4thSemester	RCH4D002	Fundamental of Biochemical Engineering	L-T-P 3-0-0	3 CREDITS

Module I: **(10 hrs)**

Introduction to Microbiology: Structure of cells, types of cells Introduction to Biochemical process industries: Industrial alcohols, antibiotic, enzymes, vitamins, single cell process
Overview of microbiology, Different types of Microbes.

Module II: **(10 hrs)**

Fermentation mechanisms and kinetics: Kinetic models of microbial growth and product formation Fermentation types: Batch and continuous fermentation, oxygen transfer in fermenter, monitoring and control of fermentation process.

Module III: **(10 hrs)**

Bioreactors: Types of bioreactor and design Sterilization Sterilization of media and air, equipment, batch and continuous sterilizer design, Transport phenomena in biochemical engineering, heat and mass transfer in bioprocessing,

Module IV: **(08 hrs)**

Biochemical product separation and recovery: Membrane separation process, chromatographic method Application to waste water treatment: Activated sludge process, aerobic and anaerobic processes.

Module V: **(07 hrs)**

Downstream processing: Recovery and purification of products, allied unit operation forproduct recovery, production of biogas and ethanol, effluent treatment by biologicalmethods.

Books:

- Biochemical Engineering Fundamentals, 2nd ed. by J E Bailey and D F Ollis,McGraw-Hill.
- Biochemical Engineering: Principles and Concepts, 3rd ed. by S T Ahmed Inamdar,PHI.
- Introduction to Biochemical Engineering, 2nd ed. by D G Rao, McGraw-Hill.
- Bioprocess Engineering: Basic Concepts, 2nd ed. by M L Shuler and F Kargi, PHI.
- Biochemical Engineering: A Textbook for Engineers, Chemists and Biologists, 1st ed. by S Katoh, J Horiuchi, and F Yoshida, Wiley-VCH.