

MSE-341

Sustainability and materials

Abitbol Tiffany

Cursus	Sem.	Type
Electrical and Electronical Engineering	MA2, MA4	Opt.
Ing.-chim.	MA2, MA4	Opt.
Materials Science and Engineering	BA6	Obl.
Neuro-X	MA2, MA4	Opt.

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

Summary

The aim of the course is to provide an overview of sustainability issues as they relate to materials science.

Content**Overview of sustainability concepts**

- Relevant terminology, such as materials life cycle, linear vs. circular economy, UN sustainable development goals, green chemistry, end-of-life scenarios
- Metrics and tools to assess sustainability, such as material intensity, carbon footprint/handprint, life cycle assessment

Case studies

- Identifying environmental impacts across material lifecycles, from raw material extraction, processing, manufacture, transport, use, to end of life
- Learning via case studies, such as packaging, plastics, batteries, textiles, engineered foods, metals, ceramics, rare earth materials, scarce materials, conflict materials

Challenges and opportunities

- Biorefinery
- Recycling and biodegradability
- Materials from renewable resources
- Local value chains/sustainable business models (e.g., materials as a service)
- Socio-political contexts of materials

Guest lectures

- Guest lecture from industry (TBD), on sustainability drivers and strategies
- Guest lecture from different academic discipline (TBD)

Learning Prerequisites**Required courses**

No specific prerequisites required

Learning Outcomes

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

- Define the concepts and terminology that underpin material circularity and sustainability
- Describe the main challenges around sustainable materials development
- Examine case studies considering different materials classes
- Assess / Evaluate potential solutions to improve the sustainability profiles of different materials
- Describe the main environmental impacts of different materials classes and key products
- Formulate strategies to improve material circularity
- Design sustainability into materials, process development, and products

Supervision

Office hours	Yes
Assistants	Yes
Forum	No

Resources

Virtual desktop infrastructure (VDI)

No

Moodle Link

- <https://go.epfl.ch/MSE-341>