MICRO-408

Laboratory introduction to biochemistry

Maerkl Sebastian

Cursus	Sem.	Type
Biomedical technologies minor	H	Opt.
Microtechnics	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
Hours	**4 weekly**
TP	4 weekly
Number of positions	

Summary

This course introduces engineers to the most commonly used techniques required to conduct work in Molecular Biology and Biochemistry. During this course students will generate and characterize a functional cell-free transcription translation system.

Content

The hands-on Introduction to Biochemistry laboratory course will introduce engineering students to fundamental methods and techniques commonly used in Biotechnology and Bioengineering. In this course the students will generate a cell-free transcription and translation system called the PURE system, which entails performing microbial cell culturing, polymerase chain reactions (PCRs), protein expression, protein purification, and other core molecular biology techniques. The students will then assess the functionality of their PURE systems by quantifying the expression of a green fluorescent protein (GFP).
Cell-free systems are becoming exceedingly powerful and therefore popular tools in biotechnology, bioengineering, and synthetic biology. In a recent example, the 2019 EPFL iGEM team who won the iGEM competition that year, developed a cell-free molecular diagnostic kit for the identification and differentiation of two grapevine diseases (https://2019.igem.org/Team:EPFL). In addition, we have shown in the past that cell-free systems are ideal tools for education and teaching by providing local high-schools with cell-free educational kits. The cell-free synthetic biology course is therefore exploring the possibility to leverage the resources available in higher education to generate an additional, synergistic benefit for the population. We are hoping that with this course we will be able to sustainably produce cell-free educational kits for use in local schools or EPFL student projects.
The introduction to biochemsitry lab course will consist of a couple of introductory lectures, followed by laboratory work. The students will be guided through all the required steps for each specific method and technique to generate functional cell-free systems.

Keywords

molecular biology
laboratory techniques and methods
biotechnology
bioengineering
synthetic biology
cell-free synthetic biology
democratizing education
open science

Learning Prerequisites

Required courses

There are no pre-requisite courses.
No prior experience or background in biology is required.

Recommended courses

EE-526 Introduction to Bioengineering

Learning Outcomes

By the end of the course, the student must be able to:

- Analyze experimental outcomes
- Carry out molecular biology techniques
- Conduct molecular biology experiments
- Quantify the functionality of a cell-free system
- Create complex biochemical systems

Teaching methods

The course will be primarily hands-on experimental work, with real-time instructions and feedback.

Assessment methods

Students will be assessed by their ability to conduct molecular biology experiements, maintain a laboratory notebook, critically assess and report the outcomes of experiments, and work in a team.

Supervision

Office hours	Yes
Assistant.e.s	Yes
Forum	Yes

Resources

Moodle Link

- https://go.epfl.ch/MICRO-408