22BT203 MICRO BIOLOGY AND FERMENTATION TECHNOLOGY

source: https://www.scientificbio.com/biomass-monitoring/

Hours Per Week :

L	T	P	C
3	0	2	4

PREREQUISITE KNOWLEDGE: Basics of Biology.

COURSE DESCRIPTION AND OBJECTIVES:

The main objective of the course is to familiarize the students to understand the classification, diversity and physiology of microorganisms. It emphasizes on the methods of microbe cultivation, sterilization techniques, microbial diseases, host pathogen interactions and their control. Further, it enables the students about design of fermentation process, media and prediction of nutritional and other process variables on the production of bioproducts.

MODULE-1

UNIT-1 **9L+0T+6P=15 Hours**

FUNDAMENTALS OF MICROBIOLOGY

Spontaneous generation theory, germ theory of diseases, microscopy-types, staining techniques, characteristics used in microbial taxonomy, sterilization processes - physical agents and chemical agents, evaluation of effectiveness of anti microbial agents, biosafety levels.

UNIT-2 **15L+0T+10P=25 Hours**

MICROBIAL DIVERSITY

Characteristic features and biological importance of viruses, bacteria, fungi, yeast and algae. Molecular basis of pathogenicity, human diseases caused by viruses, bacteria and fungi, Emerging infectious diseases.

PRACTICES:

- Sterilization techniques in microbiology.
- Microscopic examination of microorganisms.
- Gram staining of bacteria.
- Evaluation of effectiveness of anti microbial agents.
- Biochemical tests for identification of bacteria.
- Culturing and identification of fungal organisms.

MODULE-2

UNIT-1 **9L+0T+6P=15 Hours**

FERMENTATION PROCESES

Design and construction of fermenter and ancillaries, main parameters to be monitored and controlled in fermentation processes, nutrient requirement for fermentation process, culture media and types, medium optimization techniques with special emphasis on statistical techniques, pure culture techniques, microbial growth and measurement, improvement of industrially important micro organisms, preservation of pure cultures.

SKILLS:

- ✓ *Handle different microscopes.*
- ✓ *Isolation and identification of microbes from various sources.*
- ✓ *Microbial species differentiation.*
- ✓ *Aseptic maintenance of lab and hood.*
- ✓ *Maintenance of stock cultures.*
- ✓ *Handling of microbial fermentation process in fermenter.*

UNIT-2 **15L+0T+10P=25 Hours**

TYPES OF FERMENTATION

Batch culture, continuous culture, fed-batch culture- applications and examples, solid state fermentation, development of inoculum for microbial, yeast, fungal and animal cell cultivations, supply of air/nitrogen for aerobic and anaerobic process, aeration andagitation.

PRACTICES:

- Fermentation media for cultivation of microorganisms.
- Isolation of pure cultures by streak plate and pour plate technique.
- Preservation of purecultures.
- Microbial growth measurement - Viable cell count method.
- Microbial growth measurement - Turbidity estimation.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Categorize different characteristic features of micro organisms under microbial taxonomy.	Analyze	1	1,2,5,4,7,9,10
2	Apply the control agents against disease causing pathogens.	Apply	1	1,5,6,9,10
3	Evaluate the role of microorganisms in various fields.	Evaluate	1	1,3,4,5,6,9,10
4	Design fermentation media for enhanced growth and product formation.	Create	2	1,2,3,4,5,6,9,10
5	Analyze fermentation processes for industrial production of bioproducts.	Analyze	2	1,3,4,5,6,9,10

TEXT BOOKS:

1. Joanne M. Willey, Linda M. Sherwood and Christopher J. Woolverton, “Prescott’s Microbiology”, 10th edition, Mc Graw Hill, 2017.
2. Peter F. Stanbury, Allan Whitaker, Stephen J. Hall,“Principles of Fermentation Technology”, 3rd edition, Elsevier, 2016.

REFERENCE BOOKS:

1. Douglas S. Clark and Harvey W. Blanch,“Biochemical Engineering”, 2nd edition, CRC Press, 1997.
2. Michael L Shuler, Fikret Kargi and Matthew P DeLisa,“Bio process Engineering: Basic Concepts, 3rd edition, Pearson. 2017.
3. S. Krupanidhi, A. Venkata Narayana, D. JohnBabu, “Handbook of Fermentation Technology-Instant Class Notes” (eBook), 1st edition, Pothi, 2015.
4. K. R. Aneja, “Experiments in Microbiology Plant Pathology and Biotechnology”, 4th edition, New Age International limited, 2007.