BIOENG-436 **Selected topics in biotechnology**

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Cursus	Sem.	Type
Biotechnology minor	H	Opt.
Ing.-chim.	MA1, MA3	Opt.

Language of teaching	English
Credits	2
Session	Winter
Semester	Fall
Exam	Written
Workload	60h
Weeks	14
Hours	**2 weekly**
Courses	2 weekly
Number of positions	

Summary

The course presents an overview on how recent advances in biotechnology are shaping the landscape of biomedical research and contributing to improving the quality of life and addressing global health challenges today. Special emphasis is given to interdisciplinary topics.

Content

The lectures will highlight some of the latest breakthroughs in biotechnology and how they are being applied today to advance our understanding of living systems and to develop novel tools and therapies for early diagnosis and treatment of human disease, respectively. The impact on the biotechnology and biomedical industry and ethical implication of each technology will also be discussed. The topics will include, but not limited to, genome sequencing technologies, genetic editing (CRISPR), personalized medicine and personalized genomics, induced pluripotent stem cells and regenerative medicine, organoids, phage display technologies and antibody and protein engineering in drug discovery, vaccines, synthetic biology, nucleic acid based therapies, manufacturing of biologic medicine, the microbiome and the gut-brain axis.

Keywords

Biotechnology, gene sequencing, genetic engineering, synthetic biology, stem cells, microbiome, CRISPR, antibodies, proteins, regenerative medicine, molecular diagnostics.

Learning Prerequisites

Recommended courses

Biochemistry, Biological Chemistry, Organic Chemistry,

Learning Outcomes

- â#¢ Demonstrate a understanding and critical awareness of a range of topics covered during the semester
- â#¢ Demonstrate an ability to critically assess the challenges that advances in genome sequencing, genetic engineering, synthetic biology and stem cell research present to society today.
- â#¢ Gain an appreciation and understanding on how advances in biotechnology are transforming biomedical research and revolutionizing healthcare by enabling â#¢ The development of disease models that reproduce more faithful important aspects of the human disease. â#¢ Creating tools for early detection and monitoring disease progression â#¢ Development of effective drugs, antibodies and vaccines â#¢ Gene therapy â#¢ Regenerative medicine â#¢ Treatment of inherited diseases â#¢ Tailoring prevention and therapeutic strategies, personalized healthcare â#¢ The

development of new biotechnology and biomedical industry â#¢ Harnessing Natureâ##s own tool box or modifying it to develop new strategies to reengineer and reprogram biological systems, design new functions in cells or to treat human diseases

• â#¢ Demonstrate awareness of the research activities at the EPFL that are relevant to the topics covered.

Transversal skills

• Communicate effectively with professionals from other disciplines.

Teaching methods

The course instructor and/or experts in the relevant topics will give the lectures. Each lecture will be followed by an in class discussion on the ethical implications and economic and societal impact of the specific technology or scientific advances covered in the lecture.

Expected student activities

In addition to attending the lectures, students are expected to dedicated two weekly hours of personal time to preparing for the lectures and to complete homework assignments.

Assessment methods

Homework assignment (50%): Students will be asked to provide a brief biweekly report (2-4 slides) highlighting two breakthroughs in biotechnology or innovations based on previously advances in biotechnology that were reported on in the scientific and general media during this period.

Written Exams:
Midterm Exam (25%): Four scientific papers will be assigned during the second week of the semester: The midterm exam will consist of questions covering the contents of these papers.
Final Exam (25%): A written exam based on the concepts and materials covered in the lecture notes only.

Supervision

Office hours	Yes
Assistants	No
Forum	No

Resources

Bibliography

Chapters from books available at the EPFL Library and selected articles from scientific journals and the general media will be provided to prepare for the lectures and for in class discussions and debates on specific relevant topics. Additional recommended reading and reference materials will be made available for motivated students.

Notes/Handbook

The lectures slides will be available on the Moodle site.

Moodle Link

• http://moodle.epfl.ch/course/view.php?id=15516