

DEPARTMENT OF MICROBIOLOGY
PART III – SEC – II
CO-CURRICULAR COURSES
(To be offered from Semester – III – IV)

| | | | |
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| 21UMBCOC1 | Biofertilizer | 80 hrs Duration | 1 Credits |
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Course Profile:

Constant use of land leads to loss of its fertility and thus the fertility needs to be replenished. The deficiency of any one or more nutrients in the soil may impair the growth and development of plants. Macro elements like nitrogen, phosphorous and potassium are required in larger quantities. CHEMICAL fertilizers like nitrogen, and phosphorous are applied to the land so that it regains its fertility. Materials of biological origin commonly used to maintain and improve soil fertility are called biofertilizers. These are categorized as Manures and Biofertilizers. Manures are organic wastes that after partial decay are added to the soil to increase crop productivity. Microorganisms that enrich the soil in nutrients by their biological activity are biofertilizers. Main sources are bacteria, cyanobacteria and fungi. Use of biofertilizers is one of the important components of integrated nutrient management, as they are cost effective and renewable source of plant nutrients to supplement the chemical fertilizers for sustainable agriculture.

Employment Opportunities:

a. Job Prospects:

1. As production in charge in Biofertilizer Producing Industry
2. In R&D Department of Biofertilizer Producing Industry
3. Agriculture Department of Government
4. National Institutes engaged in research on Biofertilizers

b. Entrepreneur:

1. Biofertilizer Production
2. Biofertilizer Marketing
3. Agro-consultant

Duration of course:

The course shall extend over a period of Two Semester for 80 Hours. The course will normally commence in the month of August of every academic year.

Admission Procedure

Candidates for admission to the course should be B.Sc or M.Sc degree students of Shree M. & N. Virani Science College, Rajkot, studying in Semester – I to IV only. Interested students shall apply for admission at the time of notification in the prescribed form, which would be normally in the month of July of every academic year. The students shall enroll with the co-ordinator of the course. The course would commence as soon as the batch fills up.

Course Objectives:

The Course is designed:

- To demonstrate the techno-economic viability of the biofertilizer to students.
- To introduce rural based economically viable & self income generation production of Biofertilizer.
- To demonstrate the effectiveness of biofertilizer cultural practices in the farmers fields for enhanced crop productivity
- To create self employment opportunities for students

UNIT I: Introduction

10hrs

- Definition of Biofertilizer and brief History
- General account of the microbes used as Biofertilizer for various crop plants
- Advantages of Biofertilizer over chemical fertilizers.
- Mechanism of ability of the organisms to work as Biofertilizer
- Methods of application

UNIT II: N₂ Biofertilizer

15hrs

- Types and Characteristics
- Host-Rhizobium interaction
- N₂-fixation in root-nodules
- N₂-fixation in soil by free living microbes
- Production

UNIT III: Azolla & BGA Bio fertilizers

10hrs

- Characteristics
- N₂-fixation process
- Production
- Methods of application
- Types of crops for application

UNIT IV: Mycorrhizae and : PSB Bio fertilizer (Phosphate solubilising Bacteria)

15hrs

- Importance and types of mycorrhizae inoculum in agriculture
- Isolation and mass production of AM and VAM , their mass production and field applications
- Isolation and Characterization of PSB
- Mechanism of phosphate solubilisation
- Production and Methods of application

UNIT V: Quality control of Bio fertilizers

10hrs

- Introduction of FCO specifications for bio fertilizers
- Sampling procedure
- Method of analysis and Standards of bio fertilizers as per BIS
- Biostability, Storage, shelf life, quality control and marketing of product bio fertilizer
- Introduction to IPM

Practical

20 Hrs

1. Isolation of Nitrogen fixing bacteria from soil
2. Isolation of Rhizobium from root-nodules.
3. Isolation of Phosphate solubilizing bacteria from soil.
4. Isolation of VAM fungi from soil. (Demonstration).
5. Microbial limit test for PSB market fertilizer product.
6. Preparation of Biofertilizer at laboratory level and their pot testing
7. Prepare chart for fertilizer classification with chemical formula and Nutrient content.

Text Books

- Purohit, S.S., P.R. Kothari and S.K. Mathur, 1993. Basic and Agricultural Biotechnology, Agro Botanical Pub. India.
- Subba Rao, N. S. 1988. Biological nitrogen fixation: recent developments, Mohan Pramlani for Oxford and IBH Pub. Co. (P) Ltd., India.
- Somani, L.L., S.C. Bhandari, K.K. Vyas and S.N. Saxena. 1990. Biofertilizers, Scientific Publishers - Jodhpur.
- Tilak, K.V.B. 1991. Bacterial Biofertilizers, ICAR Pub., New Delhi.

Reference books

- Bio fertilizers –Vyas & Vyas(Ekta Publication).
- Bio fertilizers– Arun Sharma.
- Practical Microbiology–R. C. Dubey and D. K. Maheshwari
- Fertilizer Control Order–1985 amended up to June, 2011
- Subba Rao, N.S., G.S. Venkataraman and S. Kannaiyan 1993. Biological nitrogen fixation, ICAR Pub., New Delhi.

SCHEME OF INSTRUCTION AND EXAMINATIONS

For Students Admitted From A.Y. 2016-2017 & Onwards

| Semester –I & II | | | | | | | |
|------------------|--|----------------------------|-------------------|----------------|------------|------------|----------|
| Course Code | Course | Total Hrs- of Instructions | Exam Duration hrs | Marks allotted | | | Credits |
| | | | | CIE | SEE | Total | |
| Part –III | | | | | | | |
| 16UMBCOC1 | SEC-II: Co-curricular course - Biofertilizers: 1. Theory 2. practical | 80 (40 hrs / Semester) | 3 hrs | 30 20 | 70 30 | 100 50 | 1 |
| | | 80 | | 50 | 100 | 150 | 1 |

Examinations:

The course carries 1 credit and the students will be evaluated continuously based on their participation in learning experiences, theory, and evaluation through tests and assignments and will also be evaluated at the end of course under CEE which will be 100% internal. The pattern

of evaluation with percentage weightage will be as specified below:

| <i>Theory Courses</i> | | <i>Practical Courses</i> | |
|--------------------------------------|-----|--------------------------------------|-----|
| Continuous Internal Evaluation (CIE) | 30% | Continuous Internal Evaluation (CIE) | 40% |
| Course End Exam (CEE) | 70% | Course End Exam (CEE) | 60% |

Issue of Certificate and Marks card

Certificates will be issued to the candidates on successful completion of the Course by the autonomous college.

Evaluation norms: Theory

| S.No | Components | | | |
|--------------|-------------------|-----------|--|-----------|
| | CIE | Marks | CEE | Marks |
| 1 | Assignment – 1 | 05 | Semester End Test (after 2 nd Semester) | 70 |
| 2 | Assignment - 2 | 05 | | |
| 3 | Internal Test - 1 | 10 | | |
| 4 | Internal Test - 2 | 10 | | |
| TOTAL | | 30 | | 70 |

Evaluation norms: Practical

| S. No | Components | | | |
|--------------|--|-----------|--|-----------|
| | CIE | Marks | CEE | Marks |
| 1 | Internal practical – I - MCQ | 10 | Semester End Test (after 2 nd Semester) | 30 |
| 2 | Internal Practical – II – Short Answer Questions | 10 | | |
| TOTAL | | 20 | | 30 |