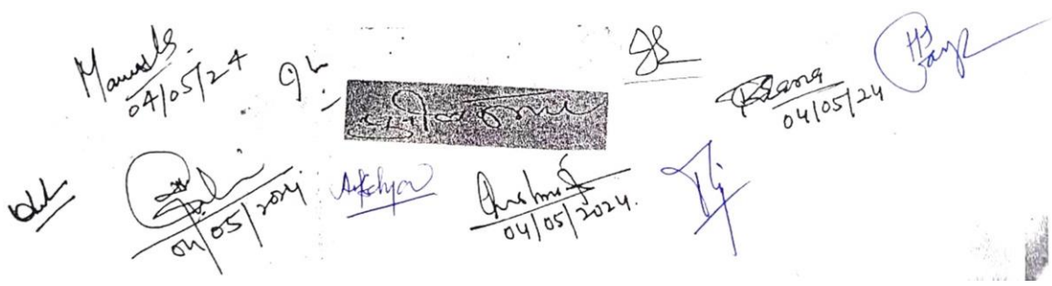
# Himachal Pradesh University,
# Summer Hill, Shimla - 171005 (H.P.) India

## NAAC Accredited "A" Grade University
## Established 1970

# NEP Syllabus
# Under Graduate (UG) -Botany

## Session 2025-26 Onwards

## Department of Bio-Sciences
**Himachal Pradesh University, Summer Hill,**
**Shimla H.P. 171005**



# Himachal Pradesh University

## Curriculum and Credit Framework for Under Graduate (UG) - Botany Programme

| Course & Academic Level | Semester | Discipline Specific Courses-Core (DSC) Credits-4 | Disciplinary Specific Elective (DSE) Credits-4 | Minor Courses (MC) Credits-4 | Multidisciplinary Courses (MDC) Credits-3 | Skill Enhancement Course (SEC) Credits-3 | Ability Enhancement Course (AEC) Credits-2 | Internship/ Apprenticeship / Project/ Community Outreach (I/A/P/C) Credits-4 | Value addition course (VAC) Credits-2 | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| **Introductory/Foundational Level Courses** | **I** | BBOTDSC - 111 Phycology and Mycology<br><br>DSC 1B (Choose one from Zoology/Chemistry/ Geology) | | MC 1 (Choose one from Zoology/ Chemistry/ Geology) | BBOTMDC - 111 Psychoactive Plants and Society | BBOTSEC - 111 Biofertilizers | AEC 1 | | | 20 |
| | **II** | BBOTDSC - 121 Bryophyta, Pteridophyta and Gymnosperms<br><br>DSC 2B (Choose one from Zoology/Chemistry/ Geology) | | MC 2 (Choose one from Zoology/ Chemistry/ Geology) | BBOTMDC - 121 Fundamentals of Horticulture | BBOTSEC - 121 Mushroom Cultivation Technology | | I/A/P/C 1 | Environmental Education (Syllabus to be framed by Deptt. of Environment Sciences HPU Shimla) | 24 |
| **Level 4.5** | **Exit 1** | **Students on exit will be awarded Undergraduate Certificate (in the Field of Study) after securing 44 credits in Semester I and II** | | | | | | | | **44** |

# Semester - I and II

# DSC – Discipline Specific Core Courses

## Paper: Phycology and Mycology

## Course Code: BBOTDSC – 111; Credits = 3(T) + 1(P) = 4

**Instructions for paper setter:** For 4 credit course where LTP is divided into 3 0 1, the syllabus and evaluation patron shall be as follows:

- For the theory course having 4 Sections/ Blocks (I, II, III, IV) in the syllabus following evaluation pattern will be followed:

| | | |
|---|---|---|
| End Semester Examination | : | 50 Marks |
| Practical Assessment | : | 20 Marks (Performance: 10; Viva-voce: 5; File: 5 Marks) |
| Internal Assessment | : | 30 Marks (Attendance: 05; Class Test: 10; Assignment & Presentation: 10; Internal Assessment of Practical: 05 Marks) |

The end-semester theory paper shall be of 50 Marks and the duration of examination will be of 3 hours. There will be 5 Parts (A, B, C, D, E) and the examiner shall set 9 questions in total from all four Sections/Blocks (I, II, III, IV) of the syllabus. Part A will have 2 questions of 10 Marks each from Section/Block I of the syllabus and students have to attempt any one. Part B will have 2 questions of 10 Marks each from Section/Block II of the syllabus and students have to attempt any one. Part C will have 2 questions of 10 Marks each from Section/Block III of the syllabus and students have to attempt any one. Part D will have 2 questions of 10 Marks each from Section/Block IV of the syllabus and students have to attempt any one. Part E will have 7 short answer questions of 2 Marks each from all four Section/Block (I, II, III, IV) of the syllabus and students have to attempt 5 questions.

**Course Objectives**

- The main objective of the course is to make students familiar about the diverse life forms, life cycles, morphology, anatomy and importance of algae and fungi.
- Understand the diversity and affinities among Algae and Fungi.

**Learning Outcomes**

On completion of this course, the students will be able to:

- Classify algae and fungi based on their characteristics and structures.
- Increase the awareness and appreciation of human friendly algae and fungi including their economic, ecological and evolutionary significance.
- Obtain laboratory skills, explore non-flowering plants for their commercial applications.

## SECTION - A

General characters of algae; classification up to families (Fritsch 1945); types of thallus; pigment composition; role of algae in nitrogen fixation; Gaidukov phenomenon as chromatic adaption and economic importance.

## SECTION - B

Important features, detailed vegetative, reproductive structures and life history (excluding development) of *Nostoc* (Cyanophyceae), *Oedogonium* (Chlorophyceae), *Vaucheria* (Xanthophyceae), *Ectocarpus* (Phaeophyceae) and *Polysiphonia* (Rhodophyceae).

## SECTION - C

General characters of fungi; classification up to families (Alexopoulos and Mims1979); types of fruiting bodies; general account of mycorrhiza and lichens.

## SECTION – D

Important features, detailed vegetative, reproductive structures and life history (excluding development) of *Phytophthora*, (Mastigomycotina), *Rhizopus* (Zygomycotina), *Penicillium* Ascomycotina), *Puccinia*, *Agaricus* (Basidiomycotina) and *Alternaria* (Deuteromycotina).

**Suggested Reading:**

**Phycology**


- Fritsch, F.E. (1971-1972). The Structure and Reproduction of Algae. Vol. I & II, London, Cambridge Univ. Press.
- Kamat, N.D. (1982). Topics in Algae. Sai Kirpa Prakashan, Aurangabad.
- Kumar, H.D. (1988). Introductory Phycology. Affiliated East-West Press limited, New Delhi.
- Round, F.E (1986). The Biology of Algae. Cambridge University Press, Cambridge.
- Kumar, H.D. (1985). Algal Cell Biology. Affiliated East-West Press Limited, New Delhi.
- Moris. I. (1967). An Introduction to the Algae. Hutchinson University Library, London.
- Kumar, H.D. and Singh, H.N. 1995. A Text book on Algae. Affiliated East West Press Pvt. Ltd., New Delhi.
- Vashistha, B.R., Sinha, A.K. and Kumar, A. 2010. Botany for Degree Students - Algae. S. Chand and Co. Ltd.
- Bendre, A. and Kumar, A. 2012. A Textbook of Practical Botany. Vol. I. Rastogi Publications.


**Mycology**


- Ainsworth, G.C., Sparrow, F.K. and Man, A.F.S. (1973). The Fungi - An Advanced Treatise. Academic Press.
- Alexopoulos, C.J. and Mims, C.W. Introductory Mycology, 3rd edition. Wiley-Easter, New Delhi.
- Alexopoulos, C.J., Mims, C.W. and Blackwell, M. (1996). Introductory Mycology. John Wiley and Sons.

- Deacon, J.W. Introduction to Modern Mycology. ELBS.
- Moore-Landerckar, E.J. (1972). Fundamentals of the Fungi. Prentice Hall, Englewood Cliffs.
- Burnett, H.L. Fundamentals of Mycology. Edwand Arnold, London.
- Aneja, K.R. and Mehrotra, R.S. Introductory Mycology.
- Dube, H.C. An Introduction to Fungi. Vikas Publ. New Delhi.
- Vashistha, B.R., Sinha, A.K. and Kumar, A. 2012. Botany for Degree Students - Fungi. S. Chand & Co. Ltd.


**Laboratory Exercises:**

1. Algal collection from different habitats and their identification.
2. Study of vegetative and reproductive structures of some genera of Cyanophyta, Chlorophyta, Xanthophyta, Pheophyta and Rhodophyta.
3. Preparation of temporary mount of algae mentioned in syllabus.
4. Learning the methods of sterilization and media preparation.
5. Study of vegetative and reproductive structures of fungal genera mentioned in theory from temporary mounts and permanent slides.
6. Study of mycorrhiza through permanent slides or photographs.

# Paper: Bryophyta, Pteridophyta and Gymnosperms

## Course Code: BBOTDSC – 121; Credits = 3(T) + 1(P) = 4

**Instructions for paper setter:** For 4 credit course where LTP is divided into 3 0 1, the syllabus and evaluation patron shall be as follows:

- For the theory course having 4 Sections/ Blocks (I, II, III, IV) in the syllabus following evaluation pattern will be followed:

| | | |
|---|---|---|
| End Semester Examination | : | 50 Marks |
| Practical Assessment | : | 20 Marks (Performance: 10; Viva-voce: 5; File: 5 Marks) |
| Internal Assessment | : | 30 Marks (Attendance: 05; Class Test: 10; Assignment & Presentation: 10; Internal Assessment of Practical: 05 Marks) |

The end-semester theory paper shall be of 50 Marks and the duration of examination will be of 3 hours. There will be 5 Parts (A, B, C, D, E) and the examiner shall set 9 questions in total from all four Sections/Blocks (I, II, III, IV) of the syllabus. Part A will have 2 questions of 10 Marks each from Section/Block I of the syllabus and students have to attempt any one. Part B will have 2 questions of 10 Marks each from Section/Block II of the syllabus and students have to attempt any one. Part C will have 2 questions of 10 Marks each from Section/Block III of the syllabus and students have to attempt any one. Part D will have 2 questions of 10 Marks each from Section/Block IV of the syllabus and students have to attempt any one. Part E will have 7 short answer questions of 2 Marks each from all four Section/Block (I, II, III, IV) of the syllabus and students have to attempt 5 questions.

**Course Objectives**

- The objective of this paper is to gain knowledge of general characteristics, life cycles of Bryophytes, Pteridophytes and Gymnosperms including their economic importance.
- Understand the diversity and affinities among Bryophytes, Pteridophytes and Gymnosperms.

**Learning Outcomes**

On completion of this course, the students will be able to:

- Develop critical understanding of classification, morphology and life cycles of Bryophytes, Pteridophytes and Gymnosperms.
- Develop understanding of diversity, ecological, economical and evolutionary significance.
- Obtain laboratory skills through related practicals.

## SECTION - A

General Topics: General characters of Bryophytes, Pteridophytes, Gymnosperms and their recent classification; Range of gametophyte; Economic and ecological importance of Bryophytes. Heterospory; evolution of stele; brief account of apogamy and apospory; Economic importance of Pteridophytes and Gymnosperms.

## SECTION - B

Important features, detailed morphology, anatomy, reproduction and life history (excluding development) of *Marchantia*, *Anthoceros* and *Funaria*.

## SECTION - C

Morphology, anatomy, reproduction and life history (excluding development) of *Selaginella*, *Equisetum* and *Adiantum.*

## SECTION - D

Detailed morphology, anatomy, reproduction and life history of *Cycas* and *Pinus*. (excluding Development). Morphological notes on *Ephedra* and *Taxus*.

## Suggested Reading:

### Bryophytes


- Bendre, A. and Kumar, A. 2012. A Textbook of Practical Botany. Vol. I. Rastogi Publications.
- Parihar, N.S. 1991. Bryophyta. Central Book Depot. Allahabad.
- Puri, P. 1980. Bryophyta. Atma Ram & Sons. Delhi.
- Rashid, A. 1998. An Introduction to Bryophyta. Vikas Publishing House Pvt. Ltd. New Delhi.
- Vashistha, B.R., Sinha, A.K. and Kumar, A. 2012. Botany for Degree Students - Bryophyta. S. Chand & Co. Ltd.


### Pteridophytes


- Rashid, A. 1999. An Introduction to Pteridophyta. Vikas Publishing House Pvt. Ltd. New Delhi.
- Bendre, A. and Kumar, A. 2012. A Textbook of Practical Botany. Vol. I. Rastogi Publications.
- Parihar, N.S. 1996. Pteridophyta. Central Book Depot. Allahabad.
- Sporne, K.R. 1991. The Morphology of Pteridophytes. B.I Publishing Pvt. Ltd. Bombay.
- Vashistha, P.C., Sinha, A.K. and Kumar, A. 2010. Botany for Degree Students - Pteridophyta. S. Chand and Co. Ltd.


### Gymnoperms


- Stewart, W.N. and Rathwell G.W. 1993. Paleobotany and the Evolution of Plants.

Cambridge University Press.

- Bhatnagar, S.P and Moitra, A. 1996. Gymnosperms. New Age International Pvt. Ltd. Publishers, New Delhi.
- Sporne, K.R. 1965. The Morphology of Gymnosperms. Hutchinson 7 Co. Ltd., London.

**Laboratory Exercises:**

1. Study of morphology, anatomy and reproduction of type specimens of bryophytes as mentioned in syllabus with the help of permanent sides.
2. Section cutting procedure of bryophyta specimens.
3. Study of morphology, anatomy and reproduction of type specimens of pteridophytes as mentioned in syllabus with the help of permanent sides.
4. Study of morphology, anatomy and reproduction of type specimens of gymnosperms as mentioned in theory paper.
5. Preparation of double stained permanent mount of type specimens as mentioned in syllabus.