As per the NEP 2020

Minor Course (Science)

(Effective from Academic Year 2024-2025 onwards)

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Science
Minor Subject Syllabus
(CBCS) As per the NEP 2020 (Semester I to IV)
w.e.f. the Academic Session 2024-25
Discipline: Botany

Semester	Course title	Credits	Course Code	Credit distribution of the course			Eligibility criteria
				Lecture	Tutorial	Practical/ Practice	
I	Diversity of Plant Kingdom	2	24BBO5101M	2	0	0	10+2 from any recognized Board
II	Cell Biology & Genetics	2	24BBO5201M	2	0	0	
III	Taxonomy of Angiosperms and Economic Botany	4	24BBO6301M	4	0	0	
IV	Plant Physiology and Biochemistry	4	24BBO6401M	4	0	0	

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 26		
		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.	6
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.	7

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Unit III	**Pteridophytes:** General characteristic features and classification, ecological and economic importance. Stelar system, heterospory 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.	6

Reference Books:	
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

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 26		**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	7
Unit II	Structure and function of Cell membrane, Endoplasmic reticulum, and Golgi bodies, Mitochondria, and Chloroplast	6
Unit III	Structure and function of Ribosomes, Lysosomes, and Peroxisomes. Nucleus- Structure, Function, Chromatin, Nucleolus, Cell Cycle- Mitosis, and Meiosis.	6
Unit IV	Structure and function of Chromosomes. Lampbrush Chromosomes, Mendelian genetics, Mono and Dihybrid cross, Incomplete dominance, and Co-dominance, Epistasis, Lethal Genes	7

Reference Books:	
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

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.

Course Title:	**Taxonomy of Angiosperms and Economic Botany**	**Course Code: 24BBO6301M**
Total Lecture hour 52		
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	**Hours** 15
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.	12
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	13
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	12

Reference Books:

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) Ist 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

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 hour 52		**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. **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).	**15**
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 - C3, C4 plants, CAM. Photorespiration. Factors affecting photosynthesis. **Respiration**: anaerobic and aerobic; glycolysis, Kreb's cycle, mitochondrial electron transport system - components, oxidative phosphorylation, ATPase. RQ - significance. Factors affecting respiration.	**12**
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.	**13**
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).	**12**

	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.	

Reference Books:

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 Distributers, 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.