

Annexure C

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULLUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAMME

**Bachelor of Science (Hons.) Biotechnology Semester-I
(Session 2025-2026)
Botany-I**

Course Code	Course Title	Course Type	Credits			Total Credits	L	P	CA	Marks
			L	T	P					
BBTM-1074	Botany-I	C	4	0	1	4	50	20	30	100

Bachelor of Science (Hons) Biotechnology Semester-I

Session: 2024-2025

Botany-I

Course Code: BBTL-1074

Course outcomes: After passing this course the student will be able to:

CO1: Understand the diversity of plants.

CO2: Understand the structure of meristems, permanent tissues, anatomy of root, stem and leaf in flowering plant.

CO3: Understand the reproduction and different aspects of pollination and self-incompatibility in flowering plants.

CO4: Understand the different plant classification systems, terminology related to floral descriptions and economic importance of various angiosperm families.

Bachelor of Science (Hons.) Biotechnology Semester-I

Session: 2025-2026

Botany-I

Course code: BBTM-1074

(Theory)

Time: 3 Hrs.

Credits (L-T-P): 4-0-0

Max. Marks: 100

Theory: 50

Practical: 20

C.A.:30

Instructions for the Paper Setters:

Eight questions of equal marks (10 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any Section.

Unit –I

Diversity in plants: General characters of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms. Concepts of species, hierarchical taxa and biological nomenclature.

Unit –II

Anatomy of flowering plants: Meristems, simple and complex permanent tissues, internal structure of stem, root and leaf, secondary growth in stem and root of *Helianthus*.

Unit –III

Reproduction in flowering plants: Structure and development of anther and male gametophyte, Structure and development of ovule and female gametophyte; Pollination (self and cross) and fertilization; structure and function of endosperm and embryo (dicot and monocot), polyembryony, self-incompatibility.

Unit –IV

Taxonomy of flowering plants: Artificial (Linnaeus), natural (Bentham & Hooker) and phylogenetic (Engler and Prantl) systems of classification; Terminology pertaining to floral description, General characteristics (including economic importance) of following families of angiosperms; giving examples of few important genera: Solanaceae: *Solanum/Petunia*, Rutaceae: *Citrus, Murraya*, Cruciferae- *Brassica*, Apiaceae (Umbelliferae)- *Coriander*, Asteraceae - *Helianthus*, Leguminosae –*Cassia/Acacia*/Sweet pea, Poaceae (Graminae)- *Triticum*.

Suggested Readings:

1. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms, 4th revised and enlarged edition. Vikas Publishing House, Delhi.
2. Dickinson, W.C. (2009). Integrative Plant Anatomy. Harcourt Academic Press, USA.

3. Hopkins, W.G. and Huner, P.A. (2008). Introduction to Plant Physiology. John Wiley and Sons.
4. Taiz, L. and Zeiger, E. (2006). Plant Physiology, 4 th edition, Sinauer Associates Inc .MA, USA.
5. Vashistha, P.C., Sinha, A.K. and Kumar, A.Pteridophyta. New Delhi: S. Chand, 2010. Print.
6. Singh, G.Plant Systematics: Theory and Practice. 3rded. New Delhi: Oxford & IBH Pvt. Ltd., 2012.Print.
7. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A., Minorsky P.V. and Jackson R.B.Biology. 8thed. USA: Pearson Benjamin Cummings, 2008. Print.
8. Sharma, P.D.Plant Pathology. India: Rastogi Publication, 2011. Print.
9. Webster, J. and Weber, R. Introduction to Fungi. 3rded. Cambridge: Cambridge University Press, 2007. Print.
10. Sethi, I.K. and Walia, S.K.Text book of Fungi and Their Allies. India: Macmillan Publishers, 2011. Print.
11. Vanderpoorten, A. and Goffinet, B. Introduction to Bryophytes. Cambridge: Cambridge University Press, 2009. Print.

Bachelor of Science (Hons.) Biotechnology Semester-I

Session: 2025-2026

Botany-I

Course Code: BBTM-1074

Course outcomes: After passing this course the student will be able to:

CO1: Understand the anatomy of dicot root, stem and leaf.

CO2: Understand structure and development of anther, male gametophyte, ovule, female gametophyte and endosperms.

CO3: Understand the description of flowers including floral diagram, floral formula, V.S. of flower of various angiosperm families.

CO4: Understand the morphology and economic importance of different angiosperm families.

Bachelor of Science (Hons.) Biotechnology Semester-I

Session: 2025-2026

Lab in Botany-I

Course Code: BBTM-1074

(Practical)

Time: 3 Hrs.

Max. Marks: 20

Credits (L-T-P): 0-0-1

Instructions for the paper setter: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

Experiments:

Plant Anatomy:

Anatomical studies of stem, root and leaf in *Helianthus* and maize plant.

Embryology:

Study of the permanent slides pertaining to micro and megasporogenesis and female gametophytes and endosperms.

Taxonomy:

- a) Description of flowers including floral diagram, floral formula, V.S. of flower of the representative genera of families mentioned in syllabus.
- b) Identification and short morphological economic note on the specimens included in Unit IV of the theory paper.

Suggested Readings:

1. Bhojwani, S.S. and Bhatnagar, S.P. (2000). The Embryology of Angiosperms, 4th revised and enlarged edition. Vikas Publishing House, Delhi.
2. Peau, K. (1977). Anatomy of Seed Plants, 3rd edition. John Wiley & Sons, New York.
3. Pegeri, K. And Vander Pijl (1979). The Principles of Pollination Biology, Pergamon Press, Oxford.
4. Dickinson, W.C. (2000). Integrative Plant Anatomy. Harcourt Academic Press, USA.
5. Fahn, A. (1974). Plant Anatomy. Pergmon Press, USA and UK.
6. Hopkins, W.G. and Huner, P.A. (2008). Introduction to Plant Physiology. John Wiley and Sons.
7. Taiz, L. and Zeiger, E. (2006). Plant Physiology, 4 th edition, Sinauer Associates Inc .MA, USA.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULLUM OF EXAMINATION OF THREE YEAR DEGREE PROGRAMME

Bachelor of Science (Hons.) Biotechnology Semester-IV (Session 2025-2026) Botany-II

Course Code	Course Title	Course Type	Credits			Total Credits	L	P	CA	Marks
			L	T	P					
BBTM-4074	Botany-II	C	3	0	1	4	50	20	30	100

Bachelor of Science (Hons.) Biotechnology Semester-IV

Session: 2025-2026

Botany-II

Course code: BBTM-4074

(Theory)

Course outcomes: After passing this course the student will be able to:

CO1: Understand the stages of plant development and the physiological mechanisms regulating growth and differentiation.

CO2: Explain the mechanisms of photosynthesis, including light harvesting, electron transport, and CO₂ fixation pathways.

CO3: Analyze how various environmental factors influence plant physiology and metabolism.

CO4: Recognize the structure, function, importance, and applications of plant cells in biological and environmental contexts.

Bachelor of Science (Hons.) Biotechnology Semester-IV

Session: 2025-2026

Botany-II

Course code: BBTM-4074

(Theory)

Time: 3 Hrs.

Credits (L-T-P): 3-0-0

Max. Marks: 100

Theory: 50

Practical: 20

C.A.:30

Instructions for the Paper Setters:

Eight questions of equal marks (10 marks each) are to be set, two in each of the four Sections (A-D). Questions of Sections A-D should be set from Units I-IV of the syllabus respectively. Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting atleast one question from each section. The fifth question may be attempted from any Section.

Section A

Nutrition, Transport and Stress responses in plants: Macronutrients and micronutrients and their deficiency symptoms; Water relations, osmosis, transpiration, water potential & its components, ascent of sap and transport of organic solutes. Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses.

Section B

Photosynthesis: Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO₂ fixation-C₃, C₄ and CAM pathways.

Section C

Plant Pathology & epidemiology: Definitions, classification, mode of transmission & control measures of plant diseases; host-pathogen interaction, Disease resistance, phytoalexins, PR proteins. A brief account of the following plant diseases with respect to casual agents, symptoms, epidemiology and their control measures : Black stem rust of wheat, Loose smut of wheat, Late and early blight of potato, Red rot of sugarcane, TMV of potato, Yellow vein mosaic of bhindi.

Section D

Biodiversity: Physical environment; biotic environment; biotic and abiotic interactions. Concept of habitat and niche; Characteristics of a population; population growth curves; population regulation; Major terrestrial biomes; biogeographical zones of India.

Suggested Readings:

1. Sharma, P.D. Plant Pathology. India: Rastogi Publication, 2011. Print.
2. Sharma, P.D. Ecology and Environment. 8th ed. India: Rastogi Publications, 2010. Print.
3. Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A. Plant Physiology and Development. 6th ed. USA: Sinauer Associates Inc., 2015. Print.
4. Hopkins, W.G. and Huner, A. Introduction to Plant Physiology. 4th ed. USA: John Wiley and Sons, 2008. Print.
5. Shibu, J., Singh, H.P., Batish, D.R. and Kohli, R.K. Invasiv

Bachelor of Science (Hons.) Biotechnology Semester-IV

Session: 2025-2026

Botany-II

Course Code: BBTM-4074

Course outcomes: After passing this course the student will be able to:

CO1: Estimate relative water content and osmotic potential in plant tissues using standard physiological methods.

CO2: Demonstrate key processes in plant water relations, including transpiration pull and oxygen evolution during photosynthesis.

CO3: Separate and identify plant pigments using chromatography techniques such as paper chromatography and TLC.

CO4: Identify major plant diseases by observing symptoms and morbid anatomy caused by fungal, bacterial, and viral pathogens.

Bachelor of Science (Hons.) Biotechnology Semester-IV

Session: 2025-2026

Botany-II

Course Code: BBTM-4074

(Practical)

Time: 3 Hrs.

Credits (L-T-P): 0-0-1

Max. Marks: 20

Instructions for the paper setter: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same may be submitted for the record to COE Office, Kanya Maha Vidyalaya, Jalandhar.

1. Estimation of relative water content of leaf.
2. Measurement of osmotic potential of different tissues by Chardakov method.
3. Demonstrate the transpiration pull by mercury method.
4. Demonstration that O₂ is evolved during photosynthesis.
5. Separation of pigments by paper chromatography/TLC method
6. Study of Plant pathogens (a) Symptoms of the diseases (b) Morbid anatomy of the plants infected with following diseases. Black stem rust of wheat, Loose smut of wheat, Late and early blight of potato, Red rot of sugarcane, TMV of potato, Yellow vein mosaic of bhindi.

Suggested Readings:

1. Sharma, P.D. Plant Pathology. India: Rastogi Publication, 2011. Print.
2. Sharma, P.D. Ecology and Environment. 8th ed. India: Rastogi Publications, 2010. Print.
3. Taiz, L., Zeiger, E., Moller, I.M. and Murphy, A. Plant Physiology and Development. 6th ed. USA: Sinauer Associates Inc., 2015. Print.
4. Hopkins, W.G. and Huner, A. Introduction to Plant Physiology. 4th ed. USA: John Wiley and Sons, 2008. Print.
5. Shibu, J., Singh, H.P., Batish, D.R. and Kohli, R.K. Invasive