

COURSE SYLLABUS

Materials and Process Selection for Product Design, 7.5 credits

Material- och processval för produktdesign, 7.5 högskolepoäng

Course Code: TMPR25	Education Cycle: Second-cycle level
Confirmed: Feb 01, 2025	Disciplinary domain: Technology
Valid From: Jan 19, 2026	Subject group: Materials Technology
	Specialised in: A1N Second cycle, has only first-cycle course/s as entry requirements
	Main field of study: Product Development

Intended Learning Outcomes (ILO)

On completion of the course the student shall:

Knowledge and understanding

- display knowledge of the relationship between the product requirements, the product design and the selection of materials and manufacturing methods
- show familiarity with key concepts of circular economy and sustainability, as well as standard testing methods for surface technology selection
- demonstrate comprehension of the economic and sustainability impacts of materials and manufacturing processes

Skills and abilities

- demonstrate the ability to apply structured selection strategies to identify suitable materials and manufacturing methods in product design, ensuring alignment with performance, sustainability, and production feasibility requirements
- demonstrate the ability to evaluate the environmental footprint of a product throughout its life cycle and understand the purpose and application of life cycle assessment (LCA)

Judgment and approach

- demonstrate an understanding of the economic and sustainability impacts of product design, materials, and manufacturing processes
- demonstrate the ability to critically analyse and select materials and manufacturing processes, including surface treatment technologies, to fulfil the requirements and specifications of products
- demonstrate the ability to understand the product life cycle in all its aspects

Content

The course deals with the systematic selection of materials and production processes for product design. The concept of Design for X (DfX) is introduced as a foundation for future courses. Different case studies will support understanding the relationship between a product's function and the design requirements based on the performance.

These requirements will be translated into materials' properties and manufacturing methods to select valid solutions. Surface treatment technologies will be reviewed as an essential part of product adaptation, together with relevant testing standards. The concepts of technology readiness levels (TRL) and manufacturing readiness levels (MRL) are part of the technology evaluations. Sustainability aspects are the focus of eco-design strategies, and the methods used to assess the environmental impact of a product's life cycle, like life cycle assessment (LCA) and materials flow analysis (MFA), for example. The project deals with

the materials and process selection for a real-life product and its practical realisation to understand the challenges with materials and manufacturing methods.

The course includes the following elements:

- Overview of properties of different material groups and manufacturing processes
- Analysis of case studies to understand the product's characteristics and requirements, with an introduction to user perception
- Overview of the characteristics of different surface treatment techniques and related test standards.
- The relationship between product design, material properties and manufacturing methods
- Sustainability perspective in material selection by eco-design and related strategies
- Introduction to Life Cycle Assessment (LCA) of products and their environmental impact

Type of instruction

Lectures, assignments and a project.

Language of instruction is in English.

Entry requirements

Passed courses of at least 150 credits in the program Industrial Product Realisation, or a bachelor's degree (i.e the equivalent of 180 ECTS credits at an accredited university) with at least 90 credits in Materials, Mechanical, Chemical, Manufacturing, Industrial, Production, Civil, or Construction Engineering, Materials and Manufacturing, Product Development, Industrial Design, Engineering Physics, Innovation or the equivalent. The bachelor's degree should comprise a minimum of 15 credits in Mathematics. Proof of English proficiency is required.

Examination and grades

The course is graded 5, 4, 3 or U.

Registration of examination:

Name of the Test	Value	Grading
Examination ¹	4 credits	5/4/3/U
Assignment	1 credit	G/U
Project	2.5 credits	G/U

¹Determines the final grade of the course, which is issued only when all course units have been passed.

Course literature

Please note that changes may be made to the reading list up until eight weeks before the start of the course.

Michael F. Ashby, Materials Selection in Mechanical Design, Publisher: Butterworth-Heinemann, ISBN: 9780443160288 (6TH EDITION)

Michael F. Ashby, Materials and the Environment, Publisher: Butterworth-Heinemann, ISBN: 9780128215210 (3TH EDITION)