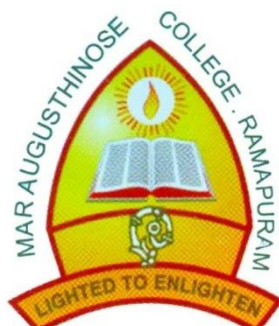


MAR AUGUSTHINOSE COLLEGE RAMAPURAM



DEPARTMENT OF BIOTECHNOLOGY

Scheme and Syllabus of

Value Added Course

2020

MAVAC011 Biofertilizers and Its Applications

BOARD OF STUDIES (BoS)

Chairperson- Ms. Sheena John (Asst. Prof. Department of Biotechnology)

Members- Dr. Prem Jose V (Director & Post-Doctoral Researcher (Rural Urban Center (RUC)-FOR2432, University of Agricultural Sciences Bangalore, Department of Agricultural Economics, GKVK Campus, Bangalore-560065, Karnataka)

Ms. Dona Maria John (Asst. prof. Department of Biotechnology)

Ms. Rathi C R (Asst. prof. Department of Biotechnology)

INTRODUCTION

The Value-Added Courses aims to provide additional learner centric graded skill oriented technical training, with the primary objective of improving the employability skills of students

AIM OF THE PROGRAMME

Understanding various aspects of the subject and acquiring methodological knowledge of them. Application of this knowledge in a suitable manner in required fields.

ELIGIBILITY FOR ADMISSIONS

All UG and PG students from various departments of the college. The number of intakes to the course is limited. The course can be offered only if there are at least 5 students opting for it.

MEDIUM OF INSTRUCTION: English.

DURATION OF THE COURSE

The duration of value-added course is 30 hours (including the hours of final examination) of which 15hrs theory and 15hrs for laboratory/demonstration/experimental activities and the course can have a maximum of three hours a day.

The value-added courses will be offered beyond the usual class hours and days of the college.

The value-added course will be a blend of theory classes / experimental learning / project-based learning / assignments / activity-based learning.

COURSE OBJECTIVES

1. Nurturing novel ideas and meaningful insights through scientific thinking.
2. Enabling critical analysis of problems and situations to reach solutions.
3. Providing a platform for individual and collective work.
4. Understanding the significance of sustainable scientific processes to support the environment.

COURSE OUTCOMES (COs)

CO1. Imparting basic knowledge in the interdisciplinary field of biotechnology.

CO2. To equip the candidates to meet the demands of the society for biofertilizers to get sustainable products and processes through biotechnology.

CO3. To be aware of the ethical issues, personal and environmental safety during biofertilizer applications

CO4. Promoting the application of biofertilizers and familiarizing the biofertilizer production methods through implementation of experiments and demonstrations.

EVALUATION

1. The value-added courses shall be evaluated through an examination at the end of the course.
2. The duration of examination is two hours.
3. The total marks of the examination shall be 100

| Components of Evaluation | Marks |
|---------------------------------|--------------|
| Attendance | 10 |
| Assignment / Seminar | 10 |
| Project & Viva | 30 (20+10) |
| External Examination | 50 |
| Total | 100 |

Pattern of questions Paper

| Sl. No. | Pattern | Marks | Choice of questions | Total marks |
|--------------|---------------------------|-----------|---------------------|-------------|
| 1 | Short Answer/problem type | 2 | 5/7 | 10 |
| 2 | Short essay/problem | 5 | 4/6 | 20 |
| 3 | Essay/problem | 10 | 2/4 | 20 |
| Total | | | | 50 |

4. A committee consisting of the Head of the Department, the course coordinator and a senior faculty member nominated by the Head of the department shall monitor the evaluation process.
5. The list of students along with the marks and the grades earned may be forwarded to the Principal/Chief Superintendent of Examinations.

6. The Dept. course coordinator is responsible for maintaining and processing the record with regard to the course, assessment marks and results.
7. Certificates will be issued to those students with 75% attendance, timely submission of assignment and project and a minimum of 40% marks in the qualifying examination.

Grading Pattern

Grades are given **on a 7-point scale** based on the total percentage of marks secured in internal and external assessment, as given below: -

| Percentage of Marks | Grade |
|----------------------------|--------------------------------|
| 95 and above | S Outstanding |
| 85 to below 95 | A⁺ Excellent |
| 75 to below 85 | A Very Good |
| 65 to below 75 | B⁺ Good |
| 55 to below 65 | B Above Average |
| 45 to below 55 | C Satisfactory |
| 35 to below 45 | D Pass |
| below 35 | F Failure |
| Absent | Ab |

SYLLABUS
MAVAC011 Biofertilizers and Its Applications

Total hours of instruction: 30 Hours

Module 1: 3 Hrs

Biofertilizers - Introduction, scope. A general account of Biofertilizers organisms- Cyanobacteria (BGA), Bacteria and Mycorrhizae. Cyanobacteria (BGA) as biofertilizers- Anabaena, Nostoc, Azolla. Anabaena as biofertilizers. Isolation of cyanobacteria. Formation of medium.

Module 2: 3 Hrs

A general account of bacterial biofertilizers organisms. Azospirillum, Azotobacter, Phosphobacteria and Rhizobium. Isolation - Azotobacter, Azospirillum, Rhizobium- Culture characteristics. Mechanism of nitrogen fixation (free-living and symbiotic) - Biochemistry and molecular basis of nitrogen fixation - Phosphate solubilization and mobilization.

Module 3: 3 Hrs

Mycorrhizal fungi as biofertilizers - Introduction, scope. A general account of Ecto, Endo and Arbuscular mycorrhizae (AM). Methods of collection, wet sieving and decanting method and inoculum production. Culture of mycorrhizae - Cultural characteristics of Ectomycorrhizal fungi. Isolation and method of inoculation of Arbuscular mycorrhizae (AM), Legume - AM interactions.

Module 4 :3 Hrs

Production technology: Strain selection, sterilization, growth and fermentation, mass production of various biofertilizers. Mass production of Azospirillum, Azotobacter and Phosphobacteria. Mass cultivation of Azolla – Cyanobacterial biofertilizers - Field application of Cyanobacterial inoculants.

Module 5: 3 Hrs

Application technology: Standards and quality control, application for field and tree crops, nursery plants and seedlings. Extension, promotion and marketing: Extension strategies, diagnosis for the effectiveness of inoculation, improvement in distribution system. National and Regional Biofertilizers Production and Development Centres, Ethical issues.

DEMONSTRATIONS/PRACTICALS (15 Hrs)

1. Enumeration of soil microbes by Plate culture method.
2. Isolation of Microorganisms from soil sample – Bacteria, Fungi, Actinomycetes and Azotobacteria.
3. Isolation and cultivation of Azotobacter, Rhizobium, Azospirillum, Cyanobacteria, Actinomycetes, Mycorrhiza.
4. Biofertilizer production using Rhizobium.
5. Biofertilizer production using Mycorrhiza.
6. Mass production technology for biofertilizers.
7. Quality control.
8. Packaging & handling, storage, logistics, delivery system Emerging technologies for biofertilizers.

Assignment and project

References:

1. Biotechnology - An introduction by Susan R Barnum, Thomsun Publishers.
2. Biotechnology: fundamentals and Applications - Purohith and Mathur, Agrobotanical Publishers, India.
3. Biofertilizer Manual, FNCA Biofertilizer Project Group, Forum for Nuclear Cooperation in Asia. Japan Atomic Industrial Forum, Tokyo.