MMB - C204
INDUSTRIAL MICROBIOLOGY

L T Credit
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Learning objectives:

- To understand the scope and application of industrial microbiology.
- To learn the preservative technique for the preservation of industrially important microorganism.
- To get the knowledge IPR and other law related to industry.
- To understand fermentation technologies used for the production of industrially important products.
- To understand how different fermentation product are produced, purified and recovered.

Learning outcomes:

At the end of course student will be able to

- Screen and isolate industrially important microorganism.
- Use the principles of preservation techniques to preserve the industrial important microorganism and also how to improve the strain
- Make use of fermentor to produce alcoholic beverage and other fermentation products.
- Explain the different method of disinfection used in industry and also how to maintain quality of product.
- Prepare and develop dairy products in laboratory.
- Describe the component, role, and working of fermentor.

UNIT – I

Introduction: Scope, strategies for selection and improvement of industrial strains; preservation of gene pool in industrial organisms; industrial media and nutrition of industrial organisms; metabolic pathways for the biosynthesis of industrial microbiology products, IPR: Intellectual property right and protection (IPP), forms of protection- patents; copyrights; trade secrets; Trademarks; European Patent convention (EPC), Budapest treaty and Paris convention. **(12 lectures)**

UNIT – II

Fermentors, fermentor designing &operations: Basic functions of fermentors, types of fermentor and construction, fermentor configurations, fed-batch cultivation; design of fermentor on the basis of physiology of organisms-air lift fermentors; pilot plant, surface or solid state fermentors, batch, fed-batch, and continuous fermentation; measurement and control of fermentation parameters, pH, temperature, dissolved oxygen, foaming and aeration, Fermentation economics
(13 lectures)

UNIT – III

Downstream processing of microbial products: Solids (insolubles) removal– filtration, centrifugation, coagulation and flocculation, foam fractionation, whole broth treatment; primary product isolation–cell disruption, liquid extraction, dissociation extraction, ion-exchange adsorption, precipitation; purification– chromatography, carbon decolorization, crystallization; product isolation– crystalline processing, drying.
(12 lectures)

UNIT – IV

Sterility in industrial microbiology: Physical and chemical methods of achieving sterility, sterilization of fermentor and its accessories, media sterilization;viruses (phages) in industrial microbiology – morphological grouping of bacteriophages, lysis of hosts by phages, prevention of phage contamination, use of phage resistant mutants, inhibition of phage with chemicals, use of adequate media conditions.
(12 lectures)

UNIT – V

Fermentation products: Production of beer, wine, organic acids – citric & lactic, amino acids –glutamic acid, yeast – baker's, food, feed, ethyl alcohol, antibiotics– penicillin & cephalosporin,methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase). **(11 lectures)**

Suggested Reading

1. Dubey, R.C. *Advanced Biotechnology*. S. Chand & Co. P Ltd, New Delhi, p. 1161; ISBN: 81:219-4290-X.
2. Casida, L.E.J.R. Industrial Microbiology, New Age International Publisher,
3. A.H.Patel, Industrial Microbiology, Laxmi Publication, **ISBN-10:** 9385750267
4. Prescott and Dunns.Industrial Microbiology, CBS Publishers and Distributers, ISBN-10: 8123910010
5. Stanbury, P.F., Whittaker, A. and Hali, S.J. 1995. Principles of Fermentation Technology, II Ed., Pergamon Press.