

As per the NEP 2020
Botany
(Minor Syllabus)
(Effective from Academic Year 2024-2025 onwards)



Pandit Deendayal Upadhyaya Shekhawati University
Sikar (Rajasthan) 307026
E-mail: reg.shekhauni@gmail.com
Website: www.shekhauni.ac.in


Dy. Registrar
Pandit Deendayal Upadhyaya
Shekhawati University,
Sikar(Rajasthan)

Semester	Course Code	Course Title	Contact Hrs per Week			Credits	Weightage (%)		
			L	T	P		CWS	MTE	ETE
I	24BBO5101M	Diversity of Plant Kingdom	2	0	0	2	10	20	70
II	24BBO5201M	Cell Biology & Genetics	2	0	0	2	10	20	70
III	24BBO6301M	Taxonomy of Angiosperms and Economic Botany	4	0	0	4	10	20	70
IV	24BBO6401M	Plant Physiology and Biochemistry	4	0	0	4	10	20	70
V	24BBO7501M	Plant Morphology and Anatomy	4	0	0	4	10	20	70
VI	24BBO7601M	Microbiology and Plant Pathology	4	0	0	4	10	20	70
VI	24BBO7602M	Plant Ecology	4	0	0	4	10	20	70

Semester – I

Learning Objectives:

Learning Objectives:
To provide basic knowledge on the concepts of diversity of plants, their inter-relationship and evolutionary process in plant kingdom.

Learning Outcomes:

By studying this course, the students will be able to:

- Understand the diversity among plants.
- Develop conceptual skill about identifying algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.
- Understand the plant body structure, economic importance and life cycle of algae, fungi, lichen, bryophyte, pteridophyte and gymnosperms.

Course Title:	Diversity of Plant Kingdom	Course Code: 24BBO5101M
Total Lecture hour	30	Hours
Unit I	Algae: General characteristic features, cell structure, range of thallus structure, methods of reproduction and classification (only up to groups), economic importance. Fungi: Introduction, affinities with plants and animals, thallus organization, cell wall composition, reproduction and economic importance.	8
Unit II	Lichens: Introduction to lichens, structure, types, economic importance of Lichens. Bryophytes: General characteristic features and reproduction, adaptation to land habit, classification and economic importance.	8
Unit III	Pteridophytes: General characteristic features and classification, ecological and economic importance. Stellar system, heterosporous and seed habit.	7
Unit IV	Gymnosperms: General characteristic features and reproduction, classification, ecological and economic importance. Angiosperm: General characteristic features and reproduction, classification and binomial nomenclature.	7
Suggestive Readings:		

Suggestive Readings:

(Signature)
Dy. Registrar
Srikrishnakumar (n)
Deendrapal University

1	Singh, Pande, Jain (2019). A Text Book of Botany, Rastogi Publications, Meerut
2	Singh, Pande, Jain (2019). A Text Book of Botany- Angiosperms, Rastogi Publications, Meerut
3	B.P. Pandey (2022). College Botany (Vol I & II), S. Chand Publications

Semester – II

Learning Objectives:

To provide basic knowledge on the concepts of cell structure, cell organelles, and inheritance.

Learning Outcomes:

By studying this course, the students will be able to:

- Understand the structure of Prokaryotic and Eukaryotic Cells.
- Understand the structure and function of various cell organelles.
- Understand the concept and pattern of inheritance.
- Understand the inheritance rules given by Mendel.

Course Title:	Cell Biology & Genetics	Course Code: 24BBO5201M
Total Lecture hour 30		Hours
Unit I	Cell Structure: Cell Theory, General structure and function of Prokaryotic and Eukaryotic Cell. A brief account of ultra-structure of a Plant Cell. Structure and function of plant Cell wall	8
Unit II	Structure and function of Cell membrane, Endoplasmic reticulum, and Golgi bodies, Mitochondria, and Chloroplast	8
Unit III	Structure and function of Ribosomes, Lysosomes, and Peroxisomes. Nucleus- Structure, Function, Chromatin, Nucleolus, Cell Cycle- Mitosis, and Meiosis.	7
Unit IV	Structure and function of Chromosomes. Lampbrush Chromosomes, Mendelian genetics, Mono and Dihybrid cross, Incomplete dominance, and Co-dominance, Epistasis, Lethal Genes	7
Suggestive Readings:		
1	Karp, G. (2010). Cell & Molecular Biology, John Wiley & Sons. Inc Publication	
2	Gupta, P.K. (2017). Cell & Molecular Biology, Rastogi Publications, Meerut	
3	Verma, P.S., Agarwal, V.K. (2023). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, S. Chand Publications	
4	Bruce Alberts (2008). Molecular Biology of the Cell, Garland Science Publications	
5	Rastogi, V.B. (2019). Genetics, Medtech Publication	

Semester - III

Learning Objectives:

- To provide basic knowledge on the concepts of taxonomic description of plants and their economic values.

Learning Outcomes:

By studying this course, the students will be able to:

- Understand the variety of plants.
- Develop conceptual skill about classifying angiosperms.
- Understand the plant floral diversity, economic importance and systematics.

Dr. Registrar
Dy. Registrar
University
Shankarajayanti
Dandit (Rajasthan)

Course Title:	Taxonomy of Angiosperms and Economic Botany	Course Code: 24BBO6301M
Total Lecture Hours 60		Hours
Unit I	Systematics: Introduction, Units of classification, Concept of Species and Genus, Herbarium and its functions, Important Herbaria and Botanical Gardens, Important Flora, Binomial System of Nomenclature, History and Types of Classification, Bentham and Hooker's System, Taxonomic terminology and plant description	17
Unit II	Diversity of flowering plants illustrated by members and economic importance of the following: Malvaceae, Brassicaceae, Fabaceae, Apiaceae, Asteraceae, Solanaceae, Apocyanaceae, Asclepidiaceae, Lamiaceae, Poaceae.	14
Unit III	Scientific name, family, Plant Parts used, and economic values of the following: Cereals- Wheat, Maize Legumes- Pea, Black Gram Beverages- Tea, Coffee Vegetable Oil- Mustard, Groundnut Spices and Condiments- Black pepper, Cumin, Cardamom, Turmeric	15
Unit IV	Scientific name, family, Plant Parts used, and economic values of the following: Rubber, Fibres- Cotton, Jute Timber- Shisham, Rohida Medicinal Plants- Ocimum, Adhatoda, Ashwangandha, Neem, Giloy, Isabgol, Aloe vera	14
Suggestive Readings:		
1	Taxonomy of Angiosperms – V.N. Nair (1995) TMH Publishing Company Limited New Delhi	
2	Plant Taxonomy – Sushella M. Das (2003) Dominant Publishers and Distributors, New Delhi	
3	Plant systematics. Gurcharan Singh (2001) Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.	
4	Essentials of Economic Botany- R.L.Prasad, B P Nautiyal, Medtech Publishers (2018) 1st edition.	
5	Kochhar, S.L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.	
6	B.P. Pandey (2007). Economic Botany, S. Chand & Company Ltd. New Delhi. 17/e	

Semester – IV**Learning Objectives:**

- To provide basic knowledge on the concepts of physical, chemical and biological functioning of plants. It is designed to survey current aspects of plant processes, biochemistry and functions with emphasis on recent research progress in related fields.

Learning Outcomes:

By studying this course, the students will be able to:

- Describe the various physiological aspects in plants.
- Examine the role, structure and importance of biomolecules associated with plant life.
- Preliminary understanding of the basic functions and metabolism in a plant body.
- Evaluate the role of enzymes in plant life.
- To understand the importance of nutrients in plant metabolism and crop yield.

Course Title:		Plant Physiology and Biochemistry	Course Code: 24BBO6401M
Total Lecture Hours 60			Hours
Unit I	Plant water relations - Diffusion, imbibition, osmosis, OP, DPD, TP; water potential - concepts and components (pressure potential, gravity potential, osmotic potential and matric potential). Absorption of water - active and passive, pathway of water movement - apoplastic and symplastic pathway.		15


 Dr. K. Registrar
 Shrikrishna University,
 Srikrishna

	Ascent of sap: cohesion-tension theory. Transpiration - types, mechanism, theories (Starch-sugar, Proton-K ⁺ ion exchange), significance; anti-transpirants. Guttation. Mineral nutrition: Role of major and minor elements in plant nutrition, deficiency symptoms of essential nutrients; mineral uptake - passive (ion exchange) and active (carrier concept).	
Unit II	Photosynthesis: Photosynthetic pigments, Light reaction; red drop and Emerson enhancement effect. Photosystems - components and organization; cyclic and non-cyclic photophosphorylation; carbon assimilation pathways - C ₃ , C ₄ plants, CAM. Photorespiration. Factors affecting photosynthesis. Respiration: anaerobic and aerobic; glycolysis, Krebs' cycle, mitochondrial electron transport system - components, oxidative phosphorylation, ATPase. RQ - significance. Factors affecting respiration.	15
Unit III	Nitrogen fixation: Biochemistry of nitrogen fixation, nitrogenase, nitrogen fixation in legumes. Plant hormones: Biosynthesis, physiological effects of auxins, gibberellins, cytokinins, ABA, and ethylene. Plant movements: tropic movements - geotropism and phototropism; nastic movements - seismonastic and nyctinastic movements. Physiology of flowering - phytochrome, photoperiodism, vernalization.	15
Unit IV	Carbohydrates: General structure and functions, Classification- mono (glucose and fructose), di (maltose and sucrose) and Polysaccharides (starch and cellulose) Lipids: Classification and Structure, Fatty acids - saturated and unsaturated; fatty acid derivatives - fats and oils; compound lipids (brief study only). Proteins: General properties, Classification of Amino Acids, denaturation and renaturation, structural organization of proteins primary, secondary, tertiary and quaternary structures. Enzymes: Structure and properties; Mechanism of enzyme action, coenzymes, allosteric enzyme, isozymes, enzyme inhibition.	15
Suggestive Readings:		
1	Dayananda B, 1999.Experiments in Plant Physiology. Narosa Publishing House, New Delhi.	
2	Hopkins WG, Norman PA, Huner, 2008. Introduction to plant physiology. John Wiley and sons. New York.	
3	Jain JL, Sanjay Jain, Nitin Jain, 2005.Fundamentals of Biochemistry. S Chand, New Delhi.	
4	Salisbury F B, Ross C W, 1992. Plant Physiology. CBS Publishers and Distributors, Delhi.	
5	Pandey S N, Sinha BK, 2006. Plant Physiology. Vikas Publishing House Pvt. Ltd.	
6	Lehninger AL, 1961.Biochemistry. Kalyan publishers, Ludhiana.	
7.	Nelson DL, Cox MM, 1993.Principles of Biochemistry. Mac Millan Publications.	
8.	Taiz L, Zeiger E, 2003. Plant Physiology (III Ed). Panima Publishing Corporation, New Delhi.	

Semester – V
Plant Morphology and Anatomy

Course Objectives:

- To study morphology and anatomy of angiosperm plants
- To learn technical terms to describe morphological and anatomical features

Course Outcomes:

On completion of the course, student will be able to:

- Understand plant morphology and anatomy
- Understand basics of floral morphology
- Understand significance of morphological modifications of plant parts


Dy. Registrar
Pandit Deendayal Upadhyaya
Shekhawati University,
Sikar(Rajasthan)

- Differentiate between monocot and dicot anatomy based on internal structures

Course Title:	Plant Morphology and Anatomy	Course Code: 24BBO7501M
Total Lecture Hour 60		Hours
Unit I	Introduction to Plant Morphology: Importance of plant morphology, Parts of an angiospermic plant. Morphology of root: Characteristics of roots: Types of root system, Regions of the root, Modifications of root. Morphology of stem: Characteristics of stem, Forms of stem, Habit of the plant: parasitic, mycoheterotrophic and epiphytic plants, Modifications of stem, Functions of stem.	15
Unit II	Morphology of leaf: Parts of a leaf, types of leaves, types of stipules and their modifications, Leaf shape, Venation, Simple and compound leaves, Modifications of leaves, Phyllotaxy, Functions of leaves. The inflorescence: Definition and its types. The flower: Flower as a modified shoot, structure of flower, types of flowers, Symmetry of the flower, Calyx and its modifications, Forms of corolla, Androecium: Parts of stamen, cohesion of stamens, adhesion of stamens. Gynoecium: Parts of carpel, simple and compound gynoecium, cohesion of carpels, placentation and its types.	15
Unit III	The fruit: Definition, Parts of fruit, Classification of fruits, Dispersal of seeds and fruits. Tissue: Meristems and Tunica-Corpus theory (shoot apical meristem), Histogen and Quiescent Center theory (root apical meristem), Simple, complex and secretory tissues and their functions, tissue systems.	15
Unit IV	Primary internal structure (root, stem and leaves), structure of leaf epidermis, trichomes and stomata. Origin of lateral roots, growth rings; sapwood and heartwood, periderm. Secondary growth (dicot root and stem). Primary anomalous internal structure and secondary anomalous growth in roots and stems with special reference to <i>Nyctanthus</i>, <i>Bignonia</i>, <i>Boerhavia</i>, and <i>Dracaena</i>.	15
Suggestive Readings:		
1. Botany for Degree Students, A.C.Dutta, Oxford University Press 2. Morphology and Economic Botany of Angiosperms, S Sundar Rajan, Anmol Publications Pvt Ltd 3. Morphology of Vascular Plants, E.J.Eames, Standard University Press. 4. A Text Book of Botany- Angiosperms, B. P. Pandey, S. Chand and Comp. Ltd. 5. A Text Book of Practical Botany II, Ashok Bendre and Ashok Kumar, Rastogi Publication. 6. Cutter, E.G. 1969. Part I: Cells and Tissues. Edward Arnold, London. 7. Cutter, E.G. 1971. Plant Anatomy: Experiment and interpretation, part II, organs. Educated Arnold; London. 8. Esau, K. 1977. Anatomy of Seed Plants, 2nd edition, John Wiley & Sons, New York. 9. Fahn, A. 1985. Plant Anatomy, Pergamon Press, Oxford. 10. Manseth, J.D. 1988. Plant Anatomy. The Benjamin/Cummings Publishing Co., Inc. Menlo Park, California, USA. 11. Trivedi, P.C.: N. Sharma and J.L. Sharma (2003) Structure, Development and Reproduction in Flowering Plants. Ramesh Book Depot, Jaipur. 12. Pandey, S. N., Chadha, A. (2009). Plant Anatomy and Embryology. Vikas Publishing House Pvt Ltd., New Delhi.		

Dr. K. K. Upadhyaya
 Pandit Deendayal Upadhyaya
 Shekhawati University,
 Sikar (Rajasthan)

Semester – VI
Microbiology and Plant Pathology

Course objective

- This course deals with microscopic studies of various biological organisms and diseases caused by plant pathogens

Course outcome:

- Understand the contributions of prominent scientists in microbiology
- Learn about the structure and reproduction in bacteria, mycoplasma and viruses
- Examine the symptoms and life history of various organisms in plant diseases

Course Title:	Microbiology and Plant Pathology	Course Code: 24BBO7601M
Total Lecture hour	60	Hours
Unit I	History of Microbiology: History of development of microbiology, Spontaneous generation versus biogenesis, major contributions of Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur, Robert Koch, Alexander Fleming, and contribution of Indian microbiologists. Virus: Characteristics and Classification of Viruses (Baltimore), Cryptograms, structure with special reference to TMV, Bacteriophage, Multiplication of Viruses (Lytic and Lysogenic). Viroids, Virusoids, Prions.	15
Unit II	Bacteria: General Characteristics, Classification by Bergey's Manual, Cell structure, Cell-wall: Composition and detailed structure of Gram positive and Gram-negative cell walls, mechanism of Gram's staining, endospore formation, Asexual Reproduction and Sexual Recombination (Conjugation, Transformation and Transduction), Archaeobacteria and Eubacteria. Mycoplasma: General Characteristics, Morphology and Reproduction.	15
Unit III	Applications of Microbiology: Importance of microbes in agriculture and food industries. Basic design of fermenter, continuous and discontinuous culture. Preparation of fermented food products (yogurt, curd and cheese). Preparation of alcoholic beverages (wine and beer). Treatment of waste water (Municipal treatment plant) and Sewage, Bioremediation.	15
Unit IV	Principles of plant pathology, important symptoms caused by fungi, bacteria, viruses and MLOs Brief account, structure, importance, life history and control measures of the following plant diseases: Green ear disease of Bajra, Downy mildew of Bajra, Loose and covered smut of Wheat/Barley, Black rust of Wheat, White rust of Wheat, Citrus canker, Little leaf of Brinjal, Yellow vein mosaic of Bhindi.	15
Suggestive Readings:		
- Pelczar, M.J. (2001) Microbiology, 5th edition. New Delhi, Delhi: Tata Mc-Graw- Hill Co. J. Willey, L. Sherwood & C. Woolverton. (2017). Prescott's Microbiology. McGraw Hill international. M. J Chan, ECS Krieg & NR Pelczar. (2004). Microbiology, McGraw Hill. International. J. G. Cappuccino, and N. Sherman. (2013). Microbiology: A Laboratory manual, Benajamin/Cummings. M. T. Madigan, J. M. Martinko & D. A. Stahl, Brock. (2010). Biology of Microorganisms, Pearson Education International. - Principles of Plant Pathology, R.S. Singh (1988), 3rd Ed., Oxford & IBH Co., New Delhi. - Plant Pathology, R.S. Mehrotra, (1989), Tata McGraw Hill Publishing Company, New Delhi. G. Rangaswami and A. Mahadevan, (1999). Diseases of Crop Plants in India, Printice Hall of India Publications. - Gail L. Schumann and Cleora J. D'Arcy C H Dickinson , J A Lucas, (2006). Essential Plant Pathology K. S. Bilgrami and H. C. Dube, (1996). A Text books of Modern Plant Pathology Vikas Publishing House Pvt. Ltd.		
Suggested E-resources:		
Online Lecture Notes and Course Materials: - Vidhya Mitra Integrated E-Content Portal - eGyanKosh-Introductions to Microbiology		


 Sandipti Deendral (Unit In-charge)
 Registrar
 Shaheed Dr. B. K. Bhaumik
 Shaheed Dr. B. K. Bhaumik
 Shaheed Dr. B. K. Bhaumik

3. e-Krishi Shiksha- Introduction Microbiology
4. NPTEL: Biotechnology - Microbiology

Semester – VI

Plant Ecology

Course objective

- In ecology, students learn about ecological factors different plant communities' general ideas about ecosystems, and phyto geography. Ecology seeks to understand the vital connections between plants and the environment. This course aims to introduce the concepts and principles of ecology, biological diversity, conservation, sustainable development, population, community and ecosystem structure and function, application of these concepts to solve environmental problems.

Course outcomes

- Course Learning Outcomes Upon completing the course, students will be able to:
- Understand diversity, distribution, community organization of plants and ecological niches.
- Learn about the succession process and types.
- Understand the energy flow pathways and global biogeochemical cycles in the ecosystem.
- Learn about the conservation of biodiversity.
- Understand the functional traits related to population, community, and landscape levels.
- Comprehend the interactions between plants and the abiotic and biotic environment.
- Contribute in restoration and conservation of plants and plant communities.

Course Title:	Plant Ecology	Course Code: 24BBO7602M
Total Lecture hour 60		Hours
Unit I	Elements of Ecology: Ecology: definition, branches and significance of ecology, Climatic Factors: Light, Temperature, precipitation, Edaphic Factor: Origin, formation, composition and soil profile, Biotic Factor: Interactions between plants and animals.	15
Unit II	Ecosystem Ecology: Ecosystem: Concept and components, energy flow, Food chain, Food web, Ecological pyramids, Productivity of ecosystem-Primary, Secondary and Net productivity, Biogeochemical cycles- Carbon, Nitrogen and Phosphorous.	15
Unit III	Population & Community Ecology: Population -definition, characteristics and importance, outlines –ecotype, Plant communities- characters of a community, outlines – Frequency, density, cover, life forms, competition, Interaction between plants growing in a community.	15
Unit IV	Plant Biodiversity and its importance: Definition, levels of biodiversity-genetic, species and ecosystem, Biodiversity hotspots- Criteria, Biodiversity hotspots of India, Loss of biodiversity – causes and conservation (In-situ and ex-situ methods), Seed banks - conservation of genetic resources and their importance.	15

Suggestive Readings:

1. Keddy, P.A. 2017. Plant Ecology: Origins, Processes, Consequences, 2nd Edition. Cambridge University Press. ISBN: 978-1107114234.
2. Collins, B.R., K.H. Anderson. 1994. Plant Communities of New Jersey. Rutgers University Press, New Brunswick, NJ. ISBN: 978-0813520711.
3. J. L. Chapman and M. J. Reiss. 1995. Ecology principles and applications. Cambridge University Press.
4. C. Faurie, C. Ferra, P. Medori and J. Devaux. 2001. Ecology Science & Practice. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.


Dr. Neelam Chandra
Srikrishna University
Pondicherry
(Srikrishna)

5. G.T. Miller Jr. 2005. Essentials of Ecology. III Edition, Thomson, Brooks/Cole.
6. Smith, R.L. 1996. Ecology and Field Biology, Harper Collins, New York.
7. Odum, E.P. 2005. Fundamentals of Ecology, Saunders, Philadelphia.
8. Odum, E.P. 2005. Basic Ecology, Saunders, Philadelphia.

Dr. Regisrar
Pandit Deendayal Upadhyaya
Shriharirajasthan)
Shriharirajasthan)