

MSE-493

Engineered living materials

Abitbol Tiffany

Cursus	Sem.	Type
Materials Science and Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	During the semester
Workload	90h
Weeks	14
Hours	3 weekly
Lecture	2 weekly
Exercises	1 weekly
Number of positions	

Summary

This course provides an introduction to the topic of engineered living materials (ELMs), a class of materials that incorporates living cells, thus enabling distinct functionalities such as the ability to grow, heal, adapt, sense, and respond.

Content

- Overview of ELMs
- Material science potential of cells and cellular exudates from different organisms; bacteria, algae, fungi
- How the potential of living cells, such as adaptability, genetic programming, patterning, etc., can be harnessed to imbue functionality into materials
- Key applications of ELMs; lubrication, bioremediation, fermented products, cellular factories for important biomolecules, self-healing, etc.,
- Comprehensive overview of key literature from this emerging field

Keywords

biomaterials, biohybrids, directed assembly, biofilm, extracellular matrix, protein, exopolysaccharides, bacteria, fungi, algae

Learning Prerequisites**Required courses**

None

Learning Outcomes

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

- Describe the basic concepts of ELMs
- Deduce how living cells and organisms can be applied in materials science
- Assess / Evaluate the potential of ELMs for different applications
- Formulate challenges related to the implementation of ELMs

Transversal skills

- Access and evaluate appropriate sources of information.
- Demonstrate a capacity for creativity.
- Manage priorities.
- Demonstrate the capacity for critical thinking
- Communicate effectively, being understood, including across different languages and cultures.

Teaching methods

Ex cathedra, with clickers and videos

Expected student activities

- short assignments
- hands-on lab project, in groups
- presentation of article from the scientific literature

Assessment methods

- assignments (1/6)
- lab project (3/6)
- journal club presentation (2/6)

Supervision

Office hours	Yes
Assistants	Yes
Forum	No

Resources

Virtual desktop infrastructure (VDI)

No

Notes/Handbook

Detailed lecture slides with references will be made available during the course.

Moodle Link

- <https://go.epfl.ch/MSE-493>