

Bioproduction in Photosynthetic Microbes

Overview

Global energy security concerns have necessitated the development of cost-effective biorenewables for energy and environmental sustainability. Photosynthetic microbes such as cyanobacteria and algae can synthesize valuable biochemical and Biofuels by harnessing solar energy. By contributing oxygen to the atmosphere, they played an important role in carbon neutralization. They are attractive to improve energy security and contribute to the environmental problems such as global warming by reducing CO₂ emission. They are endowed with high photosynthetic efficiencies and diverse metabolic capabilities that confer the ability to convert solar energy into a variety of biofuels and their precursors. Moreover, photosynthetic microorganisms are attractive since they can grow on non-arable land and utilize CO₂ and wastewater.

Although biofuel production by photosynthetic microbes is called as the third generation biofuels, and significant knowledge about the metabolism of different species is necessary for efficient bioproduction. Genome-scale metabolic model (GEM) guided genetically tractable photosynthetic microorganisms are needed today to capture the maximum solar energy and convert atmospheric CO₂ to high-energy chemical products. It is essential to understand the metabolism and the efficient metabolic engineering of the photosynthetic organisms together with cultivation and separation processes as well as increased CO₂ assimilation for the enhancement of microbial production of biofuel and biochemicals.

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

Modules	Course Duration: May 21- 25, 2018 Venue: Indian Institute of Technology Kharagpur
	<p>Course details:</p> <p>Day#1:</p> <p>Lecture 1: What is Bioproduction? Lecture 2: Photosynthetic Microbes Tutorials 1: Material balances, Stoichiometry of cell growth and product formation</p> <p>Day#2</p> <p>Lecture 3: Reconstruction of Metabolic Networks Lecture 4: Reconstruction of metabolic networks for Photosynthetic Microbes Tutorials 2: Reconstruction of Metabolic Models in a microorganism</p> <p>Day#3</p> <p>Lecture 5: Synthetic Biology Lecture 6: Genetic Modification of Cyanobacteria Tutorials 3: In teams, design a photosynthetic microbe, using the Registry of Standard Biological Parts, that meets a need in the world</p> <p>Day#4</p> <p>Lecture 7: Reconstruction of a metabolic model of cyanobacteria <i>Cyanothece</i> sp. Lecture 8: Computational tools for making cyanobacteria metabolic model more accurate Tutorials 4: Reconstruction of cyanobacteria metabolic model</p> <p>Day#5</p> <p>Lecture 9: Application of Genome-Scale Metabolic models: ¹³C Metabolic Flux Analysis, Metafluxomics Lecture 10: Protein-protein interaction, sequence alignment Tutorials 5: Problem-solving session with examples: Bioinformatics</p> <p style="text-align: center;">Number of participants for the course will be limited to fifty.</p>
You Should Attend If...	<ul style="list-style-type: none"> ▪ You are a scientist or researcher from synthetic biology and computational biology domains from Government organizations, R&D laboratories or other institutions. ▪ You are a student at of B.Sc./B.Tech./M.Sc./M.Tech./Ph.D. ▪ You are a faculty member from a reputed academic institution or technical institution.
Fees	<p>Step 1: GIAN Registration</p> <p>A mandatory registration fee of Rs. 500/- to be paid through the GIAN website (http://www.gian.iitkgp.ac.in/GREGN). The registration on GIAN is a one-time affair, i.e., once you are registered on GIAN portal, you may apply for any GIAN course.</p>

Step 2: Course registration

Participants from abroad: US \$200
Industry/ Research Organizations: Rs. 5000/-
Academic Institutions: Rs. 2000/-
Students: Rs. 1000/-

The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

Course Registration website: <https://goo.gl/forms/3697QxJaMohK9oC83>

The Faculty



Dr. Rajib Saha is an Assistant professor at the University of Nebraska-Lincoln, USA in Chemical & Biomolecular Engineering. His research interests include Reconstruction and analysis of genome-scale metabolic models and systems-level analysis of 'omics' data, His recent achievements cover development of genetic toolkit and engineering metabolic pathways in

photosynthetic microbes for carbon fixing mechanism, purple non-sulfur bacterium, and multi-drug resistant *Staphylococcus aureus*.



Dr. Pralay Mitra is an Assistant professor at the Indian Institute of Technology Kharagpur in the Department of Computer Science and Engineering. His research interest is the development of algorithms for protein structure, function modeling and protein-protein interaction network. He is also working on whole cell simulation.



Dr. Amit Ghosh is an Assistant Professor at the Indian Institute of Technology Kharagpur in the School of Energy Science & Engineering. His research interests lie in the areas of Metabolic Engineering, Synthetic Biology, Metabolic Systems Biology, ¹³C Metabolic Flux Analysis and Molecular Dynamics Simulation.

Course Co-ordinator

Dr. Amit Ghosh

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GIAN Registration Link:

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