

BIOENG-399 **Immunoengineering**

Tang Li

Cursus	Sem.	Type
Life Sciences Engineering	BA6	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	4 weekly
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Immunoengineering is an emerging field where engineering principles are grounded in immunology. This course provides students a broad overview of how engineering approaches can be utilized to study immunology, modulate immune response, and develop novel immunotherapies.

Content**Part 1. Understanding immunology from the engineering point of view**

Introduction of the course

Overview of the fundamentals of immunology: adaptive and innate immunity

Using engineering tools and new technologies to understand immunology

Part 2. Engineering novel immunotherapies for diseases

Overview of Infectious diseases and vaccines

Design of immunogenic vaccines

Cell based vaccines

Autoimmunity and tolerogenic vaccines

Cancer and cancer immunotherapies

Protein and antibody engineering

Materials engineering and immune drug delivery

Immune cell engineering and genetic engineering

Tissue engineering and Artificial lymphoid tissues

Metabolic engineering and immune modulation

Part 3. Applications and practical issues

Case studies of immunotherapy development

Keywords

immunology, immunoengineering, vaccines, infectious diseases, autoimmunity, cancer, materials engineering, drug delivery, protein engineering, drug discovery and development

Learning Prerequisites**Required courses**

Physiologie par systèmes I

Learning Outcomes

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

- Describe the concept of immunoengineering
- Make examples of how engineering approaches has led to advancements in immunotherapy and diagnosis
- Take into consideration how to apply engineering principles to immunology research and applications

Transversal skills

- Summarize an article or a technical report.
- Communicate effectively, being understood, including across different languages and cultures.
- Write a scientific or technical report.

Teaching methods

Lectures integrated with exercises

Expected student activities

Attending lectures, completing exercises, group discussion and studies, reading and presenting literature

Assessment methods

Final written exam: 100%

Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

Resources

Bibliography

Library resources

How the immune system works: Lauren Sompayrac. 3e

Kuby Immunology: Owen, Pung, Stranford. 7e

Cellular and Molecular Immunology: Abbas & Lichtman. 8e

Janeway's immunobiology: Kenneth Murphy ; Charles A. Janeway ; Allan Mowat. 8e

Ressources en bibliothèque

- [How the immune system works / Sompayrac](#)
- [Kuby Immunology / Pung](#)
- [Cellular and Molecular Immunology / Abbas](#)
- [Janeway's immunobiology / Murphy](#)