

Metabolic Engineering of Bioprocesses

Metabolic engineering (ME) in bioprocesses is an emerging multidisciplinary field which is revolutionizing “**White Biotechnology**” or the application of biotechnology for the processing and production of chemicals, materials and energy. ME considers the cell as a chemical factory where the inputs and outputs can be **re-engineered** to synthesize desired metabolites with unprecedented high productivity. The major disciplines contributing to the field are biochemical engineering, molecular genetics, enzyme technology, systems biology and computational biology.

ME specifically seeks to mathematically model a cell’s metabolic network, and determine parts of the network that constrain the production of desired products. Genetic techniques can then be used to modify the network in order to relieve these constraints. How do such modifications affect the choice and design of bioprocess operations? What can be learned from bioprocess operations, and how do operations constrain the biochemical modifications made?

This course aims to help students, academicians and scientists to apply knowledge of ME across a wide range of different bioprocesses. The course is organized in modules as:

- (a) A reconsideration of biochemical pathways to provide an understanding of why cells do what they do
- (b) Quantifying biochemical pathways by Metabolic flux analysis
- (c) Molecular biology tools available to modify metabolism
- (d) Analytical methods available to monitor and quantify bioprocesses
- (e) A detailed description of operational modes of growth. How does the bioprocess engineering design affect growth and product formation?
- (f) Case studies on biochemical production in bacterial and yeast systems for vitamins, amino acids, biochemical and biofuels.

*Course participants will learn these topics through lectures, assignments, short quizzes, hands-on approach to problem solving through software such as MATLAB.

Dates for the Course	2 nd July, 2016 to 15 th July, 2016
Host Institute	IIT Madras
No. of Credits	2
Maximum No. of Participants	50
You Should Attend If...	<ul style="list-style-type: none"> ▪ You are a final year B.Tech / Post-graduate student in any discipline related to biosciences/ biotechnology/ biochemical engineering ▪ Faculty from academic institution pursuing research on improving microbial production of chemicals by metabolic engineering ▪ You are a research scientist in any organization or industry keen to develop processes using engineered hosts.
Course Registration Fees	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"> ▪ Student Participants: Rs.2000 ▪ Faculty Participants: Rs.5000 ▪ Government Research Organization Participants: Rs.8000 ▪ Industry Participants: Rs.10000 <p>The above fee is towards participation in the course, the course material, computer use for tutorials and assignments, and laboratory equipment usage charges.</p> <ul style="list-style-type: none"> ▪ Mode of payment: Demand draft in favour of “Registrar, IIT Madras” payable at Chennai ▪ The demand draft is to be sent to the Course Coordinator at the address given below.
Accommodation	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel</p>

Course Faculty



Dr. Mark A. Eiteman is a Professor in the Biochemical Engineering division of the University of Georgia, Athens, Georgia, USA. His research interests include metabolic engineering, microbial physiology and bioprocessing, with an emphasis on microbial processes to generate fine and commodity chemicals.



Dr. T.S. Chandra is a Professor in the Dept. of Biotechnology, IIT Madras. Her research interests are in Applied and Industrial Microbiology; metabolic engineering through gene duplication, replicative and integrative transformation in eukaryotic fungi to improve riboflavin production; oxidative stress on product yields; biomass conversion to biogas and microbial fuel cells.



Dr. Subramanian Ramalingam is an Associate Professor of Anna University, Chennai. His major research interest is in the synthesis of green chemicals such as lactic acid, 1,3-propanediol, propionic acid and 3-hydroxypropionic acid in lactic acid bacteria and *E. coli* by metabolic engineering strategies.

Course Coordinator:

Name: Dr.T.S.Chandra

Address :

Dr.T.S.Chandra,
Professor,
Dept of Biotechnology,
IIT Madras.
Chennai -600 036

Phone: 044-22574103 / 6103

E-mail: chandra@iitm.ac.in

URL: <http://www.iitm.ac.in>

Co –Coordinator

Dr.S.Ramalingam

Address :

Dr.S.Ramalingam,
Associate Professor ,
Dept of Biotechnology,
Anna University,
Chennai -600 025.

Phone: +91 9444924785

E-mail: ramabioprocess@annauniv.edu