Maharaja Surajmal Brij University

Bharatpur (Rajasthan)

Syllabus for Botany

(Under Graduate Programme)

Semesters V & VI

Academic Session 2025-26

उप कुलसचिव
महाराजा सूरजमल बृज विश्वविद्यालय
भरतपुर (राज.)

B.Sc. Semester V
Detailed Syllabus
BOT-20T-501 - Plant Biochemistry and Physiology

Unit - I

Biomolecules

Nomenclature, classification, molecular structure and function of Proteins (primary, secondary, tertiary, conjugated), Carbohydrates (monosaccharides, disaccharides, polysaccharides). Lipids 7 lectures (saturated and unsaturated), Secondary Metabolites. (Alkaloids, Steroids, Compounds).

Nature or Bond

Glycosidic linkage, Peptide bond, Phosphodiester bonds, Alpha and Beta oxidation.

5 leactures

Enzymes

Nomenclature, classification, Structure, mechanism of action, factors affecting enzyme activity

3 leactures

Unit-II

Transport in Plants

Facilitated diffusion, active absorption, Passive and Active Transport (uniport, co-transport, symport, antiport.), Concept and Mechanism of Water potential, Osmosis. Plasmolysis, Ascent Sap, Root Pressure, Guttation, Transpiration, Pressure flow Hypothesis.

8 lectures

Mineral Nutrition and translocation

Macro- and Micro nutrients in Plants and deficiency symptoms, Translocation of Solutes, Phloem transport, Source-sink relationship, Factors affecting translocation of nutrients, Nitrogen Metabolism, Biological Nitrogen Fixation, Nodule formation. **7 lectures**

Unit -III

Photosynthesis

Pigments, Photosynthetic apparatus, Light reaction, PSI, PSIL, Z- scheme, Electron transport, Cyclic and Non-cyclic Photo- phosphorylation, Calvin cycle and C4 Pathway, Photorespiration, Factors affecting Photosynthesis.

8 lectures

Respiration

Acrobie and Anaerobic respiration, Fermentation, Glycolysis, Tricarboxylic Acid Cycle, Electron Transport System (ETS) and Oxidative Phosphorylation, Pentose Phosphate Pathway, Respiratory Quotient (RQ).

7 lectures

Unit-IV

Growth and Development

Phases Or Growth, Differentiation, Dedifferentiation And Redifferentiation, Characteristics, discovery and Physiological effects of Plant Growth Regulators: Auxins, Gibberellins, Cytokinins, Ethylene, Abscisic Acid. Concept, Physiology and mechanism of action of Photoperiodism and Vemalisation. Florigen concept, Seed Dormancy.

15 lectures

B.Sc. Semester- V

BOT-20P-502 – Practical-V

Syllabus

1. To study effect of temperature on permeability of Plasma Membrane
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig.
3. To separate chlorophyll pigments using paper chromatography.
4. To separate chlorophyll pigments using solvent method.
5. To demonstrate enzyme activity- Catalase, amylase.
6. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
7. Mohl's Half Leaf experiment
8. To study the effect of light intensity and bicarbonate on O_2 evolution in photosynthesis.
9. Calculate Respiration Quotient (RQ) of different substrates by Ganong's Respirometer.
10. Separation of amino acids by paper chromatography.
11. To study the phenomenon of seed germination (effect of light).
12. Demonstration of Potato osmoscope, Aerobic and Anaerobic respiration, Rate of Transpiration, Arc Auxanometer.

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A Singh

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

Reference Book:

1. Introduction to Plant Physiology – Hopkins, John Wiley and Sons, New York, 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, Springer Verlag, 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. Wilkins McGraw 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.

Reference Book:

1. Plant metabolism Dennis, Turpin, Lefebure and Layzell, Longman Essex, England.
2. Biochemistry and Physiology of Plant Hormones Moore, Springer Verlag, 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 J.B. Harborne, Academic Press, New York.

B.Sc. Semester-VI

BOT-20T-601

Angiosperm Morphology, Anatomy and Embryology

Detailed Syllabus

Unit 1 : Morphology and the Tissue System

Basic body plan of a typical dicot and a monocot plant: diversity of plants on the basis of habit, habitat, longevity, and body forms.

Tissues: Structure and function- Meristematic Tissues. Permanent Tissues: Simple Tissues and Complex Tissues: Tissue systems: Epidermal Tissue System, Ground Tissue System and Vascular Tissue System.

Organizational theories of Shoot apical meristem (SAM) and Root apical meristem (RAM)

15 hours

Unit 2: Growth in plants

Anatomy of primary structures of root, stem and leaf of dicot and monocot plants

Secondary Growth: Structure and function of vascular camium, secondary growth in stem and roots: Annual Rings: Spring wood and autum wood, Heartwood and sapwood, tyloses, Porous and non-porous wood.

Structure and function of cork cambium.Peridrm.

Anomalous growth in Nyctanthus. Boerhaavia, Bignonia and Leptadenia.

15hours

Unit 3: Embryology I

Angiosperm flower, structure of anther, microsporogenesis, Development of male gametophyte, Structure of pistil, structure of ovule and its types, megasporogenesis, development and types of female gametophyte.

15 hours

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Unit 4: Embryology II

Pollination and double fertilization. Endosperm: structure and types, embryo development in dicotyledons and monocotyledons, Seed structure (monocot and dicot), specialized structures related to seed, seed dispersal mechanisms. Polyembryony, apomixes 15 hours

Sem. VI – Practical Syllabus BOT 20P 602

1. Study of Tissue organization in root and shoot apices using permanent slides.
2. Study of Anatomy of dicot and monocot root
3. Study of Anatomy of dicot and monocot stem
4. Study of Anatomy of dicot and monocot leaf
5. Study of Anomalous secondary growth in stems of *Nyctanthus*, *Boerhaavia*, *Bignonia* and *Leptadenia*..
6. Study of ovule using temporary/ permanent slides/photographs.
7. Study of T. S. of anther, to study the wall layers and pollen sac with pollen grains.
8. Study of pollen germination and pollen viability.
9. Measurement of pollen size using micrometry.
10. Study of types of placentation in angiosperms.
11. Study of structure of endosperm (nuclear and cellular) using permanent slides / Photographs.
12. Study of developmental stages of dicot and monocot embryos using permanent slides / photographs.
13. Study of seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).
14. Any other exercise related to syllabus

Suggested Books and References –

Suggested Books:

1. Cutter E.G. 1971. Plant Anatomy: Experiment and Interpretation. Part II Organs. Edward Arnold, London.
2. Esau K. 1977. Anatomy of seed plants, 2nd edition, John Wiley and Sons New York.
3. Fahn, A. 1974. Plant anatomy 2nd edition. Pergamon press. Oxford.
4. Crang, R. et al, 2018. Plant anatomy: a concept based approach to the structure of seed plants.

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Reference Book:

1. An introduction to Embryology of Angiosperm – P. Maheshwari, New Delhi.
2. Recent Advances in the Embryology of Angiosperms – P. Maheshwari, New Delhi.
3. The Embryology of Angiosperms - Bhajwani and Bhatnagar, Vikas Pub. 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 Book Comp. 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, McGraw Hill Book Comp. Ltd. New York.

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