



ASPECTS OF BIOCHEMICAL ENGINEERING

PROF. DEBABRATA DAS

Department of Biotechnology
IIT Kharagpur

TYPE OF COURSE : Rerun | Core | UG/PG

COURSE DURATION : 12 Weeks (24 Jan' 22 - 15 Apr' 22)

EXAM DATE : 23 Apr 2022

PRE-REQUISITES : Mathematics in 10+2

INTENDED AUDIENCE : Biotechnology, Chemical Engineering, Biochemical Engineering, Environmental Engineering, Biochemistry

INDUSTRIES APPLICABLE TO : IFB Agro Industry; IOC; ONGC, Dr. Reddy's Laboratories, Biocon, United Beverages, Ranbaxy Lab. Ltd., pfizer India.

COURSE OUTLINE :

Biochemical Reaction Engineering is mostly deals with the most complicated life systems as compared to Chemical Reaction Engineering. To describe the behavior of any life system in terms of mathematical form is the basic essence of biochemical reaction engineering. The present course in true sense is an interdisciplinary subject since biologist, physicist, chemist, technologist and mathematician all join hand in hand to develop realistic models. This specialized subject comprises of transport processes, sophisticated advanced control system besides conventional biology, physics and mathematics. Production of biomolecules can be done broadly in two different ways namely, using enzymes and microbial cells. The present course is designed to cater all the above aspects of the subject. Students undergoing this course will be initially able to differentiate between conventional chemical reaction engineering and biochemical reaction engineering. They also develop the expertise to do the design of any biochemical process which will be very much useful for the industries.

ABOUT INSTRUCTOR :

Prof. Debabrata Das pursued his doctoral studies from Indian Institute of Technology (IIT) Delhi. He is a Senior Professor at IIT Kharagpur. He was also associated as MNRE Renewable Energy Chair Professor. He has pioneered the promising R&D of Bioenergy production processes by applying fermentation technology. Prof. Das is involved in three different area of research: Gaseous energy recovery from organic wastes; algal biorefinery and CO₂ sequestration; and microbial fuel cell. He is presently involved in teaching both undergraduate and post-graduate courses on Biochemical Reaction Engineering; Aspects of Biochemical Engineering; Bioprocess Plant and Equipment Design; and Bioprocess Technology for the students of Department of Biotechnology; Department of Chemical Engineering; Department of Chemistry and School Energy Science and Engineering. He has been teaching for the last 29 years.

COURSE PLAN :

Week 1: Microbiology, Biochemistry and Bioproducts

Week 2: Stoichiometry and Thermodynamics of biochemical reactions

Week 3: Kinetics of homogeneous chemical reactions

Week 4: Different types of bioreactors and reactor analysis

Week 5: Kinetics of enzyme catalyzed reactions using free enzymes

Week 6: Kinetics of enzyme catalyzed reactions using immobilized enzymes

Week 7: Kinetics of substrate utilization, product formation and biomass production of microbial cells

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Week 9: Design and analysis of activated sludge process and anaerobic digester. Scale up of bioreactor

Week 10: Transport phenomenon in bioprocess

Week 11: Air and medium sterilization

Week 12: Operation and Process control, Downstream processing, Economic analysis of biochemical processes and summary & conclusion