Precision Fermentation for Sustainable Manufacturing of Bio-actives and Industrial Biochemicals

Overview

In the past few decades, the application of biotechnological tools has changed the process of manufacturing food and pharmaceuticals. These tools refer to engineering and scientific principles that are used to process natural resources using biological means. Tools including the use of enzymes, synthetic and systems biology, and biochemical process engineering are used to develop products such as bread, wine, distilled spirits, amino acids, organic acids, antibiotics, vitamins, etc. These products have a multi-billion-dollar market value, and industries manufacturing them require highly qualified professionals with a core understanding of the fundamental and engineering principles involving processes used for manufacturing them. Currently, in India and abroad, there is a growing interest in industrial biotechnology with an emphasis on precision fermentation as part of cellular agriculture. Cellular agriculture involves the use of large-scale fermentation to produce products that have specific functional or sensory characteristics. The current status of precision fermentation is still within research and development. Unlike traditional fermentation, precision fermentation requires more intensive control and manufacturing processes, which require considerable understanding of the topics, including bioreactor design and analysis, instrumentation and control, and scale-up.

The primary objective of this course is to provide a basic and advanced understanding of bioreactor design and analysis. The details include:

- Introduce participants to the field of precision fermentation and cellular agriculture.
- Enhance participants' understanding of technologies and methodologies used in systems and synthetic biology.
- Introduce participants to the fundamentals of bioreactor design principles, including the design of reactors, heat and mass transfer in bioreactors, instrumentation, and control, and scale-up.
- Give examples and have an informed discussion of the key technologies underpinning research and industrial application of precision fermentation for sustainable manufacturing.

Course participants will learn these topics through lectures and hands-on experiments. Also, case studies and assignments will be shared to stimulate the research motivation of participants.

Modules	**Dates of Lectures and Tutorials: Dec 2- Dec 6, 2024** **Lectures:** 1. Introduction to precision fermentation and cellular agriculture 2. Introduction to synthetic and systems biology, Enzymes and Engineering Enzymes 3. Introduction to bioreactor design and analysis 4. Heat and Mass transfer in bioreactors, Scale-up of bioreactors 5. Developing a plant protein (case study 1) 6. Developing a microbial protein (case study 2) **Tutorials:** 1. Tutorial and demonstration on the application of analytical instruments including spectrophotometer, HPLC, and GC for sample and product analyses 2. Tutorial on the design of batch and fed-batch reactors 3. Tutorial and demonstration on the application of FTIR for sample and product analyses 4. Developing a plant protein (case study 1) 5. Developing a microbial protein (case study 2)
You Should Attend If…	• Executives, engineers, and researchers from manufacturing, service, and government organizations, including R&D laboratories. • Students at all levels (BTech/MSc/MTech/PhD) or Faculty from reputed academic institutions and technical institutions. **Number of participants for the course will be limited to fifty.**
Fees	The participation fees for taking the course is as follows: **Students: INR 1,000** **Academic Institutions: INR 10,000** **Industry/ Research Organizations: INR 30000** **Participants from abroad: US $500** The above fee includes all instructional materials, computer use for tutorials, and laboratory equipment usage charges. The participants will be provided with accommodation and food on payment basis.

The Faculty

Dr. Ashutosh Singh is an Associate Professor in the School of Engineering at the University of Guelph**.** His research work involves the development of novel food processing methods and the use of physical, chemical, engineering, bioinformatics and biotechnological tools to improve our limited understanding of the nutritional component of food at the molecular level. In recent years his research group has expanded the research areas to include the development of non-destructive food quality and safety testing techniques using ATR-FTIR and NIR. His research group also works in the area of design, fabrication and application of microfluidic electrochemical biosensors, Quartz-Crystal Microbalance (QCM) biosensors and colorimetric biosensors to identify food allergens and toxins**.**

Dr. Winny Routray is working as an Assistant Professor in the Department of Food Process Engineering at National Institute of Technology Rourkela, India. Her research interests encompass many aspects of food and post-harvest engineering, by-product and waste valorization through bioprocessing, downstream processing, and microbial applications, with the general themes of bio-engineering and sustainable biomaterials production.

Dr. Balasubramanian Paramasivan is serving as an Associate Professor in the Department of Biotechnology & Medical Engineering at National Institute of Technology Rourkela, India. His research interests encompass bioenergy, environmental engineering and management, rural technologies, and sustainable development.

Course Co-ordinator:

Dr. Winny Routray
Phone: 0661 - 246 2914
E-mail: routrayw@nitrkl.ac.in

.....

For more details visit link:
https://gian.iith.ac.in/