



**DEPARTMENT OF MICROBIOLOGY**  
**MUHAMMED ABDURAHIMAN MEMORIAL**  
**ORPHANAGE (MAMO) COLLEGE**

[Govt. Aided First Grade College & Affiliated to University of Calicut.  
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**CURRICULUM FOR CERTIFICATE**  
**COURSE IN**

**CERMB006: PRODUCTION OF**  
**BIO-FERTILIZERS**

**OFFERED DURING THE**  
**ACADEMIC YEAR 2019-20**  
**[APPROVED BY ACADEMIC COMMITTEE, MAMO COLLEGE]**



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## DEPARTMENT OF MICROBIOLOGY

### CURRICULUM FOR CERTIFICATE COURSE - CERMB006

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## INSTITUTIONAL VISION, MISSION & OBJECTIVES 01



VISION

**VISION:** Build Scientifically Oriented, Intellectually Accomplished, Morally Upright and Socially Committed youth who can play a constructive role in Nation Building.



MISSION

**MISSION:** Intellectual, social and economic empowerment of the youth in general and women, minorities, orphans and the destitute in particular by providing quality, value-based higher-education.



OBJECTIVES

**OBJECTIVES:** Pursuit of Excellence, Harnessing technology, Thrust on value-based education, Nurturing Excellence and Moulding the youth for Nation Building.



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## VISION, MISSION, OBJECTIVES & CORE VALUES OF THE DEPARTMENT **02**



VISION

**VISION:** To brim the upcoming generation with Scientific Knowledge.



MISSION

**MISSION:** Providing quality education and training to bring out the very best in students through the stimulus of scholarly progression and intellectual development.



**OBJECTIVES:** (a) Empowerment of the students with scientific background and the technical skills, (b) Empower the students to be an entrepreneur in the field of Microbiology and allied areas.



VALUES

**CORE VALUES:** Accountability, Communication, inclusivity, innovation, Industrial excellence, Professionalism, Teamwork and tolerance.



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## B.Sc MICROBIOLOGY: PROGRAMME EDUCATIONAL OBJECTIVES [PEOs] 03

After 4 to 5 years of graduation, the career and professional accomplishments attained by the Microbiology Graduates would reflect that the programme really prepared the graduates to deal with the real world, where they could apply and use the skills and knowledge they have learned to good use.

Specifically, the graduate would be able to:



**PEO1:** Pursue any of the following three alternatives: (i) immediately take up a career in any area of Microbiology and work productively as a successful microbiologist in diverse career paths including supportive and leadership roles on multidisciplinary teams. (ii) Broaden the scope of the career path by pursuing higher studies and research in the field of Microbiology. (iii) Go for taking up the challenge and spearheads start-ups by positively exploiting the diverse potentials of the microbiological field.



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**PEO2:** Graduates will communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavours, and practise their profession with high regard to legal and ethical responsibilities.



**PEO3:** Be original, creative, innovative and systematic in their all endeavours, including individual, collaborative and entrepreneurial ventures with meticulous strategic thinking, planning and execution.



**PEO4:** Have sufficient breadth of understanding to enable continued professional development and lifelong learning throughout their career.



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# B.Sc MICROBIOLOGY: PROGRAMME SPECIFIC OUTCOME [PSOs] 04

On successful completion of a Bachelor Degree in Microbiology, the graduates would be able to:



**PSO1:** The students able to understand the theoretical knowledge in the field of microbiology like general, analytical, clinical, food and industrial sectors.



**PSO2:** The students able to expertise in applying practical knowledge in medical, biochemical and industrial sectors.



**PSO3:** The students acquire research knowledge in industrial training and summative projects.



**PSO4:** The students able to analyse socially acceptable solutions to complex environmental problems with applications of modern and appropriate techniques for sustainable development.



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**PSO5:** The students able to create bio products like microbial inoculums, biologically active compounds and probiotics.



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# B.Sc MICROBIOLOGY: PROGRAMME OUTCOMES [POs] 05

The students graduating from B.Sc Microbiology Programme should be able to:



**PO1: SCIENTIFIC & COMPUTING KNOWLEDGE:** Apply scientific and practical methods to analyse microorganisms from different sources.



**PO2: PROBLEM ANALYSIS:** Identify, formulate, review research literature, and analyze complex real-life problems reaching substantiated conclusions using first principles of statistics, natural sciences, and bioinformatics.



**PO3: DESIGN/DEVELOPMENT OF SOLUTIONS:** Design solutions for complex real-life problems or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.



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**PO4: CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.



**PO5: MODERN TOOL USAGE:** Apply appropriate and modern practical techniques, resources, and modern bioinformatics software including prediction and modeling to complex biomolecules with an understanding of the limitations.



**PO6: THE MICROBIOLOGICAL PROFESSION AND SOCIETY:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional practice.



**PO7: ENVIRONMENT AND SUSTAINABILITY:** Understand the impact of the environmental pollutions and their solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.



**PO8: ETHICS:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the microbiological practice.



**PO9: INDIVIDUAL AND TEAM WORK:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.



**PO10: COMMUNICATION:** Communicate effectively on complex microbial activities with the community and



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with society, such as, being able to comprehend and write effective reports and analyse the microbial activities, make effective presentations, and give and receive clear instructions.



#### **PO11: PROJECT MANAGEMENT AND FINANCE:**

Demonstrate knowledge and understanding of the microbiological principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.



**PO12: LIFE-LONG LEARNING:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of changing environment.



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## CERTIFICATE COURSE

# CERMB006: PRODUCTION OF BIO-FERTILIZERS **06**

## COURSE CURRICULUM

Course Name	Production of Bio-fertilizers
Course Code	CERMB006
Year	2019-20
Course Designer	Mrs. Ummukulsu.K
Couse Duration	30 Hrs
Course Schedule	November to February
Maximum Students Intake	60 Students



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#### 1. COURSE LEVEL

Foundational, skill-oriented certificate programme.

#### 2. PREREQUISITE

Fundamental knowledge in production of bio-fertilizers..

#### 3. COURSE INTAKE & ADMISSION

Maximum 60 students will be given admission to the course based on First-Come-First-Serve basis. All the students of the MAMO College are eligible for free enrolment for the course. The enrolment notification will be issued for the course well in advance of the commencement of the course.

#### 4. COURSE COORDINATOR

Ms. Ummukulsu K, Assistant Professor, Department of Microbiology.

#### 5. COURSE PREAMBLE

Repeated use of land for farming leads to depletion of nutrients. Use of chemicals fertilizers leads to pollution of the environment and a downward trend in soil health. Use of bio-fertilizers can address this problem and be a mainstay for sustainable agriculture.

#### 6. DURATION

Total Duration: 30 Hrs. [Contact Hrs. 8Hrs, lab Hrs.8 Course Woks: 7 and Assessment Works: 7]

#### 7. CURRICULUM FOCUS

Enhance the employability of the learners through curriculum enrichment for



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additional skill development.

## 8. COURSE OBJECTIVES

Learners are expected to

- To facilitate the students to understand basics of bio-fertilizers
- To provide exposure to bio-fertilizer production technology

## 9. SKILL EXPECTED

On the successful completion of the course, learners will be able to:

- To develop skills about handling, cultivation and propagation of quality microbial inoculants
- Upgrade the knowledge and develop technical skills of bio-fertilizer production

## 10. COURSE OUTCOMES

Upon the successful completion of the course, the learners will be able to:

CO No	Course Outcome(CO)	Skill/Knowledge Attainment Level Based on Revised Bloom's Taxonomy
CO1	Develop basic knowledge on importance, scope and potential of bio-fertilizers	Understand
CO2	Ability to distinguish the types of bio-fertilizers	Understand
CO3	Have a detailed awareness on advantage of bio-fertilizers on chemical fertilizers	Analyse
CO4	Learners will be able to produce bio-fertilizers	Understand



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#### 11. MAPPING OF COs WITH PSO<sub>s</sub> AND PO<sub>s</sub>

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	0	1	0	1	1	1	1	1	2	2	0	1	1	1	0	1	0
CO2	1	0	2	1	0	1	1	1	2	3	1	2	1	1	2	1	1
CO3	1	1	2	1	1	1	1	1	2	0	1	2	1	1	1	1	1
CO4	1	0	2	1	1	0	1	1	2	3	1	2	1	1	2	1	1
AVG	0.8	0.5	1.5	1.0	0.8	0.8	1.0	1.0	2.0	2.0	0.8	1.8	1.0	1.0	1.3	1.0	0.8

#### 12. MODULE-WISE COURSE CONTENTS

##### MODULE 1: INTRODUCTION TO BIO-FERTILIZERS

**MODULE DURATION:** 7 Hrs. [Contact Hrs. 3 Hrs., Course Works: 2 and Assessment Works: 3]

**MODULE CONTENT:** necessity, scope and benefits, advantages of Bio-fertilizers over chemical fertilizers

**MODULE OUTCOME:** On successful completion of the module learners can familiarize with the necessity, scope and benefits of bio-fertilizers

##### MODULE 2: TYPES OF BIO-FERTILIZERS

**MODULE DURATION:** 10 Hrs. [Contact Hrs. 2 Hrs .Lab Hrs. 3Hrs Course Works: 2 and Assessment Works: 3]

**MODULE CONTENT:** symbiotic nitrogen fixation- (*Rhizobium*, *Frankia*), symbiotic nutrient mobilizers-*Endo mycorrhizae* and *Ectomycorrhizae*. Non-symbiotic microbe- *Azotobacter*. Associative symbiosis- *Azospirillum*



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**MODULE OUTCOME:** On successful completion of the module learners will be able understand about the types of bio-fertilizers

### MODULE 3: MASS PRODUCTION OF BIO-FERTILIZERS

**MODULE DURATION:** 14 Hrs. [Contact Hrs. 2 Hrs, Lab hrs. 5 hrs Course Works: 2 and Assessment Works: 2]

**MODULE CONTENT:** media preparation, sterilization, microbial propagation, mass scale production, fermentation

**MODULE OUTCOME:** On successful completion of the module learners will be able understand about the production of bio-fertilizers

### REFERENCES

1. [https://books.google.co.in/books/about/The\\_Complete\\_Technology\\_Book\\_On\\_Bio\\_Fert.html?id=ID1u7mzd-nUC](https://books.google.co.in/books/about/The_Complete_Technology_Book_On_Bio_Fert.html?id=ID1u7mzd-nUC)
2. S. Rao, *Textbook Soil Microbiology*.
3. Rangaswamy, *Textbook Plant Pathology*.

### ADDITIONAL REFERENCES & STUDY MATERIALS

4. <https://nptel.ac.in/courses/102/105/102105058/>
5. <https://nptel.ac.in/courses/126/105/126105014/>
6. <http://www.amm-mcrc.org/publications/biofertilizers.pdf>

## 13. DELIVERY MODE

The course employs multi-mode delivery mechanisms including contact lecture, online MOOC courses from NPTEL, Online and offline course works.



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#### 14. DELIVERY SCHEDULE

November to February.

#### 15. DETAILED COURSE DELIVERY PLAN

Hour	Delivery Mode and Activity	Topics to be Covered
1	Contact Hour - 1: Classroom Discussion	Introducing the Course
2	Contact Hour – 2 Class room Discussion	Necessity and scope of bio-fertilizers
3	Contact Hour – 3 Classroom Discussion	Advantages of bio-fertilizers over chemical fertilizers
4	Course work - 1: Course assignment	Importance of bio-fertilizers
5	Course work- 2: Course assignment	Advantages and disadvantages of bio-fertilizers
6	Assessment Hour-1	Assignment on hazardous effect of chemical fertilizers to environment
7	Contact Hour-4 Classroom Discussion	Different types of bio-fertilizers
8	Contact Hour-5 Classroom Demonstration	Difference between symbiotic nitrogen fixation and non-symbiotic nitrogen fixation
9	Course Work-3 Course Assignment	Course Assignment on Endo-mycorrhizae and Ectomycorrhizae
10	Course Work – 4: Course Assignment	Course Assignment on associative symbiosis
11	Assessment Hour - 2	Assignment on symbiotic nitrogen fixers



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Hour	Delivery Mode and Activity	Topics to be Covered
12	Assessment Hour-3	Assignment on non-symbiotic microbes
13	Lab hour -1	Isolation of symbiotic microbes from root nodule
14	Lab Hour-2	Isolation of non-symbiotic nitrogen fixers from soil
15	Lab Hour-3	Detection of R:S ratio by estimating rhizosphere population
16	Contact Hour-6 Classroom Demonstration	Media preparation and sterilization
17	Lab Hour-4	Preparation of media and its sterilization
18	Course Work-5 : Course assignment	Assignment on composition of different media
19	Assessment hour-4	Course Assignment on different methods of sterilization
20	Contact Hour-7 Classroom Demonstration	Microbial propagation
21	Lab Hour - 5	Propagation of symbiotic nitrogen fixers
22	Lab Hour - 6	Propagation of non-symbiotic nitrogen fixers
23	Assessment hour-5	Assignment on procedure of propagation
24	Contact Hour-8 Classroom discussion	Fermentation and its different types of fermentation media
25	Lab Hour-7	Preparation of different types of fermentation media
26	Lab Hour-8	Mass scale production of fertilizers



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**COORDINATOR**  
**ACADEMIC COMMITTEE**  
MUHAMMED ABDURAHIMAN MEMORIAL  
ORPHANAGE COLLEGE  
P.O. MANASSERY, MUKKAM - 673602



# MUHAMMED ABDURAHIMAN MEMORIAL ORPHANAGE (MAMO) COLLEGE

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## DEPARTMENT OF MICROBIOLOGY

### CURRICULUM FOR CERTIFICATE COURSE - CERMB006

Hour	Delivery Mode and Activity	Topics to be Covered
27	Course Work – 6: Course Assignment	Course Assignment on fermenters, its parts and different types of fermenters
28	Course Work – 6: Course Assignment	Course Assignment on fermenters, its parts and different types of fermenters
29	Assessment Hour - 6	Course End Assessment
30	Assessment Hour - 7	Course End Assessment

## 16. ASSESSMENT COMPONENTS

Total Marks: 100

**CLASSROOM AND GROUP PARTICIPATION: 20 Marks.** This component aims at testing the course content understanding and the reflection skills and their attainment levels.

**COURSE WORK: 30 Marks.** This component aims at testing the skill attainment levels of the learners in analysing and implementing the real-world problem.

**MID-COURSE ASSIGNMENT: 20 Marks.** This component aims at testing the module-wise attainment levels of the course objectives and course outcome and module outcomes.

**END-COURSE ASSESSMENT: 30 Marks.** This component aims at testing overall attainment levels of the course with respect to course objectives, course outcome and module outcomes.

## 17. COURSE EVALUATION & GRADING

The course evaluation is done/coordinated entirely by the course coordinator. The



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### CURRICULUM FOR CERTIFICATE COURSE - CERMB006

following 10-point Indirect Grading System is used for awarding grades to students:

Percentage of Mark	Letter Grade	Interpretation	Class
95 and above	O	Outstanding	First Class with Distinction
85 to below 95	A+	Excellent	First Class with Distinction
75 to below 85	A	Very good	First Class with Distinction
65 to below 75	B+	Good	First Class
55 to below 65	B	Satisfactory	First Class
45 to below 55	C	Average	Second Class
35 to below 45	P	Pass	Third Class
Below 35	F	Failure	Fail
Incomplete	I	Incomplete	Fail
Absent	Ab	Absent	Fail

The grade is awarded by the course-coordinator by considering the overall performance of the learner in all the assessment component of the course.

## 18. GRIEVANCE REDRESSAL

The grievances, if any, can be submitted to the Head of the Department for its redressal. Those grievances that cannot be redressed by HoD can be forwarded to Academic Council of the College for final decision on the matter.

## 19. ISSUANCE OF CERTIFICATES

The Course Completion Certificate will be issued to all the successful candidates showing the Total Marks and Grade Obtained.



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