

GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for M.Sc. in Industrial Biotechnology, Semester - 1

Subject Name: Industrial Microbiology

Subject Code: 1310102

W.E.F 2021-22

1. Learning Outcomes

Learning Outcome Component	Learning Outcome (Learner will be able to)
Theoretical and practical understanding of industrial microbiology	<ul style="list-style-type: none">Describe the main steps and processes used to produce biological products in industry.
Exploitation of microorganisms in industries as a valuable source for production of useful products	<ul style="list-style-type: none">Discover new useful microorganisms, analyze their potential applications and store them reliably for later use.
Appreciate the microorganisms as a viable alternative to use of chemicals for production of useful products	<ul style="list-style-type: none">Evaluate which molecular techniques are applicable to improve production.
Effective Communication	<ul style="list-style-type: none">Communicate concepts and ideas effectively.
Professional & Ethical Behaviour	<ul style="list-style-type: none">Transparency, honesty and ethical reasoning in handling microbes and product processing.

LO – PO Mapping: Correlation Levels:

1 = Slight (Low); 2 = Moderate (Medium); 3 = Substantial (High), “-“= no correlation

Sub Code: 1310102	PO1	PO2	PO3	PO4	PO5	PO6	PO7
LO1: Theoretical and practical understanding of industrial microbiology	2	2	3	1	2	2	1
LO2: Exploitation of microorganisms in industries for production of useful products	3	3	3	2	2	3	1
LO3: Microorganisms as a viable alternative to use of chemicals for production of useful products	3	3	3	3	2	3	1
LO4: Effective communication	2	2	2	2	3	3	2
LO5: Professional & Ethical Behaviour	2	1	1	2	3	2	3

2. Course Duration: The course duration is 45 sessions of 60 minutes each.

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3. Course Contents:

Module No:	Module Content	No. of Sessions	70 Marks (External Evaluation)
1	<u>Characteristics of microbes</u> Introduction to Microbiology and Microbes; Morphology, Structure and Growth; Bacterial and other Microbial growth curves.	4	7
2	<u>Isolation of microbes from nature and screening of biological activities</u> Actinomycetes, Bacteria, Fungi; Developing and Semi-automating Screening Tests.	4	10
3	<u>Culture preservation and inoculum development</u> Culture Preservation; Cryopreservation; Inoculum Development.	4	5
4	<u>Small scale liquid fermentation</u> Introduction and Scope; Fermentation Vessels, Shakers, Media /Composition and Gas Exchange; Sampling and Analysis.	5	6
5	<u>Small scale solid state fermentation</u> Advantages/Disadvantages of Solid State Fermentation; Growth and Production of Enzymes; Small Scale Process Control.	5	6
6	<u>Experimental designs for improvement of fermentation</u> Sequential Nature of Design Experiments; Screening Designs; Optimization Designs and Verification of Models.	5	5
7	<u>Cell and enzyme immobilization</u> Different types of Immobilizations (entrapment, cross linking, covalent etc.); Performance and case studies.	5	10
8	<u>Strain improvements by recombinant and non-recombinant methods</u> Recombinant Methods; Non recombinant (Mutagenesis, fusion, recombination etc.); Operational Conditions, Statistical analysis.	5	6

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9	<u>Culture and analysis using gel microdrops</u> GMD's for Culture and Assays,; Open GMD's; Closed GMD's.	4	10
10	<u>Culture of extremophiles</u> Culture strategies and Challenges; Preservation; Batch and Continuous cultivation etc.	4	5

4. Pedagogy:

- ICT enabled Classroom teaching
- Practical / live assignment
- Interactive classroom discussions

5. Evaluation:

Students shall be evaluated on the following components:

A	Mid-Semester Examination	(Internal assessment-30 Marks)
B	End-Semester Examination	(External assessment-70 Marks)

6. Reference Books:

No	Author	Name of the Book	Publisher	Year of Publication / Edition
1	M.T. Madigan and J.M. Martinko	Brock Biology of Microorganisms	Pearson Prentice-Hall	Latest edition
2	J. M. Willey, L. Sherwood, C.J. Woolverton, L.M. Prescott,	Prescott's Microbiology	McGraw Hill, New-york	Latest Edition
3	A.L. Demain and J. Davies	Manual of Industrial Microbiology and Biotechnology	ASM Press	Latest Edition

Note: Wherever the standard books are not available for the topic appropriate print and online resources, journals and books published by different authors may be prescribed.

7. List of Journals/Periodicals/Magazines/Newspapers / Web resources, etc

- <https://www.bergeys.org/publications/>
- <https://www.journals.elsevier.com/bioresource-technology>

Course Outcomes:

On completion of this course, students should be able to:

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- Describe the main steps and processes used to produce biological products in industry;
- Discover new useful microorganisms and store them reliably for later use;
- Evaluate which molecular techniques are applicable to improve production.