

**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**

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Himachal Pradesh University

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

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SEC – Skill Enhancement Courses

Paper: Biofertilizers

Course Code: BBOTSEC – 111; Credits = 3

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

- For the theory course having 3 Sections/ Blocks (I, II, III) in the syllabus following evaluation pattern will be followed:

End Semester Examination : 50 Marks

Internal Assessment : 25 Marks

(Attendance: 05; Class Test: 10; Assignment
& Presentation: 10)

The end-semester theory paper shall be of 50 Marks and the duration of examination will be of 2 hours. There will be 4 Parts (A, B, C, D) and the examiner shall set 7 questions in total from all four Sections/Blocks (I, II, III) of the syllabus. Part A will have 2 questions of 12 Marks each from Section/Block I of the syllabus and students have to attempt any one. Part B will have 2 questions of 12 Marks each from Section/Block II of the syllabus and students have to attempt any one. Part C will have 2 questions of 12 Marks each from Section/Block III of the syllabus and students have to attempt any one. Part D will have 10 short answer questions of 2 Marks each from all three Section/Block (I, II, III) of the syllabus and students have to attempt 7 questions.

Course Objective

The objective of the course is to make students gain knowledge on organic agriculture, farming and use of eco-friendly biofertilizers like *Rhizobium*, *Azospirillum* and mycorrhizae, their identification, multiplication and recycling of the organic waste.

Learning outcomes

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

- Develop their understanding on the concept of organic agriculture, certification Process, product labeling and regulatory mechanisms.
- Identify the different forms of Organic Manures and biofertilizers, methods of their production and application for better crop production and their uses.

SECTION - A

Fertilizers: introduction, types of fertilizers and their advantages and disadvantages; brief account of microbes used as biofertilizers; marketable forms of biofertilizers.

SECTION - B

General account, isolation, identification, mass multiplication, carrier based inoculants, application and crop response of *Rhizobium*, *Azotobacter* and *Azospirillum*; General account on phosphate solubilizing microorganisms (PSMs).

SECTION - C

Cyanobacteria (BGA): *Azolla* and *Anabaena* association, nitrogen fixation, factors affecting growth, blue green algae and *Azolla* in rice cultivation.

Mycorrhizal Association: Types of mycorrhizal association, VAM - isolation, inoculum production, influence on growth and yield of crop plants.

Suggested Readings:

- Dubey, R.C., 2005 A Text book of Biotechnology S. Chand & Co, New Delhi.
- Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.
- John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.
- Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.
- Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.
- Thakur, A.K., Bassi, S.K. and Singh, K.J. 2017. Biofertilizers. S. Dinesh and Co., Jalandhar.
- Vayas, S.C, Vayas, S. and Modi, H.A. 1998. Biofertilizers and Organic Farming Akta Prakashan, Nadiad.

Paper: Mushroom Cultivation Technology

Course Code: BBOTSEC – 121; Credits = 3

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

- For the theory course having 3 Sections/ Blocks (I, II, III) in the syllabus following evaluation pattern will be followed:

End Semester Examination : 50 Marks

Internal Assessment : 25 Marks

(Attendance: 05; Class Test: 10; Assignment
& Presentation: 10)

The end-semester theory paper shall be of 50 Marks and the duration of examination will be of 2 hours. There will be 4 Parts (A, B, C, D) and the examiner shall set 7 questions in total from all four Sections/Blocks (I, II, III) of the syllabus. Part A will have 2 questions of 12 Marks each from Section/Block I of the syllabus and students have to attempt any one. Part B will have 2 questions of 12 Marks each from Section/Block II of the syllabus and students have to attempt any one. Part C will have 2 questions of 12 Marks each from Section/Block III of the syllabus and students have to attempt any one. Part D will have 10 short answer questions of 2 Marks each from all three Section/Block (I, II, III) of the syllabus and students have to attempt 7 questions.

Course Objective

The objectives of the course are:

- To enable the students to identify edible and poisonous mushrooms.
- Provide hands on training for the preparation of bed for mushroom cultivation and spawn production
- Give the students exposure to the experiences of experts and functioning mushroom farms.
- Help the students to learn a means of self employment and income generation.

Learning outcomes

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

- Identify edible types of mushroom
- Gain the knowledge of cultivation of different types of edible mushrooms, spawn production, harvesting and storage.
- Learn a means of self-employment and income generation.

SECTION - A

Introduction, history. nutritional and medicinal value of edible mushrooms; nutrition and nutraceuticals - proteins, amino acids, minerals, carbohydrates, crude fibre contents and vitamins; poisonous mushrooms; Research centres - National level and Regional level.

SECTION - B

General account of instruments used in mushroom cultivation; compost production, mushroom bed preparation; Medium preparation and sterilization; Pure culture isolation; Preparation of spawn and multiplication.

SECTION - C

Cultivation technology of *Agaricus bisporus* and *Pleurotus* sp.; short-term storage (refrigeration - upto 24 hours), long term storage (canning, pickels, papads), drying, storage in salt solutions. Problems in mushroom cultivation - diseases, pests, nematodes, weed moulds and their management strategies.

Suggested Reading:

- Goodwin, T.W. and Mercer, L.E. 1989. Introductory Plant Biochemistry.
- Bahl, N. 1988. Handbook of Mushroom. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.
- Krishnamoorthy, A.S., Marimuthu, T. and Nakkern, S. 2005 Mushroom Biotechnology . TNAU Press, Coimbatore, India.
- Harander, S. 1991. Mushrooms. The Art of Cultivation Sterling Publishers.
- Tripathi, D.P. 2005. Mushroom Cultivation. Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.