

V SEMESTER
COURSE 14 A: INDUSTRIAL MICROBIOLOGY
credits -3

Course Outcomes:

By the Completion of the course, the learner should able to–

1. Recognize various industrially important microorganisms
2. Identify the methods of screening of required microorganisms
3. Identify the appropriate methods of fermentation to be adapted for productions
4. Discuss the basic concepts in industrial microbiology, industrially important microbes and metabolites
5. Explain the components of upstream and downstream bioprocessing

UNIT I: Microorganisms of industrial importance **No. of hours: 9**

1. Brief history and developments in industrial microbiology.
2. Microorganisms of industrial importance -yeasts (*Saccharomyces cerevisiae*), molds (*Aspergillus niger*) bacteria (*E.coli*), actinomycetes (*Streptomyces griseus*).
3. Industrially important Primary and secondary microbial metabolites- Techniques involved in selection of industrially important metabolites from microbes.

UNIT II : Screening and Strain Improvement **No. of hours: 9**

1. Primary and secondary screening. Preservation and maintenance of industrial strains
2. Outlines of strain improvement.
3. Fermentation media (Crude and synthetic media; molasses, corn- steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates)

UNIT III: Bioreactors **No. of hours: 9**

1. Components of a typical continuously stirred tank bioreactor.
2. Types of fermenters – laboratory, pilot-scale and production fermenters.
3. Types of fermentation processes- solid state, liquid state; batch, fed- batch, continuous; aerobic, anaerobic; submerged, surface

UNIT IV: Fermentation and Downstream processes **No. of hours: 9**

1. Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration
2. Downstream processing - filtration, centrifugation, cell disruption, solvent extraction.

3. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes.

UNIT V: Microbial Productions

No. of hours: 9

1. Production of citric acid, ethanol and penicillin.
2. Production of Glutamic acid and vitamin B12
3. Industrial production and uses of amylases, proteases, lipases and cellulases.

Skill Outcomes:

By the completion of the course the learner should be able to–

1. Comprehend the significance of and demonstrate microbial diversity by isolating microorganisms from natural environments.
2. Microscopically demonstrate the microorganisms found in fermented food; prepare some of the fermented products(wine) in the laboratory to observe the associated physical and chemical changes.
3. Carry out microbial productions in small scale (citric acid) and estimate the product

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COURSE 14 A INDUSTRIAL MICROBIOLOGY

credits -1

1. Microbial fermentation for the production and estimation of ethanol
2. Isolation of amylase producing microorganisms from soil
3. Production of amylase from bacteria and fungi
4. Assay of amylase
5. Demonstration of fermenter
6. Production of wine from grapes
7. Growth curve and kinetics of any two industrially important microorganisms.
8. Microbial fermentation for the production and estimation of citric acid

References:

1. Stanbury, P.F., Whitaker, A. and Hall, S.J. (1997). Principles of Fermentation Technology, Aditya Books (P) Ltd. New Delhi.
2. Doyle, M.P., Beuchat, L.R. and Montville, T.J. (1997). Food Microbiology: Fundamentals and Frontiers. ASM Press, Washington D.C., USA.

Co-Curricular Activities:

1. Lectures/ Seminar on current trends in industrial microbiology