applications –S.S.Purohit, AgrobiosJodhpur.
11. Biotechnology –S.R. Barnum, Brooks Cole.
12. Plant Biotechnology-P.K. Gupta, Rastogi Publication Meerut.
13. Laboratory Mannual of Biotechnology –P.K.Gupta, RastogiPublication Meerut.

PRACTICAL MARKING SCHEME: SEMESTER IV

BOT6.5DCCP405 (Lab 1)

1.	Anatomy	10
2.	Morphology	8
3.	Embryology	8
4.	Molecular Biology	8
5.	Biotechnology	6
6.	Spot (6): Three-Paper-Bot 401 Three-Paper-Bot 402	24
7.	*Viva-voce*	8
8.	Records	8
9.	Internal assessments (Excursion Report/ Herbarium of Local Flora/ Seminar/Regularity/ Discipline/Term Test)	20
	Total	**100**

BOT6.5DSEP406 (Lab 2)

1.	Question from Paper 403:	(A) Major	13
		(B) Minor	07
2.	Question from Paper 404:	(A) Major	13
		(B) Minor	07
3.	Spot (6):	Three from Paper 403 Three from Paper 404	24
4.	*Viva-voce*		8
5.	Records		8
6.	Internal assessments (Excursion Report/Seminar/Regularity/Discipline/Term Test)		20
		Total	**100**