SSD GIRLS' COLLEGE BATHINDA
AN AUTONOMUS COLLEGE
Session: 2026-27, 2027-28 & 2028-29
B.Sc. Part-III (Sem V&VI)
Semester-V
Subject Botany
Course Credits: 4

Theory
4 Lectures per week

Practical
2 Lectures per week

Semester VI
Scheme of Examination

	Name of The Paper	Credits	Time In Hrs.	External Assessment Marks	Internal Assessment Marks	Total
Theory	Botany Major-Plant Morphology, Anatomy & Reproduction Code: BM502	3	3	50	20	70
Practical	Botany Practical Code: BM502P	1	3	20	10	30
Total Marks (Theory and Practical) (3+1 Credits)						100

Note: Internal assessment will be based on attendance (20%), written Assignments/Project work etc. (40%) and two mid-semester tests/Internal examination *(40%).

Theory
4 Lectures per week

Practical
2 Lectures per week

Semester VI
Scheme of Examination

	Name of The Paper	Credits	Time In Hrs.	External Assessment Marks	Internal Assessment Marks	Total
Theory	Botany Major-Plant Metabolism Code: BM602A	3	3	50	20	70
Practical	Botany Practical Code: BM602A(P)	1	3	20	10	30
Theory	Botany Major-Plant Ecology and Economic Botany Code:BM602B	3	3	50	20	70
Practical	Botany Practical Code: BM602B(P)	1	3	20	10	30
Total Marks (Theory and Practical) (3+1 Credits)						100

Note: Internal assessment will be based on attendance (20%), written Assignments/Project work etc. (40%) and two mid-semester tests/Internal examination *(40%).

S.S.D Girls' College, Bathinda
Multidisciplinary Course Based On NEP -2020
B.Sc. / B.Sc. (Honours)
Session: 2026-27, 2027-28 & 2028-29

SYLLABUS

B.Sc. (Med.) Part-III (SEMESTER-V)
SUBJECT: MAJOR BOTANY-PLANT MORPHOLOGY, ANATOMY & REPRODUCTION
Paper Code: BM502

Total Marks: 70
Theory Marks: 50
Internal Assessment Marks:20
Pass Marks: 35%

Time Allowed: 3 hours
Total Teaching time: 3 hrs/Week
Credit: 3

INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus, out of which the student will be required to attempt two questions from each section. Each question will carry 8 marks. Section C will be compulsory with 9 short-answer type questions of 02 marks each which will cover the entire syllabus.

INSTRUCTION FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section – A

1. **Morphology of Root, Stem and Leaf:** Characteristics, parts, types, modifications and functions.
2. **Morphology of Flower and Fruit:** Structure of flower, Inflorescence types, structure and types of fruits and seeds.
3. **Tissue system:** Simple and complex tissue system, primary structure of dicot and monocot stem and root, secondary growth in dicot root and stem of angiosperms.
4. **Leaf anatomy:** Internal structure of dicot and monocot leaf, leaf anatomy in relation with environment.

Section – B

5. **Types of reproduction:** Asexual and sexual reproduction, significance.
6. **Pollination:** Types, pollen-pistil interaction, self-incompatibility.
7. **Male and female gametophyte:** Microsporogenesis, Megasporogenesis, double fertilization, triple fusion, types of ovules and embryo-sac.
8. **Post fertilization changes:** Embryo and endosperm development, development of fruit and seed.

Course Outcomes

1. Students will study and understand plant morphology, anatomy and tissue system.
2. Students will gain knowledge of plant reproduction, pollination, fertilization and seed development.
3. Students will apply the acquired knowledge for plant identification and further biological studies.

RECOMMENDED READINGS

1. Bhojwani, S.S. and Bhatnagar, S.P. 2000. The Embryology of Angiosperms; 4th revised and enlarged edition, Vikas Publishing House, Delhi.
2. Chelsea D. Specht and Donald Kaplan (2022). Kaplan's Principles of Plant Morphology. Apple Academic Press Inc.
3. Esau, K. 1977. Anatomy of Seed plants 2nd Edition, John Wiley & Sons, New York.
4. Fahn, A. 1974. Plant Anatomy, 2nd Edition, Pergamon Press, Oxford.
5. Pullaiah, T. 2001. Text Book of Embryology of Angiosperms, Regency Publications, New Delhi.
6. Rudall, P. 2007. Anatomy of Flowering Plants, - An Introduction to structure and Development, Cambridge University Press, Cambridge, U.K.

Multidisciplinary Course Based on NEP-2020
B.Sc. / B.Sc. (Honours)
B.Sc.(Med.) Part III Sem V Major Botany
2026-27, 2027-28, 2028-29
Practical Paper: Morphology, Anatomy & Reproduction
Practical Paper Code: BM502P

Total Marks: 30
Practical Marks: 20
Internal Assessment Marks:10
Pass Marks: 35%

Time Allowed: 3 hours
Total Teaching time: 2 hrs/Week
Credit: 1

SUGGESTED LABORATORY EXCERCISES

Teachers may select plant/material available in their locality/institution.

1. To examine and identify different root types (taproot and adventitious root), stem types (underground and aerial) and their modifications.
2. To study leaf shapes, venation and phyllotaxy.
3. Study of different types of inflorescence, fruits and seeds (dicot and monocot).
4. Examination of parts of a typical flowering plant.
5. To study the anatomy of Dicot and Monocot root, stem (including normal secondary growth) and leaf from the locally available material.
6. Study of stomata from epidermal peel.
7. Examination of flowers for their pollination mechanism (*Salvia, Ficus, Calotropis*).
8. Structure of anther, microsporogenesis (using permanent slides) and pollen grains and pollinia (whole mounts).
9. Study of Pollen viability using glycero-acetocarmine.
10. Structure of ovule and embryo sac. (Permanent slides)
11. Structure of nuclear and cellular endosperm.
12. Study of Embryo development in monocots and dicots. (Permanent slides)
13. Simple experiments to show vegetative propagation (leaf cuttings in *Bryophyllum*; stem cuttings in rose, money plant, sugarcane and *Bougainvillea*).
14. Study of different placentation types.

S.S.D Girls' College, Bathinda
Multidisciplinary Course Based On NEP -2020
B.Sc. / B.Sc. (Honours)
Session: 2026-27
SYLLABUS
B.Sc. (Med.) Part-III (SEMESTER-VI)
SUBJECT: PLANT METABOLISM
Paper Code: BM602A

Total Marks: 70
Theory: 50 Marks
Internal : 20 Marks

Time Allowed: 3 hours
Total Teaching Time: 3 hrs/Week
Credit: 3

INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 8 marks each. Section C will be compulsory with 9 short-answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 18 marks in all.

INSTRUCTION FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section – A

1. **Introduction:** Primary and Secondary Metabolism. Types of primary and secondary metabolism; role of metabolites in plant growth and development.
2. **Enzymes:** Introduction; nomenclature and classification; mechanism of enzyme action; enzyme kinetics – Michaelis Menten equation; Regulation of Enzymes.
3. **Photosynthesis:** History of photosynthesis, photo-physical phase (Z-scheme); photochemical phase (Calvin Cycle), C_4 cycle, CAM cycle, Photorespiration and its ecological significance.
4. **Respiration:** Aerobic and anaerobic respiration, respiratory quotient, Glycolysis; Citric Acid Cycle, Electron Transport Chain, Pentose Phosphate Pathway, Gluconeogenesis.

Section – B

5. **Nitrogen metabolism:** Importance of nitrogen, nodule formation, Biological Nitrogen fixation; Ammonia uptake and transport.
6. **Sulphur metabolism:** Importance of sulphur in plants; uptake and transport of sulphur; Sulphate assimilation, Sulphated compounds.
7. **Lipid Metabolism:** Types, structure and functions of lipids; Fatty Acids biosynthesis; B-oxidation.
8. **Secondary Metabolites:** Types and structure of Terpenoids, Cyanogenic glycosides, Glucosinolates, Alkaloids and Phenolic compounds; Role of secondary metabolite in plant growth and development.

Course Outcomes

1. Students will understand the basics of Plant metabolism.
2. Students will gain knowledge about Enzymes, Photosynthesis and Respiration in plants

RECOMMENDED READINGS

7. Buchanan, B.B. Gruissem, W. And Jones, R.L. 2015. *Biochemistry & Molecular Biology* of Plants (2nd Ed.). John Wiley & Sons, Ltd., UK.
8. Cox, M. M. And Nelson, D. L. 2013. *Lehninger Principles of Biochemistry* (6th Ed.) W. H. Freeman and Company, New York.
9. Hopkins, W.G. 1999. *Introduction to Plant Physiology* (20th ed.) John Wiley & Sons, Inc. New York.
10. Jain, V. K. (2022). *Fundamentals of plant Physiology* (2nd ed.) S. Chand Publishing.
11. Taiz, L., Zeiger, E., Mollder I. M. And Murphy, A. 2015. *Plant Physiology* (6th Ed.). Sinauer associates, Inc., Publishers, Sunderland, Massachusetts.

Multidisciplinary Course Based on NEP-2020
B.Sc. / B.Sc. (Honours)
B.Sc.(Med.) Part III Sem VI Major/Minor Botany
2026-27, 2027-28, 2028-29
Practical Paper: Plant Metabolism
Practical Paper Code: BM602A(P)

Total Marks: 30
Practical Marks: 20
Internal Assessment Marks: 10
Pass Marks: 35%

Time Allowed: 3 hours
Total Teaching Time: 2 hrs/Week
Credit: 1

SUGGESTED LABORATORY EXCERCISES

Teachers may select plant/material available in their locality/institution.

1. To study amylase enzyme activity from germinating wheat/barley/maize grains.
2. Demonstration of necessity of light, carbon dioxide and chlorophyll for photosynthesis.
3. Separation of chlorophyll pigments by paper chromatography method.
4. Demonstration of photosynthetic efficiency at different light, CO_2 source and temperature conditions.
5. Demonstration of aerobic respiration in plant tissues.
6. Demonstration of liberation of heat energy during respiration in germinating seeds.
7. Demonstration of the presence of proteins, amino acids and fats by qualitative tests in seed. samples.
8. To separate amino acids from plant material by paper chromatography and their identification by comparison with standards.
9. Estimation of free fatty acids by titration method in vegetable oil.
10. Demonstration of the presence of secondary metabolites (phenolic compounds, flavonoids. terpenoids and glycosides) in plant materials by microchemical tests.

S.S.D Girls' College, Bathinda
Multidisciplinary Course Based On NEP -2020
B.Sc. / B.Sc. (Honours)
Session: 2026-27

SYLLABUS

B.Sc. (Med.) Part-III (SEMESTER-VI)
SUBJECT: PLANT ECOLOGY AND ECONOMIC BOTANY
Paper Code: BM602B

Total Marks: 70
Theory Marks: 50
Internal Assessment Marks: 20
Pass Marks: 35%

Time Allowed: 3 hours
Total Teaching Time: 3 hrs/Week
Credit: 3

INSTRUCTION FOR THE PAPER SETTER

The question paper will consist of three sections A, B and C. Section A and B will have four questions each from the respective section of syllabus and will carry 8 marks each. Section C will be compulsory with 9 short-answer type questions (8-10 lines) which will cover the entire syllabus uniformly and will carry 18 marks in all.

INSTRUCTION FOR CANDIDATES

Candidates are required to attempt two questions from each section A and B and the entire section C, which is compulsory.

Section – A

1. **Concept of Ecology and its scope:** Environment factors-climatic, edaphic, topographic and biotic.
2. **Population Ecology:** Characters, positive and negative interaction, growth forms, carrying capacity, ecotypes, ecads.
3. **Community Ecology:** Community characteristics, frequency, density and abundance, cover and life forms, ecological succession (Hydrosere and Xerosere), Gause principle of competitive exclusion.
4. **Structure and concept of Ecosystem:** Ecological pyramids, food chain, food web, ecological energetics, ecological productivity.

Section – B

5. **Cereal crops**: Botany, brief history of origin and uses of Wheat, Rice and Maize.
6. **Vegetable Oil yielding crops:** Brief history of origin, botany and uses- Mustard, coconut, Groundnut and Sunflower.
7. **Spices and Condiments:** Botanical name, family, plant part used, active principle and uses of Ginger, Turmeric, Cinnamon, Clove, Cardamom, Black Pepper, Cumin and Fennel.
8. **Medicinal and aromatic plants:** Botanical name, family, plant part used, active principle and uses of Ashwagandha, Belladonna, Glycyrrhiza, Neem, Rauwolfia, Stevia and Tulsi.

Course Outcomes

1. Students will understand the basic concepts of ecology, ecosystem and environmental factors .
2. Students will gain knowledge about ecological processes and economic importance of Cereal & Vegetable oil yielding crops and medicinal plants.
3. Students will learn about Spices and condiments

RECOMMENDED READINGS

1. Kochhar, S.L. 1998. *Economic Botany in* Tropics. 2nd Edition, Mac Millan India Ltd., New Delhi.
2. Kormondy, E.J. 1996. *Concepts of Ecology*, Prentice-Hall of India Pvt. Ltd., New Delhi. Mackenzie, A. et al. 1999. *Instant Notes in Ecology,* Viva Books Pvt. Ltd., New Delhi.
3. Mcknney, M.L., Schoch, R.M. & Yonaujak, L., 2007. *Environmental Science: Systems and Solutions* (4th Edition). Jones and Bartl. Pub., USA.
4. Odum, E.P.1983. *Basic Ecology*, Saunders, Philadelphia.
5. Sambamurthy, A.V.S.S. and Subramanyam, N.S. 1989. *A Textbook of Economic Botany,* Wiley Eastern Ltd., New Delhi.
6. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014: *Ecology, Environment Science and Conservation,* S. Chand and Co. Ltd. New Delhi.

Multidisciplinary Course Based on NEP-2020
B.Sc. / B.Sc. (Honours)
B.Sc.(Med.) Part III Sem VI Major/Minor Botany
2026-27, 2027-28, 2028-29
Practical Paper: Plant Ecology and Economic Botany
Practical Paper Code: BM602B(P)

Total Marks: 30
Practical Marks: 20
Internal Assessment Marks: 10
Pass Marks: 35%

Time Allowed: 3 hours
Total Teaching Time: 2 hrs/Week
Credit: 1

SUGGESTED LABORATORY EXCERCISES

Teachers may select plant/material available in their locality/institution.

1. To determine minimum number of quadrats required for study of a grassland community.
2. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkiaer's Standard Frequency Diagram.
3. To determine frequency, density and dominance of a grassland community.
4. To measure the above ground plant biomass in a grassland.
5. To determine Kemp's constant for dicot and monocot leaves and to estimate the leaf area index of a grassland community.
6. To estimate bulk density and porosity of grassland and woodland soil.
7. To determine moisture content and water holding capacity of grassland and woodland soil.
8. To study the vegetation structure through profile diagram.
9. To estimate transparency, pH and temperature of different water bodies.
10. To demonstrate dust holding capacity of the leaves of different plant species
11. To study the morphology, structure and simple micro chemical tests of the food storing tissues in rice, wheat, maize, potato and sugarcane. Microscopic examination of starch in these plants (except sugarcane).
12. To study the hand sections of groundnut, mustard and coconut and staining of oil droplets with Sudan III and Sudan Black.
13. To study Black pepper, cloves, cinnamon (hand sections) and open fruits of cardamom and describe them briefly on basis of economic part used.
14. Field Visit to study sources of firewood (10 plants), timber-yielding trees (10 trees) and bamboos. A list to be prepared mentioning special features.
15. Preparation of an illustrated inventory of 10 medicinal plants and their use in indigenous systems of medicine of allopathy. Write their botanical and common names, part used and diseases/disorders for which they are prescribed.