Lifecycle performance of product systems

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Summary
Provide the conceptual, technical and methodological understanding of measuring and evaluating the production/consumption decisions on the environmental, social and economic performance of products and services over their life cycle.

Content
- Overview of the performance challenges of products and services over their life cycle.
- Lifecycle characteristics of products in Beginning of Life (BOL), Middle of Life (MOL) and End of Life (EOL) phases.
- Key Performance Indicators (KPI) of products and services
- Overview of methodologies and approaches including Life Cycle Assessment (LCA), Life Cycle Costing (LCC), Social Life Cycle Assessment (SLCA), eco-design and circular manufacturing/circular economy.
- Overview of design & assessment tools.
- Discussions and presentations based on case studies and scientific articles.
- Hands-on practical LCA experience: evaluation of product/services and possible alternatives using professional tools.

Keywords
Product Lifecycle, Life Cycle Assessment, Life Cycle Costing, Circular economy

Learning Prerequisites
Important concepts to start the course
- Principles of mechanical design
- Principles of materials

Learning Outcomes
By the end of the course, the student must be able to:
- Choose suitable methods and tools for (a) the development of, (b) the modelling and simulation of, (c) the analysis of and (d) the choice of solution for an engineering problem in the mechanical engineering domain (product design, manufacturing process and system production), CP1
• Choose production tools and methods based on performance and cost requirements and needs, taking into consideration applicability limits and associated hypotheses. CP8
• Carry out a multi-criterion (technological, economic and environmental) analysis of the solutions. CP8
• Choose suitable methods and tools for (a) the development of, (b) the modelling and simulation of, (c) the analysis of and (d) the choice of solution for an engineering problem in the mechanical engineering domain (product design, manufacturing process and system production) CP1
• Choose production tools and methods based on performance and cost requirements and needs, taking into consideration applicability limits and associated hypotheses CP8
• Apply adapt and synthesize learned engineering skills to create novel solutions CP14

Transversal skills

• Communicate effectively, being understood, including across different languages and cultures.
• Make an oral presentation.
• Evaluate one's own performance in the team, receive and respond appropriately to feedback.
• Write a scientific or technical report.
• Plan and carry out activities in a way which makes optimal use of available time and other resources.
• Use a work methodology appropriate to the task.
• Negotiate effectively within the group.
• Give feedback (critique) in an appropriate fashion.
• Demonstrate a capacity for creativity.
• Use both general and domain specific IT resources and tools
• Collect data.

Teaching methods

The course is organized in theoretical sessions, presentations of selected topics by students and a project (Environmental Life Cycle Assessment) to be realized by the students in groups using appropriate software.

Expected student activities

• Participation in the course
• Study documents and do presentations
• Prepare and ask questions
• Do a project using a software tool
• Write a project report

Assessment methods

• report on the project (80%)
• presentations in the class (20%)

Resources

Bibliography
Course material documentation is distributed in the moodle platform during the semester.

Notes/Handbook
Course material documentation is distributed in the Moodle platform during the semester.
Moodle Link

- https://go.epfl.ch/ME-516