

MSE-341

**Sustainability and materials**

Abitbol Tiffany

Cursus	Sem.	Type
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
<b>Hours</b>	<b>3 weekly</b>
Lecture	2 weekly
Exercises	1 weekly
<b>Number of positions</b>	

**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>