

**Educational Objectives:**

1. This course discusses the use of microorganisms in fermentation technology and biotechnology which cover principles and history of fermentation, microbial metabolisms and regulation, strain improvement, microbial isolation and screening, culture preservation, fermentation techniques and conditions and their application in the production of enzymes, amino acids, alcohol, acetic acid, lactic acid, biomass and mixed fermentation commonly implemented in food industries. This course is designed to enable students develop a food fermentation process using microorganisms and local based substrate.

**Course Outcomes:**

2. Students should at the end of the course,
  - a. Evaluate factors that contribute in enhancement of cell and product formation during fermentation process.
  - b. Analyse kinetics of cell and product formation in batch, continuous and fed-batch cultures.
  - c. Differentiate the rheological changes during fermentation process and classify it under certain rheological group.
  - d. Analyse lab scale information and apply it for scaling up process.
  - e. Analyse the kinetic of batch and continuous, sterilization process.

**Course Contents:**

- a. An introduction to fermentation processes
- b. Microbial growth kinetics
- c. Batch cultures
- d. Fed batch cultures
- e. Continuous cultures
- f. The isolation, preservation and improvement of industrially important microorganisms
- g. Improvement methodologies for industrial microorganisms
- h. Media for industrial fermentations
- i. Sterilization
- j. The development of inoculation for industrial fermentations
- k. Design of a fermentor

- l. Instrumentation and control
- m. Aeration and agitation
- n. The recovery and purification of fermentation products
- o. Effluent treatment
- p. Fermentation economics
- q. Discussion/Presentations/Seminars

**Recommended Books:**

1. Principles of Fermentation Technology by P F Stanbury, A Whitaker and S J Hall. Elsevier Science Ltd. 2nd Edition. Reprint 2003.
2. Fermentation Microbiology and Biotechnology by E. M. T. El-Mansi, C. F. A. Bryce, Arnold L. Demain and A.R. Allman (Editors). Taylor and Francis Ltd. 1999.
3. Fermentation Technology by M L Srivastava. Alpha Sciences.
4. Practical Fermentation Technology by Brian McNeil and Linda Harvey. John Wiley & Sons Ltd. West Sussex, England. 2008