

Paper No- 12
SEMESTER - V
INDUSTRIAL MICROBIOLOGY

THEORY

MARKS: 100

Unit 1 Introduction to industrial microbiology and fermentation processes No. of lectures: 6

- 1.1 Brief history and developments in industrial microbiology
- 1.2 Types of fermentation processes - Solid-state and liquid-state (stationary and submerged) fermentations; batch, fed-batch (eg. baker's yeast) and continuous fermentations

(Chapter 2, Industrial Microbiology by Casida LE, 1st Ed. Wiley Eastern Ltd., 2005 (Reprint), Pages:3-24

Chapters 1 and 2, Principles of Fermentation Technology by Stanbury PF, Whitaker A and Hall SJ, 2nd Ed. Elsevier, 1995, Pages: 1-9;13-30)

Unit 2 Types of bio-reactors and measurement of fermentation parameters No. of lectures: 12

- 2.1 Components of a typical bio-reactor
- 2.2 Types of bioreactors-Laboratory, pilot- scale and production fermenters, constantly stirred tank and air-lift fermenters
- 2.3 Measurement and control of fermentation parameters - pH, temperature, dissolved oxygen, foaming and aeration

(Chapters 3 and 9, Industrial Microbiology by Casida LE, 1st Ed. Wiley Eastern Ltd., 2005 (Reprint), Pages:25-50;142-144)

Chapters 7 and 8, Principles of Fermentation Technology by Stanbury PF, Whitaker A and Hall SJ, 2nd Ed. Elsevier, 1995, Pages: 167-190;202-204;208;215-226)

Unit 3 Isolation of industrially important microbial strains and fermentation media

No. of lectures: 8

- 3.1 Sources of industrially important microbes and methods for their isolation
- 3.2 Preservation and maintenance of industrial strains, strain improvement
- 3.3 Crude and synthetic media; molasses, corn-steep liquor, sulphite waste liquor, whey, yeast extract and protein hydrolysates

(Chapters 4 and 7, Industrial Microbiology by Casida LE, 1st Ed. Wiley Eastern Ltd., 2005 (Reprint), Pages:55-75;117-127)

Chapters 3 and 4, Principles of Fermentation Technology by Stanbury PF, Whitaker A and Hall SJ, 2nd Ed. Elsevier, 1995, Pages: 35-42;93-106)

Unit 4 Down-stream processing

No. of lectures:4

Cell disruption, filtration, centrifugation, solvent extraction, precipitation, lyophilization and spray drying

(Chapter 10, Principles of Fermentation Technology by Stanbury PF, Whitaker A and Hall SJ, 2nd Ed. Elsevier, 1995, Pages: 280-300;304-305)

Unit 5 Microbial production of industrial products (micro-organisms involved, media, fermentation conditions, downstream processing and uses) No. of lectures: 18

- 5.1 Citric acid, ethanol, penicillin, glutamic acid, Vitamin B12
- 5.2 Enzymes (amylase, protease, lipase)
- 5.3 Wine, beer

*(Chapters 17,18,21,24,25 and 26, Industrial Microbiology by Casida LE,1st Ed. Wiley Eastern Ltd., 2005 (Reprint), Pages:221-247;299-304;347-351;377-381;390-400;403-407
Chapters 7,8,9,11,12,13 and 15, A Textbook of Industrial Microbiology by Crueger Wand Crueger A,2nd Ed. Panima Publishing Corporation, 2000, Pages:124-128;134-141;158-163;191-197;203-204;207;219-221;229-231;292-297)*

PRACTICALS

MARKS: 50

1. Microbial fermentations for the production and estimation (qualitative and quantitative) of:
 - (a) Enzymes: Amylase and Protease
 - (b) Amino acid: Glutamic acid
 - (c) Organic acid: Citric acid
 - (d) Alcohol: Ethanol
2. A visit to any educational institute/industry to see an industrial fermenter, and other downstream processing operations

SUGGESTED READINGS

1. Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited
2. Okafor N. (2007). Modern Industrial Microbiology and Biotechnology. 1st edition. Bios Scientific Publishers Limited. USA
3. Waites M.J., Morgan N.L., Rockey J.S. and Higton G. (2001). Industrial Microbiology: An Introduction. 1st edition. Wiley – Blackwell
4. Glaze A.N. and Nikaido H. (1995). Microbial Biotechnology: Fundamentals of Applied Microbiology. 1st edition. W.H. Freeman and Company

ONLINE READING MATERIAL

1. http://www.ebook3000.com/Industrial-Microbiology--An-Introduction_60498.html
2. industrial microbiology books pdf
3. <http://freemicrobiologybooks.com/>
4. <http://freemicrobiologybooks.com/category/industrial-microbiology/>