INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**BACHELOR OF SCIENCE (MICROBIOLOGY)**
SEMESTER	**6**
COURSE TITLE	**FERMENTATION TECHNOLOGY**
COURSE CODE	**02MB0356**
COURSE CREDITS	**4**

Objective:

1 To acquaint students with technical and biological aspect of microbial utilisation for production of metabolites

Course Outcomes: After completion of this course, student will be able to:

1 Determine appropriate methods for strain improvement and preservation of microbial cultures to enhance their industrial utility and stability.

2 Analyze the criteria for selecting microbial growth media by evaluating their composition, suitability, and effect on microbial metabolism.

3 Make use of knowledge of reactor design to select and optimize industrial reactors based on process requirements and efficiency.

4 Compare upstream and downstream processing steps in fermentation industries, examining their impact on product yield, quality, and cost-effectiveness.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	**Introduction to Fermentation technology** History, Scope and Development of Fermentation technology; Isolation and screening of industrially important microorganisms - primary and secondary screening; Maintenance of Strains; Strain improvement: Mutant selection and Recombinant DNA technology.	15
2	**Fermentation media** Natural and Synthetic media; Basic components of an media (Carbon sources; Nitrogen sources; Vitamins; Minerals; Anti-foaming agents); Role of buffers in media; Process of aeration, and agitation.	15

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Contents : Unit	Topics	Contact Hours
3	**Fermentor design** Basic designs of Fermentor; Type of fermentors: Waldhof, Tower, Deepjet, Cyclone column, Packed tower and airlift fermenter; Scale up study and Product development; Down-stream processing and Product recovery; Regulation and safety.	15
4	**Production of Microbial Products** Production of alcohol; Organic acid - Citric acid; Antibiotic - Penicillin, Amino acid - Glutamic acid; Vitamin - B1; Single Cell Protein (SCP).	15
Total Hours		**60**

Textbook :

1 Principles of Fermentation Technology, Peter F Stanbury, Allan Whitaker, Stephen J Hall, Butterworth-Heinemann Press. UK., 2016

2 Fermentation Microbiology and Biotechnology., T. El-Mansi, C. Bryce, Arnold L. Demain, A.R. Allman, CRC Press, 2006

References:

1 Fermentation and Biochemical Engineering Handbook, Fermentation and Biochemical Engineering Handbook, Celeste M. Todaro, Henry C. Vogel, William Andrew Press. Norwich, NY., 2014

2 Microbial Technology: Fermentation Technology, Microbial Technology: Fermentation Technology, H. J. Peppler, D. Perlman, Academic Press., 2014

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
5.00	10.00	30.00	30.00	20.00	5.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.

3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

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Supplementary Resources:

1 https://www.youtube.com/watch?v=Jrhs5hvOWKY

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