

FACULTY OF LIFE SCIENCES

Syllabus

for the award of Degree in

Bachelor of Science (Medical) (Honours)

(Offered under 4-year Degree Programme)

(Under Credit Based Continuous Evaluation Grading System under NEP 2020)

(SEMESTER I-VI)

Session: 2026-2027



Kanya Maha Vidyalaya, Jalandhar (Autonomous)

The Heritage Institution

Bachelor of Science (Medical) (Honours) (Session 2026-2027)

Programme Specific Outcomes:

Upon successful completion of this course, students will be able to:

- PSO1. Acquire knowledge on basic, important concepts in the field of biology such as diversity, physiology, Evolution, Genetics, Developmental Biology and Comparative Anatomy and can be applied to various fields of Biotechnology.
- PSO 2. Describe the diversity, ecological and evolutionary importance of animal life ranging from the single celled protozoan to the highly complex vertebrates. They will also learn to describe the various aspects of morphology, physiology and embryology in nonchordate and chordate life forms.
- PSO3. Apply appropriate techniques and modern instruments for animal physiology, biochemical estimations, cellular activities of animals and other medical laboratory technologies with an understanding of the application.
- PSO4. Acquaint the students about the Botany, importance of nature, classification, morphology, biology, structure, life cycle and economic importance of microorganisms and Plants.
- PSO5. Understand Botanical Nomenclature, Classification, plant diversity, conservation, phylogenetic, relationships and development.
- PSO6. Understand role of plant sciences in the pursuit of many applied sciences like Agriculture, Horticulture, Sericulture, Forestry, Biotechnology and many more.
- PSO7. Demonstrate knowledge to help acquire, articulate, retain, and employ practical skills relevant to Food Chemistry and Nutrition, Food Plant Hygiene and Sanitation, Food Processing and Packaging, Quality Assurance, Food analysis, Food Plant Layout and Management. Students will demonstrate engagement in the Food Science discipline through involvement in research or internship activities.
- PSO8. Demonstrate knowledge to help acquire, articulate, retain, and employ practical skills relevant to Fundamentals of Microbiology, Basics of Food Microbiology, Microbial Nutrition and Metabolism, Microbial Ecology, Applied Microbiology. Students will demonstrate engagement in the Microbiology discipline through involvement in research or internship activities.
- PSO9. Demonstrate knowledge of chemistry and apply this knowledge to analyse a variety of chemical phenomena and will be able to interpret and analyse quantitative data.

PSO10. Understand theoretical concepts of instruments that are commonly used in most chemistry fields as well as interpret and use data generated in instrumental physical and chemical analyses.

PSO11. To train students in multidisciplinary and interdisciplinary areas in chemical sciences. They will also be able to employ critical thinking and scientific inquiry in the performance, design, interpretation and documentation of laboratory experiments, at a level suitable to succeed at an entry-level position in industry or a chemistry postgraduate program.

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULLUM OF EXAMINATIONS OF FOUR-YEAR DEGREE PROGRAM Bachelor of Science (Medical) (Honours) Session 2026-2027

Bachelor of Science (Medical) (Honours) Semester I								
Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		CA	Examination Time (in Hours)
					L	P		
BSML-1075	Botany (Diversity of Cryptogams)	DSC	4-0-0	100	70		30	3
BSMP-1075	Diversity of Cryptogams Lab		0-0-2	50	--	35	15	3

SCHEME AND CURRICULLUM OF EXAMINATIONS OF FOUR-YEAR DEGREE PROGRAM Bachelor of Science (Medical) (Honours) Session 2026-2027

Bachelor of Science (Medical) (Honours) Semester II								
Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		CA	Examination Time (in Hours)
					L	P		
BSML-2075	Botany (Cell Biology and Genetics)	DSC	4-0-0	100	70		30	3
BSMP-2075	Cell Biology and Genetics Lab		0-0-2	50	--	35	15	3
BSMM-2070	Medicinal Botany	SEC	2-0-1	100	50	20	30	3+2

Kanya Maha Vidyalaya, Jalandhar (Autonomous)

SCHEME AND CURRICULLUM OF EXAMINATIONS OF FOUR-YEAR DEGREE PROGRAM

Bachelor of Science (Medical) (Honours)

Session 2026-2027

Bachelor of Science (Medical) (Honours) Semester III								
Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		CA	Examination Time (in Hours)
					L	P		
BSML-3075	Botany (Diversity of Phanerogams)	DSC	4-0-0	100	70		30	3
BSMP-3075	Diversity of Phanerogams Lab		0-0-2	50	--	35	15	3

SCHEME AND CURRICULLUM OF EXAMINATIONS OF FOUR-YEAR DEGREE PROGRAM

Bachelor of Science (Medical) (Honours)

Session 2026-2027

Bachelor of Science (Medical) (Honours) Semester IV								
Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		CA	Examination Time (in Hours)
					L	P		
BSML-4075	Botany (Structure, Development And Reproduction In Flowering Plants)	DSC	4-0-0	100	70		30	3
BSMP-4075	Structure, Development And Reproduction In Flowering Plants Lab		0-0-2	50	--	35	15	3
BSMM-4070	Medicinal Botany	SEC	2-0-1	100	50	20	30	3+2

**SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR-YEAR DEGREE
PROGRAMME**
Bachelor of Science (Medical) (Honours)
Session-2026-27

Bachelor of Science (Medical) (Honours) Semester-V								
Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		C A	Examination time (in Hours)
					L	P		
BSML-5075	Botany (Plant physiology and Biochemistry)	DSC	4-0-0	100	70	--	30	3
BSMP-5075	Botany (Plant physiology and Biochemistry)-Lab		0-0-2	50	--	35	15	3
BSMI-5075	Summer Internship							

**SCHEME AND CURRICULUM OF EXAMINATIONS OF FOUR-YEAR DEGREE
PROGRAMME**
Bachelor of Science (Medical) (Honours)
Session-2026-27

Bachelor of Science (Medical) (Honours) Semester-VI								
Course Code	Course Name	Course Type	Credits	Total Marks	Ext.		CA	Examination time (in Hours)
					L	P		
BSML -6075	Botany (Plant Ecology)	DSC	4-0-0	100	70		30	3
BSMP -6075	Botany (Plant Ecology)– Lab		0-0-2	50		35	15	3
BSMM-6070	Medicinal Botany	SEC	2-0-1	100	50	20	30	3+2

Bachelor of Science (Medical) (Honours) Semester–I (Session 2026-27)

BOTANY (DIVERSITY OF CRYPTOGRAMS)

Course Code: BSMM-1075

(THEORY)

Course outcome:

After passing this course the student will be able to:

CO1: Understand the classification, characteristic features, life cycle and economic value of algae.

CO2: Develop knowledge about features, classification, life cycle and economic importance of fungi.

CO3: Build up a sound foundation Botany so that the students may be able to apply the acquired knowledge while interacting into the other fields of Botany.

CO4: Acquaint the students about the classification, morphology, biology and economic importance of various Pteridophytes.

Bachelor of Science (Medical) (Honours) Semester–I (Session 2026-27)
Course Title: Botany (Diversity of Cryptogams)
Course Code: BSML-1075
(THEORY)

Time: 3 Hrs.

Max. Marks: 100

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

Theory: 70

C.A.:30

Instructions for the Paper Setters:-

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit 1

Algae: General characters, classification and economic importance; important features and life history of Chlorophyceae– *Volvox*, *Oedogonium*; Xanthophyceae–*Vaucheria*; Phaeophyceae– *Ectocarpus*; Rhodophyceae–*Polysiphonia*.

Unit II

Fungi: Important features and life history of Mastigomycotina–*Phytophthora*; Zygomycotina–*Mucor*; Ascomycotina–*Saccharomyces*, *Peziza*; Basidiomycotina–*Puccinia*, *Agaricus*; Deuteromycotina–*Colletotrichum*. General account of Lichens.

Unit III

Bryophyta: Amphibians of plant kingdom displaying alternation of generations; structure, reproduction, ecology and economic importance. Classification of bryophytes, Structure and reproduction of *Marchantia* (Hepaticopsida), *Anthoceros* (Anthocerotopsida), *Funaria* (Bryopsida).

Unit IV

Pteridophyta: First vascular plant; classification; ecology and economic importance of pteridophytes. Important characteristics of Psilopsida, Lycopsida, Sphenopsida and Pteropsida. Structure and reproduction in *Rhynia*, *Lycopodium*, *Selaginella*, *Equisetum*, and *Pteris*

Suggested Readings:

1. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. (1996) Introductory Mycology (4th Edition), Wiley - Blackwell, USA.
2. Dube, H.C., (2007) A Textbook of Fungi, Bacteria and Viruses (3rd edition), Scientific Publishers, India
3. Dube, H.C., (2013) An Introduction to Fungi (4th edition), Scientific Publishers., India.
4. Goffinet B. (2008). Bryophyte Biology. Cambridge University Press, UK.
5. Sambamurty, S.S. (2013). A Textbook of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. I K International Publishing House Pvt Ltd., India
6. Sharma, O.P. (2014). Bryophyta. McGraw Hill Education Pvt Ltd., India.
7. Sharma, O.P., (2004), Text Book of Thallophytes. McGraw Hill Publishing Co., India.
8. Sharma, P.D., (2004), The Fungi, (2nd Edition) Rastogi Publication, India.
9. Srivastava, H.N., (2018), Diversity of Microbes and Cryptogams, Vol. I, Pradeep's Publication.
10. Vashishta, P.C, Sinha, A.K, Kumar, A., (2010). Botany for Degree Students Pteridophyta (Vascular cryptogams). S.S. Chand Publications.

Bachelor of Science (Medical) (Honours) Semester–I (Session 2026-27)
Botany (Diversity of Cryptogams Lab)
Course Code: BSMP-1075
(PRACTICAL)

Course outcome:

After passing this course the student will be able to:

CO1: Students will assess various phylogenetic information sources, such as ultrastructure and morphology, to understand algae and fungi.

CO2: Understand the evolutionary history and time-scale of non-vascular plants, including the development of the first terrestrial plants from green algae.

CO3: Identify fungal disease symptoms in host plants and study pathogen morphology through section cutting.

CO4: Identify and classify different types of lichens.

Bachelor of Science (Medical) (Honours) Semester–I (Session 2026-27)
Botany (Diversity of Cryptogams)
Course Code: BSMP-1075
(PRACTICAL)

Time: 3 Hrs

Credits (L-T-P): 0-0-2

Max. Marks: 50

Practical: 35

C.A.:15

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.

Suggested Laboratory Exercises:-

Teachers may select plants/material available in their locality/institution

1. Study of the genera included under algae and fungi.
2. Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophyta and Pteridophyta
3. Observation of disease symptoms in hosts infected by fungi.
4. Section cutting of diseased material and identification of the pathogens as per the theory syllabus.
5. Study of morphology of Lichens (crustose, foliose and fruticose).

Bachelor of Science (Medical) (Honours) Semester–II (Session 2026-27)
Course Title: Botany (Cell Biology and Genetics)
Course Code: BSML-2075
(THEORY)

Course outcome:

After passing this course the student will be able to: -

CO1: Explain the structure of cell and organelles associated with it.

CO2: Understand cellular envelopes and their functions.

CO3: Understand the chemical basis of hereditary material i.e., DNA, Mitosis, Meiosis and gene interactions

CO4: Understand different methods of gene expression in prokaryotes and eukaryotes AND various methods of genetic mutation and variations in living beings.

Bachelor of Science (Medical) (Honours) Semester–II (Session 2026-27)

Course Title: Botany (Cell Biology and Genetics)

Course Code: BSML-2075

(THEORY)

Time: 3 Hrs.

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

Max. Marks: 100

Theory: 70

C.A.:30

Instructions for the Paper Setters:-

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit-I

Nucleus: Ultrastructure; nuclear membrane; nucleolus; nucleoid in prokaryotes. Histone proteins: structure and function, Extra nuclear Genome: mitochondrial and plastid DNA; plasmids. Structure and function of cellular organelles.

The Cell Envelopes: Ultra structure of plasma membrane: bi-layer lipid structure, extrinsic and intrinsic proteins, functions. Ultra structure of cell wall, cell wall composition and its functions.

Unit-II

DNA the Genetic Material: DNA structure and its types (A, B, Z DNA); replication; DNA–protein interaction; the nucleosome model; genetic code; satellite and repetitive DNA, Cell Division: Mitosis; meiosis.

Unit-III

Genetic Inheritance: Mendelism; laws of segregation and independent assortment; linkage analysis; Incomplete dominance and co-dominance, multiple alleles, lethal alleles, epistasis, pleiotropy, penetrance and expressivity, polygenic inheritance.

Unit-IV

Gene expression: Structure of gene; transfer of genetic information; transcription, translation, protein synthesis, tRNA; ribosomes; regulation of gene expression in prokaryotes and eukaryotes.

Genetic Variations: Mutations, spontaneous and induced; transposable genetic elements; DNA, damage and repair

Suggested Readings:-

1. Johnson, A., Raff, L. and Walter, R. (2008). Molecular Biology of the Cell (5th Edition). Taylor and Francis Group, USA.
2. Brown, T.A. (2011). Genetics: A Molecular Approach (3rd Edition). BIOS Scientific Publishers, UK.

3. Fletcher, H., Hickey, I. and Winter, P. (2010). Instant Notes on Genetics (3rd edition) Taylor and Francis Group, USA.
4. Fukui, K. and Nakayama, S. (1996). Plant Chromosomes; Laboratory Methods, CRC Press, Boca Raton, Florida.
5. Gardner, E.J., Simmons, M.J. and Snustad, D.P. (2012). Principles of Genetics (8th Edition). Wiley Sons, USA.
6. Gunning, B.E.S. and Steer, M.W. (1996). Plant Cell Biology; Structure and Function, Jones and Barlett Publishers, Boston, Massachusetts.
7. Gupta, P.K. (2016). Cell and Molecular Biology, Rastogi Publications, Meerut, India.
8. Harns, N. and Oparka, K.J. (1994). Plant Cell Biology, A Practical Approach. IRL Press, at Oxford University Press, Oxford, UK.
9. Karp, G. (2013). Cell and Molecular Biology: Concepts and Experiments (7th Edition). Wiley Publishers, USA.
10. Kleinsmith, L.J. and Kish, V.M. (1995). Principles of Cell and Molecular Biology (2nd edition). Harper Collins College Publishers, New York, USA.
11. Krebs, B. E., Goldstein, E.S. and Kilpatrick, S.T. (2011). Lewins Genes X. Jones and Bartlett Publishers, LLC, UK.
12. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A. and Ploegh, H. (2016). Molecular Cell Biology, W.H. Freeman & Co., New York, USA.
13. Plopper, G. (2016). Principles of Cell Biology. Jones and Barnett Learning, Boston, Massachusetts.
14. Sharma, A.K. and Sharma, A. (1999). Plant Chromosomes; Analysis. Manipulation and Engineering, Harwood Academic Publishers, Australia.
15. Singh, B.D. (2007). Molecular Genetics. Kalyani Publishers, India.
16. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics (5th Edition). John Wiley and Sons Inc., U.S.A.

Bachelor of Science (Medical) (Honours) Semester–II (Session 2026-27)

Course Title: Botany (Cell Biology and Genetics Lab)

Course Code: BSML-2075

(PRACTICAL)

Course Outcome:

After passing this course the student will be able to:

CO1: Study of cell structure and plastids examination.

CO2: Understand microscopic structure of cell through light microscope and electron micrograph.

CO3: Evaluate methodologies in the design of genetics experimental procedures.

CO4: Analyze special chromosome types and apply inheritance laws using genetic data.

Bachelor of Science (Medical) (Honours) Semester–II (Session 2026-27)

Course Title: Botany (Cell Biology and Genetics Lab)

Course Code: BSML-2075

(PRACTICAL)

Time: 3 Hrs

Credits (L-T-P):0-0-2

Max. Marks: 50

Theory: 35

C.A.: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.

Suggested Laboratory Exercises:

1. To study cell structure from onion leaf peels; demonstration of staining and mounting methods.
2. Comparative study of cell structure in onion cells, *Hydrilla* and *Spirogyra*.
3. Study of cyclosis in *Tradescantia* Staminal Cells.
4. Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, *Lycopersicon* and *Capsicum*).
5. Examination of electron micrographs of eukaryotic cells with special reference to organelles.
6. Study of electron micrographs of viruses, bacteria, cyanobacteria and eukaryotic cells for comparative cellular organization.
7. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).
8. Cytological examination of special types of chromosomes: bar body, lampbrush and polytene chromosomes.
9. Working out the laws of inheritance using seed mixtures.
10. Working out the mode of inheritance of linked genes from test cross and/or F2 data.

Bachelor of Science (Medical) (Honours) Semester–II (Session 2026-27)
Course Title: Botany (Medicinal Botany)
Course Code: BSMM -2070
(Theory)

Course Outcomes:

After completion of course students will be able to:

CO1: Understand the historical significance and foundational concepts of Ayurveda, Siddha, and Unani medicinal systems.

CO2: Identify and conserve endangered and endemic medicinal plants.

CO3: Acquire skills in the propagation techniques of medicinal plants.

CO4: Explore ethnobotany and its application in traditional and modern medicine.

Bachelor of Science (Medical) (Honours) Semester–II (Session 2026-27)

Course Title: Botany (Medicinal Botany)

Course Code: BSMM -2070

(Theory)

Time: 3 Hrs.

Credits (L-T-P): 2-0-0

Max. Marks: 100

Theory: 50

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 may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit-I

1. History, Scope and Importance of Medicinal Plants: Indigenous Medicinal Sciences; Definition and Scope-*Ayurveda*: History, origin, *panchamahabhutas*, *saptadhatu* and *tridosha* concepts, *Rasayana*, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: *Umoor-e- tabiya*, tumors treatments/ therapy, polyherbal formulations.

Unit-II

2. Conservation of endangered and endemic medicinal plants: Definition; Endemic and Endangered medicinal plants, Red list criteria; *In situ* conservation: Biosphere reserves, sacred groves, National Parks; *Ex situ* conservation: Botanical Gardens.

Unit-III

3. Propagation of Medicinal Plants: Objectives and classification of nurseries; nursery practices including seed sowing, pricking, use of green house for nursery production, plant propagation through cuttings, layering, grafting and budding with suitable examples. Cultivation and propagation of selected medicinal plants :Amla (*Emblica officinalis*), Ashwagandha (*Withania somnifera*), Bahera (*Terminalia belerica*), Harhar (*Terminalia chibula*) and Aloe vera.

Unit-IV

4. Ethnobotany and Folk medicines:

Definition, scope and significance of ethnobotany; ethnobotany in India; methods of ethnobotanical studies; Palaeo-ethnobotany; ethnic communities of India and traditional ecological knowledge; ethnoecology; folk medicine, ethnomedicine and ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac disorders, infertility, diabetics, blood pressure and skin diseases.

Suggested Readings

1. Trivedi P C, 2006. Medicinal Plants: Ethnobotanical Approach, Agrobios, India.
2. Dhaduk, H. L, 2016, Medicinal Plants: Cultivation and Uses. India: DAYA Publishing House.
3. Shankar Gopal Joshi (2000). Medicinal Plants. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Bachelor of Science (Medical) (Honours) Semester–II (Session 2026-27)
Course Title: Botany (Medicinal Botany Lab)
Course Code: BSMM -2070
(PRACTICAL)

Time: 2 Hrs.

Practical: 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.

Suggested Laboratory Exercises

1. To visit the nurseries for the study of medicinal and aromatic plants.
2. To visit Botanical Garden and Herbal Garden for the identification of Medicinal Plants.
3. To study harvesting, drying, grading, storage, processing techniques for medicinal and aromatic plants.
4. Collection and Identification of locally used ethnobotanicals.
5. To extract essential oils from aromatic plants by hydrodistillation method.
6. To study major ethnomedicinal plants and practices followed in India.
7. Qualitative analysis of secondary metabolites from plant sample.

Bachelor of Science (Medical) (Honours) Semester–III (Session 2026-2027)

Course Title: Botany (Diversity of Phanerogams)

Course Code: BSML-3075

(THEORY)

Course outcome: -

After passing this course the student will be able to:

CO1: Develop an understanding of the characteristics of seed plants and the evolution of seeds in angiosperms and gymnosperms. Study the salient features, classification, evolutionary trends, and vegetative and reproductive morphology of representative gymnosperms such as *Pinus*, *Cycas* and *Ephedra*.

CO2: Acquire knowledge of the principles of Botanical Nomenclature, and the classification of angiosperms with emphasis on salient features of the systems proposed by Bentham and Hooker, Hutchinson, Engler and Prantl.

CO3: Understand the diversity, distinguishing characteristics and systematic position of flowering plant families like Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, Liliaceae, Orchidaceae and Poaceae.

CO4: Gain knowledge of the diversity, diagnostic features and economic importance of flowering plant families like Ranunculaceae, Brassicaceae, Rutaceae, Fabaceae, Apiaceae, Acanthaceae, Asteraceae.

Bachelor of Science (Medical) (Honours) Semester–III (Session 2026-2027)

Course Title: Botany (Diversity of Phanerogams)

Course Code: BSML-3075

(THEORY)

Time: 3 Hrs.

Max. Marks: 100

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

Theory: 70

C.A.:30

Instructions for the Paper Setters:-

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit I

Seed plants: Characteristics, distinguishing features of angiosperms and gymnosperms, primitive angiosperms.

Gymnosperms: General features, classification, diversity of Gymnosperms including fossil and living gymnosperms; Geological time scale and fossilization. Study of Morphology, anatomy (root, Stem and leaf) and reproduction (life-cycle) of *Pinus*, *Cycas*, and *Ephedra*.

Unit II

Angiosperm Taxonomy: Brief history, Aims and fundamental components (alpha-taxonomy, Omega-taxonomy, Holotaxonomy); Identification keys. Botanical nomenclature: Taxonomic ranks; Type concept; Principle of priority. Systems of Plant Taxonomy: Artificial, Natural and Phylogenetic systems of classification. Salient features of the systems proposed by Bentham and Hooker, Engler and Prantl, Hutchinson.

Unit III

Diversity of flowering plants as illustrated by members of the families Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Chenopodiaceae, Euphorbiaceae, Liliaceae, Orchidaceae and Poaceae.

Unit IV

Diversity of flowering plants as illustrated by members of the families Ranunculaceae, Brassicaceae, Rutaceae, Fabaceae, Apiaceae, Acanthaceae, Asteraceae.

Suggested Readings:-

1. Angiosperm Phylogeny Group (2003). An update of the Angiosperm Phylogeny Group classification for the orders and families of the flowering plants: APG
2. Bendre, A. (2007). Practical Botany, Rastogi Publications, Meerut.
3. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms, New Age International Limited, New Delhi. 2. Gifford, E.M. and Foster, A.S. (1988). Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.
4. Botanical Journal of the Linnaean Society 141: 399-436. 2. Cronquist, A. (1981). An Integrated System of Classification of Flowering Plants. Columbia University Press, New York.
5. Davis, P.H. and Heywood, V.H. (1963). Principles of Angiosperm Taxonomy, Oliver and Boyd, London.
6. Gifford, E.M. and Foster, A.S. (1988). Morphology and Evolution of Vascular Plants, W.H. Freeman & Company, New York.
7. Jeffrey, C. (1982). An Introduction to Plant Taxonomy, Cambridge University Press, Cambridge, London.
8. Jones, S.B., Jr. and Luchsinger, A.E. (1986). Plant Systematics (2nd edition). McGraw- Hill Book Co., New York.
9. Pellant, C. (1994). Fossils, Dragon's World, Great Britain
10. Radford, A.E. (1986). Fundamental of Plant Systematics, Harper and Row, New York
11. Simpson, M.C. (2006). Plant Systematics. Elsevier, Amsterdam
12. Sporne, K.R. (1965). The Morphology of Gymnosperms, Hutchinson & Co. (Publishers) Ltd., London.
13. Taylor, T. N., Taylor, E. L. and Krings, M. (2008). Paleobotany: The Biology and Evolution of Fossil Plants (2nd Edition). Elsevier Inc. Netherlands.
14. Vashistha, P. C. (2016). Botany for degree students. S.Chand and Company, New Delhi

Bachelor of Science (Medical) (Honours) Semester–III (Session 2026-2027)

Course Title: Botany (Diversity of Phanerogams Lab)

Course Code: BSMP-3075

(PRACTICAL)

Course outcome:

After passing this course the student will able to:

CO1: Demonstrate practical knowledge of vegetative and reproductive structures of *Cycas*, *Pinus* and *Ephedra* through specimen observation, dissection, and slide analysis.

CO2: Analyze anatomical features of gymnosperm organs using transverse, longitudinal, and vertical sections, including reproductive structures and developmental stages.

CO3: Identify and classify representative angiosperms from major plant families using morphological and floral characteristics.

CO4: Demonstrate understanding of taxonomic diversity and key diagnostic features of selected dicot and monocot families.

Bachelor of Science (Medical) (Honours) Semester–III (Session 2026-2027)

Course Title: Botany (Diversity of Phanerogams Lab)

Course Code: BSMP-3075

(PRACTICAL)

Time: 3 Hrs

Max. Marks: 50

Credits (L-T-P): 0-0-2

Practical: 35

C.A.:15

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.

Suggested Laboratory Exercises:-

1. Gymnosperms

Cycas (i) Habit, armour of leaf bases on the stem (if specimen is not available show Photography), very young leaf (circinate vernation) and old foliage leaves, scale leaf, bulbils, male cone (specimen); Microsporophyll, megasporophyll mature seed. (ii) Study through permanent slides—normal root (T.S.), stem (T.S.) (if sections are not available show photographs), ovule (L.S.). (iii) Study through hand sections or dissections-coralloid root (T.S.), rachis (T.S.), leaflet (V.S.), microsporophyll (V.S.), pollen grains (W.M.).

Pinus (i) Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1st year, 2nd year and 3rd year female cones, winged seeds. (ii) Study through permanent slides-root (T.S.), female cone (L.S.) ovule (L.S.), embryo (W.M.) showing polycotyledonous condition. (iii) Study through hand sections or dissections-young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S. male cone (L.S.), male cone (T.S.), Pollen grains (W.M.).

Ephedra (i) Habit and structure of whole and female cones. (ii) Permanent slides-female cone (L.S.). (iii) Hand sections/dissections-node (L.S.), internode (T.S.), macerated stem to see vessel structure; epidermal peel mount of vegetative parts to study stomata, male cone (T.S. and L.S.), Pollen grains.

2. Angiosperms

This list is only indicative. Teachers may select plants/material available in their locality/institution.

1. Ranunculaceae: *Ranunculus*, *Delphinium*
2. Brassicaceae: *Brassica*, *Alyssum*, *Iberis*, *Coronopus*.
3. Malvaceae: *Hibiscus*, *Abutilon*.
4. Rutaceae: *Murraya*, *Citrus*.
5. Fabaceae: Faboideae: *Lathyrus*, *Cajanus*, *Melilotus*, *Trigonella*, Caesalpinioideae: *Cassia*, *Caesalpinia*, Mimosoideae: *Prosopis*, *Mimosa*, *Acacia*.
6. Apiaceae: *Coriandrum*, *Foeniculum*, *Anethum*.
7. Acanthaceae: *Adhatoda*, *Peristrophe*.
8. Apocynaceae: *Vinca*, *Thevetia*, *Nerium*.
9. Asclepiadaceae: *Calotropis*.
10. Solanaceae: *Solanum*, *Withania*, *Datura*.
11. Euphorbiaceae: *Euphorbia*, *Phyllanthus*.

12. Lamiaceae: *Ocimum*, *Salvia*.
13. Chenopodiaceae: *Chenopodium*, *Beta*.
14. Liliaceae: *Asphodelus*, *Asparagus*.
15. Poaceae: *Avena*, *Triticum*, *Hordeum*, *Poa*, *Sorghum*.

Bachelor of Science (Medical) (Honours) Semester–IV (Session 2026-2027)

**Course Title: Botany (Structure, Development and Reproduction
In Flowering Plants)**

Course Code: BSML-4075

Course outcome:

After passing this course the student will be able to: -

CO 1: Understand the structural organization and development of the shoot system in flowering plants, including meristematic activity, tissue differentiation, and secondary growth.

CO 2: Explain the structure and function of wood, secondary phloem, and leaves, including their roles in transport, photosynthesis, stress adaptation, and senescence.

CO 3: Understand root structure, development, and modifications, along with methods and economic significance of vegetative reproduction, including grafting and budding.

CO 4: Understand flower structure, pollination mechanisms, fertilization processes, and seed and fruit development, including their ecological roles and dispersal strategies.

Bachelor of Science (Medical) (Honours) Semester–IV (Session 2026-2027)

**Course Title: Botany (Structure, Development and Reproduction
In Flowering Plants)**

Course Code: BSML-4075

Time: 3 Hrs.

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

Max. Marks: 100

Theory: 70

C.A.:30

Instructions for the Paper Setters:-

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit I

The basic body plan of a flowering plant: Diversity in plant form; branching pattern; monopodial and sympodial growth; canopy architecture.

The Shoot System: The shoot apical meristem and its histological organization; meristematic and permanent tissue, formation of internodes. Cambium and its functions; formation of secondary xylem.

Unit II

General account of wood structure: Role in conduction of water and minerals; characteristics of growth rings, sapwood and heart wood; secondary phloem-structure function relationships; periderm.

Leaf: Origin, development, arrangement and diversity in size and shape; internal structure in relation to photosynthesis and water loss; adaptations to water stress; senescence and abscission.

Unit III

The Root System: The root apical meristem; differentiation of primary and secondary tissues and their roles; structural modification for storage, respiration, reproduction and for interaction with microbes.

Vegetative Reproduction: Methods of vegetative propagation, detailed study and types of grafting and budding, economic aspects.

Unit IV

Flower: A modified shoot; structure, development and varieties of flower; functions, structure of anther and pistil; the male and female gametophytes; types of pollination; attractions and reward for pollinators; (sucking and foraging types); pollen-pistil interaction self-incompatibility.

Double fertilization: formation of seed endosperm and embryo; fruit development and maturation Significance of seed; ecological adaptation; dispersal strategies.

Bachelor of Science (Medical) (Honours) Semester–IV (Session 2026-2027)

Suggested Readings:-

1. Beck, C.B. (2010). An Introduction to Plant Structure and Development: Plant anatomy for the Twenty First Century (2nd Edition). Cambridge University Press, UK.
2. Bhojwani, S.S. and Bhatnagar, P. (2000). The Embryology of Angiosperms (4th revised and enlarged edition), Vikas Publishing House, New Delhi.
3. Cutler, D. F., Botha, T. and Stevenson, D. M. (2007). Plant Anatomy: An Applied Approach. Blackwell Publishing, Oxford, UK.
4. Dickison, W.C. (2000). Integrative Plant Anatomy. Academic Press, California, USA.
5. Hartmann, H.T. and Kestler, D.E. (1976). Plant Propagation: Principles and Practices, 3rd edition, Prentice Hall of India Pvt. Ltd., New Delhi.
6. Mauseth, J.D. (1988). Plant Anatomy, The Benjamin/Cummings Publishing Company Inc., Menlo Park, California, USA.
7. Peau, K (1977) Anatomy of Seed Plants, 3rd edition. John Wiley & Sons, New York.
8. Pegeri, K. and Vander Pijl (1979). The Principles of Pollination Biology, Pergamon Press, Oxford.
9. Raven, P.H., Evert, R.F. and Eichhorn, S.E. (1999). Biology of Plants, 5th edition. W.H. Freeman and Co., Worth Publishers, New York.
10. Rudall, P. J. (2007). Anatomy of Flowering Plants: An Introduction to Structure and Development (3rd Edition). Cambridge University Press, UK.
11. Steeves, T.A. and Sussex, I.M. (1989). Patterns in Plant Development (2nd Edition). Cambridge University Press, Cambridge.
12. Thomas, P. (2000) Trees: Their Natural History, Cambridge University Press, Cambridge.

Bachelor of Science (Medical) (Honours) Semester–IV (Session 2026-2027)
Course Title: Botany (Structure, Development and Reproduction
In Flowering Plants Lab)
Course Code: BSMP-4075
(PRACTICAL)

Course Outcome

After passing this course the student will be able to:

CO1: Develop knowledge about the role of herbarium techniques in plant identification.

CO2: Understand different life forms exhibited by flowering plants.

CO3: Understand anatomy of different plant parts using free hand razor technique.

CO4: Examine flower and their mode of pollination.

Bachelor of Science (Medical) (Honours) Semester–IV (Session 2026-2027)
Course Title: Botany (Structure, Development and Reproduction
In Flowering Plants Lab)
Course Code: BSMP-4075
(PRACTICAL)

Time: 3 Hrs
Credits (L-T-P):0-0-2

Max. Marks: 50
Practical: 35
C.A.:15

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.

Suggested Laboratory Exercises

1. Study of any commonly occurring dicotyledonous plant (for example *Solanum nigrum* or *Kalanchoe*) to the body plan, organography and modular type of growth.
2. Life forms exhibited by flowering plants (by a visit to a forest or a garden, Study of tree like habit in cycads, bamboo, banana, traveller's tree (*Revenala madagascariensis*) and *Yucca* and comparison with true trees as exemplified by conifers and dicotyledons.
3. L.S. Shoot tip to study the cytohistological zonation and origin of leaf primordia.
4. Monopodial and sympodial types of branching in stems (especially rhizomes).
5. Anatomy of primary and secondary growth in monocots and dicots using free hand razor technique (*Solanum*, *Boerhavia*, *Helianthus*, *Mirabilis*, *Nyctanthus*, *Draceana*, Maize) hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood, microscopic study of wood in T.S., T.L.S. and R.L.S.
6. Field study of diversity in leaf shape, size, thickness and surface properties. Internal structure of leaf. Structure and development of stomata (using epidermal peels of leaf).
7. Anatomy of the root. Primary and secondary structure.
8. Examination of a wide range of flowers available in the locality and methods of their pollination.
9. Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts). Pollen viability using in vitro pollen germination.
10. Structure of ovule and embryo sac development using serial sections from permanent slides.
11. Nuclear and cellular endosperm. Embryo development in monocots and dicots (using permanent slides/dissections).
12. Simple experiments to show vegetative propagation (leaf cuttings in *Bryophyllum*, *Sansevieria*, *Begonia*; stem cuttings in rose, *Salix*, money plant, Sugarcane and *Bougainvillea*).
13. Germination of non-dormant and dormant seeds.

Bachelor of Science (Medical) (Honours) Semester V (Session 2026-27)

Course Title: - Botany (Plant Physiology and Biochemistry)

Course Code: - BSML-5075

Course Outcome:

After passing this course student will be able to:

CO1: Understand plant-water relations, stomatal physiology, mineral nutrition, nutrient deficiency symptoms, and the mechanisms of phloem transport and source–sink interactions in plants.

CO2: Gain knowledge of photosynthesis, including major carbon fixation pathways, and understand the physiological processes involved in seed germination, flowering, senescence, fruit ripening, and hormonal regulation of plant growth and development.

CO3: Develop an understanding of cellular respiration, ATP production, Krebs cycle, electron transport system, oxidative phosphorylation, and the role of metabolic pathways in energy generation.

CO4: Understand the principles of nitrogen and lipid metabolism, including nitrogen fixation, nitrate assimilation, fatty acid biosynthesis, β -oxidation, and lipid storage and mobilization in plants.

Bachelor of Science (Medical) (Honours) Semester V (Session 2026-27)

Course Title: -Botany (Plant Physiology and Biochemistry)

Course Code: - BSML-5075

Time: 3 Hrs.

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

Max. Marks: 100

Theory: 70

C.A.:30

Instructions for the Paper Setters: -

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit I

Plant-Water Relation: Importance of water to plant life, physical properties of water, (imbibition) diffusion and osmosis, absorption, transport of water and transpiration, physiology of stomata.

Mineral Nutrition: Essential macro-and micro-elements and their role, mineral uptake, deficiency and toxicity symptoms (hydroponics).

Transport of Organic Substances: Mechanism of phloem transport, source-sink relationship, factors affecting translocation.

Unit II

Photosynthesis: Significance, historical aspects, photosynthetic pigments, action and absorption spectra and enhancement effects, concept of two photosystems, z-scheme, photophosphorylation, Calvin cycle, C₄ pathway, CAM plants, photorespiration.

Growth and Development: seed germination and factors of their regulation, plant movements, the concept of photoperiodism, physiology of flowering, physiology of senescence, fruit ripening, plant hormones.

Unit III

Respiration: ATP-the biological energy currency, aerobic and anaerobic respiration, Krebs' cycle, electron transport mechanism (chemi-osmotic theory), redox potential, oxidative phosphorylation, pentose phosphate pathway.

Unit IV

Nitrogen and Lipid Metabolism: Biology of nitrogen fixation, importance of nitrate reductase and its regulation, ammonium assimilation, structure and function of lipids, fatty acid biosynthesis, β -oxidation, saturated and unsaturated fatty acids, storage and mobilization of fatty acids.

Suggested Readings: -

1. Bowsher, C. and Tobin, A. (2021). *Plant Biochemistry*. 2nd Edition. Garland Science/CRC Press.
2. Buchanan, B.B., Gruissem, W. and Jones, R.L. (2015). *Biochemistry and Molecular Biology of Plants*. 2nd Edition. Wiley-Blackwell.
3. Devlin, R.M. and Witham, F.H. (1983). *Plant Physiology* (4th Edition). CBS Publishers / Indian reprint.
4. Epstein, E. and Bloom, A.J. (2004/2005). *Mineral Nutrition of Plants: Principles and Perspectives*. 2nd Edition. Sinauer Associates/Oxford University Press.
5. Heldt, H.W. and Piechulla, B. (2010/2011). *Plant Biochemistry*. 4th Edition. Academic Press/Elsevier.
6. Hopkins, W.G. and Hüner, N.P.A. (2008/2009). *Introduction to Plant Physiology*. 4th Edition. Wiley.
7. Jain, V.K. (2025). *Fundamentals of Plant Physiology* (21st Edition). S. Chand Publishing.
8. Jain, V.K. (2025). *Fundamentals of Plant Physiology*. 21st Edition. S. Chand Publishing.
9. Marschner, P. ed. (2011/2012). *Marschner's Mineral Nutrition of Higher Plants*. 3rd Edition. Academic Press/Elsevier.
10. Noggle, G.R. and Fritz, G.J. (1983). *Introductory Plant Physiology* (2nd Edition). Prentice Hall.
11. Pandey, S.N. and Sinha, B.K. (2009). *Plant Physiology* (4th Edition). Vikas Publishing House.
12. Pandey, S.N. and Sinha, B.K. (2009). *Plant Physiology*. 4th Edition. Vikas Publishing House.
13. Salisbury, F.B. and Ross, C.W. (1991/1992). *Plant Physiology*. 4th Edition. Wadsworth Publishing Company.
14. Taiz, L., Møller, I.M., Murphy, A. and Zeiger, E. (2022/2023). *Plant Physiology and Development*. 7th Edition. Oxford University Press.
15. Verma, V. (2007). *Textbook of Plant Physiology*. Ane Books India.

Bachelor of Science (Medical) (Honours) Semester V (Session 2026-27)

SEMESTER–V

Course Title: - Botany (Plant Physiology and Biochemistry Lab)

Course Code: - BSMP-5075

Course Outcomes (COs):

After passing this course student will be able to:

CO1: Students will develop practical skills to investigate plant-water relations, including osmosis, imbibition, water potential, permeability of plasma membranes, transpiration, and ascent of sap through laboratory experiments.

CO2: Students will acquire proficiency in biochemical techniques such as protein estimation, enzyme assays, chromatography, and pigment separation for the analysis of plant metabolites and physiological processes.

CO3: Students will be able to perform experiments related to photosynthesis, respiration, growth, and plant hormone bioassays, and interpret the physiological responses of plants under different environmental conditions

CO4: Students will develop the ability to record observations, analyse experimental data, and apply scientific methods for understanding fundamental concepts of plant physiology and biochemistry.

Bachelor of Science (Medical) (Honours) Semester V (Session 2026-27)
Course Title: - Botany (Plant Physiology and Biochemistry) Lab
Course Code: - BSMP-5075

Time: 3 Hrs

Credits (L-T-P):0-0-2

Max. Marks: 50

Theory: 35

C.A.:15

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.

Suggested Laboratory Exercises:

1. To study the permeability of plasma membrane using different concentrations of organic solvents.
2. To study the effects of temperature on permeability of plasma membrane.
3. To prepare the standard curve of protein and determine the protein content in unknown samples.
4. To study the enzyme activity of catalase and peroxidase as influenced by pH and temperature.
5. Separation of chloroplast pigments by solvent method.
6. Determining the osmotic potential of vacuolar sap by plasmolytic method.
7. Determining the water potential of any tuber.
8. Separation of amino acids in a mixture by paper chromatography and their identification by comparison with standards.
9. Bioassay of auxin, cytokinin, GA, ABA and ethylene using appropriate plant material.
10. Demonstrate the ascent of sap using a dye.
11. Demonstrate the transpiration pull by mercury method.
12. Demonstration of osmosis by potato osmoscope.
13. Comparison of loss of water from two surfaces of leaf by CoCl_2 method/four leaf method.
14. Demonstration of imbibition by plaster of paris method.
15. Demonstration that O_2 is evolved during photosynthesis.
16. Separation of pigments by paper chromatography/TLC method.
17. Demonstration of phototropism movements.
18. Demonstration the measurements of growth by arc auxanometer.

Suggested Readings: -

1. Bajracharya, D. (1999). Experiments in Plant Physiology: A Laboratory Manual. Narosa Publishing House, New Delhi.
2. Devi, P. (2000). Principles and Methods of Plant Molecular Biology, Biochemistry and Genetics. Agrobios, Jodhpur, India.
3. Harborne, J.B. (1998). Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis (3rd Edition). Chapman & Hall, London.
4. Hopkins, W.G. and Hüner, N.P.A. (2008). Introduction to Plant Physiology (4th Edition). John Wiley & Sons, USA.
5. Jayaraman, J. (1981). Laboratory Manual in Biochemistry. Wiley Eastern Ltd., New Delhi.
6. Kochhar, S.L. and Gujral, S.K. (2012). Comprehensive Practical Plant Physiology. Macmillan Publishers India Ltd., Delhi.
7. Moore, T.C. (1974). Research Experiences in Plant Physiology: A Laboratory Manual. Springer-Verlag, Berlin.
8. Plummer, D.T. (1996). An Introduction to Practical Biochemistry (3rd Edition). Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
9. Roberts, J. and Tucker, G.A. (eds.) (2000). Plant Hormone Protocols. Humana Press, New Jersey, USA.
10. Sadasivam, S. and Manickam, A. (2008). Biochemical Methods (3rd Edition). New Age International Publishers, New Delhi.
11. Sawhney, S.K. and Singh, R. (2000). Introductory Practical Biochemistry. Narosa Publishing House, New Delhi.
12. Scott, R.P.W. (1995). Techniques and Practice of Chromatography. Marcel Dekker, New York.
13. Taiz, L., Møller, I.M., Murphy, A. and Zeiger, E. (2022). Plant Physiology and Development (7th Edition). Oxford University Press/Sinauer Associates.
14. Wilson, K., Hofmann, A., Walker, J.M. and Clokie, S. (2018). Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology (8th Edition). Cambridge University Press.
15. Witham, F.H., Blaydes, D.F. and Devlin, R.M. (1971). Experiments in Plant Physiology. Van Nostrand Reinhold Company, New York.

Bachelor of Science (Medical) (Honours) Semester VI (Session 2026-27)

Course Title: - Botany (Plant Ecology)

Course Code: - BSML-6075

Course Outcomes:

After passing this course student will be able to:

CO1: Understand the influence of environmental factors such as atmosphere, water, light, temperature, soil, and biota on plant growth and distribution, and explain the morphological, anatomical, and physiological adaptations of plants to different ecological conditions.

CO2: Acquire knowledge of community ecology, including community characteristics, ecological parameters, biodiversity indices, life forms, biological spectrum, and ecological succession, and evaluate their significance in ecosystem functioning.

CO3: Understand the principles of population and ecosystem ecology, including population growth patterns, ecotypes, ecosystem structure, energy flow, food chains, food webs, ecological pyramids, and biogeochemical cycles.

CO4: Gain knowledge of the biogeographical regions and major vegetation types of India and analyze the concepts of landscape ecology, biodiversity hotspots, land-use dynamics, and the impact of habitat characteristics on biodiversity conservation.

Bachelor of Science (Medical) (Honours) Semester VI (Session 2026-27)

Course Title: - Botany (Plant Ecology)

Course Code: - BSML-6075

Time: 3 Hrs.

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

Max. Marks: 100

Theory: 70

C.A.:30

Instructions for the Paper Setters: -

Eight questions of equal marks (14 marks each) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit I

Plants and Environment: Atmosphere (gaseous compositions), water (properties of water cycle), light (global radiation, photosynthetically active radiation), temperature, soil (development, soil profiles, physico-chemical properties) and biota.

Morphological, anatomical and physiological responses of plants to water (hydrophytes and xerophytes), temperature (thermoperiodicity and vernalization), light (photoperiodism, heliophytes and sciophytes) and salinity.

Unit II

Community Ecology: Community characteristics, absolute and relative frequency, density and dominance, basal area and importance value index (IVI), Whittaker's classification of biodiversity, indices of alpha, beta and gamma diversity, life forms, biological spectrum, ecological succession.

Unit III

Population Ecology: Concept and characteristics of population; population density, natality, mortality, immigration and emigration; age structure and sex ratio; population dispersion patterns; population growth curves, exponential and logistic growth, carrying capacity; survivorship curves; population regulation; r- and K-selection; ecotypes and ecads.

Ecosystem: Structure, abiotic and biotic components, food chain, food web, ecological pyramids, energy flow, biogeochemical cycles of carbon, nitrogen and phosphorus.

Unit IV

Biogeographical Regions of India

Vegetation types of India: Forests and grasslands

Landscape Ecology: Definition & concept; effect of patch size and shape on biodiversity; dynamics of land use; hotspots.

Bachelor of Science (Medical) (Honours) Semester VI (Session 2026-27)

Suggested Readings:

1. Begon, M., Townsend, C.R. and Harper, J.L. (2021). Ecology: From Individuals to Ecosystems (5th Edition). Wiley-Blackwell.
2. Bowman, W.D., Hacker, S.D. and Cain, M.L. (2024/2025). Ecology (6th Edition). Oxford University Press.
3. Kumar, H.D. Modern Concept of Ecology (8th Edition). Vikas Publishing House, New Delhi.
4. MacKenzie, A., Ball, A.S. and Virdee, S.R. (2002). BIOS Instant Notes in Ecology (2nd Edition). Viva Books Pvt. Ltd., New Delhi.
5. Odum, E.P. and Barrett, G.W. (2005/2012 Indian reprint). Fundamentals of Ecology (5th Edition). Cengage Learning India Pvt. Ltd., New Delhi.
6. Primack, R.B. (2014). Essentials of Conservation Biology (6th Edition). Sinauer Associates.
7. Relyea, R. (2025). Ecology: The Economy of Nature (10th Edition). Macmillan Learning.
8. Sharma, P.D. (2025). Ecology and Environment (13th Edition). Rastogi Publications, Meerut.
9. Sher, A.A. and Molles, M.C. (2026). Ecology: Concepts and Applications (9th Edition / Current Release). McGraw Hill.
10. Singh, J.S., Singh, S.P. and Gupta, S.R. (2014). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
11. Smith, T.M. and Smith, R.L. (2022). Elements of Ecology (9th Edition). Pearson.
12. Turner, M.G. and Gardner, R.H. (2015). Landscape Ecology in Theory and Practice: Pattern and Process (2nd Edition). Springer.

Bachelor of Science (Medical) (Honours) Semester VI (Session 2026-27)

Course Title: - Botany (Plant Ecology Lab)

Course Code: - BSMP-6075

Course Outcomes:

After passing this course student will be able to:

CO1: Develop practical skills in vegetation analysis by applying ecological techniques to study species frequency, density, dominance, biomass, vegetation cover, and Importance Value Index (IVI) in different plant communities.

CO2: Assess biodiversity and community structure using ecological indices and vegetation profiling methods, and interpret the effects of environmental factors on plant distribution and abundance.

CO3: Acquire proficiency in analyzing soil, including bulk density, porosity, moisture content, and water-holding capacity. Water characteristics pH, salinity, temperature, transparency, and dissolved oxygen.

CO4: Understand plant adaptations to different habitats and evaluate environmental pollution through indicators such as leaf area injury, dust-holding capacity, and comparative studies of polluted and unpolluted ecosystems.

Bachelor of Science (Medical) (Honours) Semester VI (Session 2026-27)
Course Title: - Botany (Plant Ecology Lab)
Course Code: - BSMP-6075

Time: 3 Hrs

Credits (L-T-P):0-0-2

Max. Marks: 50

Theory: 35

C.A.:15

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.

Suggested Laboratory Exercises

1. To determine minimum number of quadrats required for reliable estimate of biomass in grasslands through species area curves.
2. To study the frequency of herbaceous species in grassland and to compare the frequency distribution with Raunkiaer's Standard Frequency Diagram.
3. To estimate Importance Value Index for grassland species on the basis of relative frequency, relative density and relative dominance in protected and grazed grassland.
4. To measure the vegetation cover of grassland through point frame method.
5. To measure the above ground plant biomass in a grassland.
6. To study the morphological anatomical features of hydrophytes (*Hydrilla*, *Eichhornia*) Xerophytes (*Nerium*, *Calotropis*).
7. To determine diversity indices (richness, Simpson, Shannon-Weaver) in grazed and protected grassland.
8. To estimate bulk density and porosity of grassland and woodland soils.
9. To determine moisture content and water holding capacity of grassland and woodland soil.
10. To study the vegetation structure through profile diagram.
11. To estimate transparency, pH and temperature of different water bodies.
12. To measure dissolved oxygen content in polluted and unpolluted water samples.
13. To estimate salinity of different water samples.
14. To determine the percent leaf area injury of different leaf samples collected around polluted sites.
15. To estimate dust-holding capacity of the leaves of different plant species.

Suggested Readings:

1. Allen, S.E., Grimshaw, H.M., Parkinson, J.A. and Quarmby, C. (1974). Chemical Analysis of Ecological Materials. Blackwell Scientific Publications.
2. APHA, AWWA and WEF. (2022). Standard Methods for the Examination of Water and Wastewater (24th Edition). American Public Health Association, Washington, DC.
3. Gupta, P.K. (2018). Methods in Environmental Analysis: Water, Soil and Air. Agrobios.
4. Kapur, P. and Govil, S.R. (2000/2004 reprint). Experimental Plant Ecology. CBS Publishers & Distributors, New Delhi.
5. Krebs, C.J. (2014). Ecological Methodology (3rd Edition). Benjamin Cummings / online revised chapters.
6. Ludwig, J.A. and Reynolds, J.F. (1988). Statistical Ecology: A Primer on Methods and Computing. Wiley-Interscience, New York.
7. Maiti, S.K. (2003). Handbook of Methods in Environmental Studies, Vol. 1: Water and Wastewater Analysis. ABD Publishers.
8. Maiti, S.K. (2003). Handbook of Methods in Environmental Studies, Vol. 2: Air, Noise, Soil and Overburden Analysis. ABD Publishers.
9. Michael, P. (1984/1986 reprint). Ecological Methods for Field and Laboratory Investigations. Tata McGraw-Hill Publishing Co. Ltd., New Delhi.
10. Misra, K.C. (1989). Manual of Plant Ecology. Oxford & IBH Publishing Co., New Delhi.
11. Moore, P.D. and Chapman, S.B. (1986). Methods in Plant Ecology (2nd Edition). Blackwell Scientific Publications.
12. Saxena, M.M. (1998). Environmental Analysis: Water, Soil and Air. Agro Botanical Publishers.
13. Sharma, P.D. (2025). Ecology and Environment (13th Edition). Rastogi Publications, Meerut.
14. Trivedy, R.K. and Goel, P.K. (1986). Chemical and Biological Methods for Water Pollution Studies. Environmental Publications, Karad.