INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING**
SEMESTER	**1**
COURSE TITLE	**FERMENTATION TECHNOLOGY**
COURSE CODE	**01CM1109**
COURSE CREDITS	**3**

Objective:

1 The aim of this course to gain knowledge about fermentation processes, learn role of microorganisms in fermentation and to gain skills to control of fermentation processes.

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

1 Analyze the characteristics of conditions required in fermentation processes
2 Predict the role of microorganism in fermentation
3 Design the production technologies for different types of fermented products
4 Evaluate various fermentation and sterilization types

Pre-requisite of course: Basics of Microbiology

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	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	8
2	**Fermentation Media** Natural and Synthetic media, Basic components of a media (Carbon sources; Nitrogen sources; Vitamins; Minerals; Anti-foaming agents), Role of buffers in media; Process of aeration, and agitation	8
3	**Fermenter Design** Body construction: construction material, Temperature controls, Aeration and agitation systems, Stirrer glands and bearings, Baffles, Valves and steam traps, Pressure-control valves	8

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Contents : Unit	Topics	Contact Hours
4	**Sterilization** Definition and process, types of sterilization methods- batch and continuous, Thermal death kinetics, filter sterilization of liquid media and air	6
5	**Production of Microbial Products** Production of alcohol; Organic acid - Citric acid, Antibiotic - Penicillin, Amino acid - Glutamic acid, Vitamin - B1; Single Cell Protein (SCP)	8
Total Hours		**38**

Textbook :

1 Biochemical Engineering Fundamentals, Bailey J.E. and Ollis, D.F., McGraw Hill, 1986

References:

1 Principles of Fermentation Technology, Principles of Fermentation Technology, Stanbury, P. F., Whitaker, A., Hall, S. J., Elsevier Science, 2016

2 Bioprocess engineering : basic concepts, Bioprocess engineering : basic concepts, Michael L. Shuler, Fikret Kargi, Prentice Hall of India Pvt. Ltd., 2002

3 Bioprocess engineering principles, Bioprocess engineering principles, Doran, P. M. , Elsevier, 1995

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
10.00	20.00	25.00	25.00	10.00	10.00

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, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

4 Students will use supplementary resources such as online videos, NPTEL videos, e? courses, Virtual Laboratory

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Supplementary Resources:

1 https://nptel.ac.in/courses/102/105/102105058/

2 https://www.labster.com/simulations/fermentation/

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