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**

<table>
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<th>Office hours</th>
<th>Yes</th>
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<td>Assistants</td>
<td>Yes</td>
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<td>Forum</td>
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**Resources**

Virtual desktop infrastructure (VDI)

No

**Moodle Link**

- [https://go.epfl.ch/MSE-341](https://go.epfl.ch/MSE-341)