ME-517

Product decarbonization and life cycle analysis

Wakeman Martyn

Cursus	Sem.	Type
Managmt, dur et tech	MA3	Opt.
Mechanical engineering	MA1, MA3	Opt.
Minor in Engineering for sustainability	H	Opt.
Robotics, Control and Intelligent Systems		Opt.

Language of teaching	English
Credits	5
Withdrawal	Unauthorized
Session	Winter
Semester	Fall
Exam	During the semester
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	1 weekly
Project	1 weekly
Number of positions	

It is not allowed to withdraw from this subject after the registration deadline.

Summary

This course will address the need to decarbonize engineered products and to reduce their environmental and societal impacts. Life cycle analysis (LCA) will be used as a tool to quantify the impacts of engineered products and to aid design of lower impact alternatives.

Content

- Sustainability through an engineering lens
- Towards a NetZero and NetPositive economy
- Industrial decarbonization
- Circular economy and mass flows
- Hard to abate and critical materials
- Life cycle analysis using a software tool
- Individual LCA assignment
- Monetary flows, cost and financial modelling, ethics
- Group project including LCA
- Stakeholder engagement and quantified sustainability / decarbonization initiatives

Keywords

Sustainability
Engineered products
Life cycle analysis
Materials
Cost modelling
Decarbonization
Case studies

Learning Prerequisites

Important concepts to start the course

- Principles of mechanical design, Principles of materials, CAD

Learning Outcomes

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

- Critique key sustainability concepts
- Analyze environmental and societal impacts
- Model impacts using LCA tools
- Assess / Evaluate the impacts of engineered products
- Elaborate the environmental, societal, and human health impacts of products across their life cycle
- Produce quantified sustainability and decarbonization initiatives

Transversal skills

- Use both general and domain specific IT resources and tools
- Demonstrate the capacity for critical thinking
- Communicate effectively, being understood, including across different languages and cultures.
- Give feedback (critique) in an appropriate fashion.
- Take account of the social and human dimensions of the engineering profession.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Make an oral presentation.
- Write a scientific or technical report.

Teaching methods

Ex cathedra and invited speakers
Sessions with exercises or work on project
Individual LCA study
Group project

Expected student activities

Attendance at lectures
Individual LCA assignment
Group case study of an engineered product including written report and oral presentation

Assessment methods

10% individual LCA assignment
50% group project written report
20% group project oral presentation
20% open book exam (no internet) during semester

Resources

Moodle Link

- https://go.epfl.ch/ME-517