UNIVERSITY OF NORTH BENGAL

PROPOSED COURSE STRUCTURE

FOUR YEAR UNDERGRADUATE PROGRAM (FYUGP)

SEMESTER-I

Skill Enhancement Course

BIOFERTILIZERS

UNDER THE
NEW CURRICULUM AND
CREDIT FRAMEWORK, 2022

W.E.F. 2024–2025

SEMESTER - I

Course Type: Skill Enhancement Course
Course Code: POOASEC113
Course Name: Biofertilizers

Credits: 3 (Theory-2, Practical-1)
Full Marks: 60 (Theory-40, Practical-20)

Brief Course Description:

This course deals with studying various bio-fertilizers used in agriculture during organic farming. The course will help the students learn the isolation, characterization, and production of bio-fertilizers for commercial value. This course will help in the development of good entrepreneurial skills.

Prerequisite(s) and/or Note(s):

(1) High School Biology.
(2) Note(s): Syllabus may be modified after and not during the term itself, depending on the circumstances. However, students will be evaluated only on the basis of topics covered in the course.

Course Objectives:

Knowledge acquired:

(1) Role of biofertilizers and their mechanism of action in agriculture.
(2) Symbiotic and non-symbiotic nitrogen fixers and their importance in agriculture.
(3) Knowledge of different types of organic farming.

Skills gained:

(1) Isolation, and characterization of biofertilizer-related microbes.
(2) Mass inoculum production and field application of bio-fertilizers.
(3) Green manuring and bio-composting.

Competency Developed:

(1) Students will acquire technical knowledge in biofertilizer production technology.
(2) Students will acquire technical knowledge in organic farming.

THEORY

Credits: 2 **Total lectures: 30**

Unit 1 Introduction (6 Lectures)

Definition of biofertilizers. General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers, nitrogen cycle.

Unit 2 Symbiotic and Non - Symbiotic Nitrogen Fixers (12 Lectures)

Rhizobium - Isolation, characteristics, types, inoculum production and field application.
Frankia - Isolation, characteristics, non-leguminous crop symbiosis.
Cyanobacteria, general characteristics, Heterocyst and its function.
Azolla-Anabaena symbiosis - Isolation, characterization, mass multiplication, role in rice cultivation, field application.

Unit 3 Mycorrhizal Biofertilizers (6 Lectures)

Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants, Mass inoculum production of VAM, field applications of Ectomycorrhizae and VAM.

Unit 4 Organic Farming (6 Lectures)

Green manuring and organic fertilizers, bio composting and method of vermicomposting – field Application; FYMs, PGPRs.

PRACTICAL

Credits: 1 **Total classes: 30**

1. Isolation of *Rhizobium* from root nodules.
2. Specimens/photographs of heterocyst, *Azolla* and *Anabaena azollae* association.
3. Demonstration of biofertilizer production through photographs/videos.
4. Demonstration of isolation of VAM and mass multiplication through photographs/videos.
5. Field study report on visit to the vermicompost facility / rice field / organic farm.

Suggested Readings

1. Dubey, R.C., 2005 A Text book of Biotechnology S.Chand & Co, New Delhi.

2. Kumaresan, V. 2005, Biotechnology, Saras Publications, New Delhi.

3. John Jothi Prakash, E. 2004. Outlines of Plant Biotechnology. Emkay Publication, New Delhi.

4. Sathe, T.V. 2004 Vermiculture and Organic Farming. Daya publishers.

5. Subha Rao, N.S. 2000, Soil Microbiology, Oxford & IBH Publishers, New Delhi.

6. Vayas,S.C, Vayas, S. and Modi, H.A. 1998 Bio-fertilizers and organic Farming Akta Prakashan, Nadiad.

QUESTION PATTERN & TOTAL MARKS DISTRIBUTION FOR SEC PAPER

Theoretical Paper (Full Marks = 40)

Sl No.	Questions to be answered	Out of	Marks for each Question	Total Marks
1.	5	8	**1**	5 × **1** = 5
2.	3	5	**5**	3 × **5** = 15
3.	2	4	**10**	2 × **10** = 20

PRACTICAL QUESTION PATTERN & EXAMINATION GUIDELINES

Practical Paper (Full Marks = 20)

❖ Layout of marks for practical examination:

a)	Experiment/ Demonstration	6 Marks
b)	Submission of Field Report/ Assignment	10 Marks
c)	Laboratory notebook	2 Marks
d)	Viva Voce	2 Marks
	Total	**20 Marks**

❖ Questions are to be set following the practical syllabus.

1. **For experiment/demonstration** – to be set from serial no. 1, 2, 3, 4. (alternate questions may be set).
2. **For submission of field report/ assignment** – the report should be prepared on the basis of field visit as per serial no. 5 with proper photographs and documentation.
   Note: In case the field visit cannot be conducted, only in such cases, the students should be instructed to conduct a field visit themselves as per serial no. 5 and submit the assignment based on the same.
3. **For laboratory notebook** – the signed laboratory class notebook is to be submitted at the time of the exam.
4. **For viva-voce** – to be asked from the whole syllabus with special emphasis on the practical syllabus.

DURATION OF EXAMINATION FOR SEC PAPERS

Semester End Examination	Full Marks	Duration of Exams
Theoretical	40	2 Hours
Practical	20	3 Hours