



COURSE SYLLABUS

Materials and Manufacturing Technology, 7.5 credits

Material och Tillverknings teknik, 7,5 högskolepoäng

Course Code: TTTR21	Education Cycle: Second-cycle level
Confirmed by: Dean Mar 1, 2021	Disciplinary domain: Technology
Revised by: Director of Education Oct 25, 2023	Subject group: MA2
Valid From: Aug 1, 2024	Specialised in: A1N
Version: 3	Main field of study: Product Development

Intended Learning Outcomes (ILO)

After a successful course, the student shall:

Knowledge and understanding

- show familiarity with materials behaviour in manufacturing processes
- show familiarity with sustainability aspects of manufacturing technologies

Skills and abilities

- demonstrate skills of explaining and analysing the principles of various manufacturing processes for metallic components
- demonstrate the ability to understand and quantitatively describe mechanics and physics of the interaction between manufacturing process, material and resulting component characteristics
- demonstrate the ability of selecting proper characterization techniques and analysing the results for understanding the material behaviour before, during and after manufacturing processes

Judgement and approach

- demonstrate the ability to quantitatively determine the capabilities of manufacturing technologies for production of metallic components and its sustainability

Contents

This course is intended to develop a deeper understanding of the relationship between manufacturing processing and materials properties for metallic components. It covers various manufacturing methods including casting, forming, and powder metallurgy, as well as secondary processing such as welding and machining, and coating. Some advanced manufacturing techniques such as additive manufacturing of metals will be also covered. For each manufacturing method, the covering aspects include principles, choices of materials, choice of processes, properties of materials, advantages and disadvantages, relative process economics and sustainability aspects. Examples are drawn from manufacturing processes mainly used in aerospace, automotive, electronics, and power generation sectors, as the main end-users.

The course includes the following items:

- Overview of materials (metals and alloys) selection and identification
- Overview of materials characterization and testing
- Detailed understanding of manufacturing methods to cast, form, and add/remove materials to/from the finished component
- Mechanics and physics of the interaction between manufacturing process, material and resulting product characteristics

Type of instruction

Lectures, laboratory sessions, project work and assignments/quizzes.

The teaching is conducted in English.

Prerequisites

The applicant must hold the minimum of a bachelor's degree (i.e the equivalent of 180 ECTS credits at an accredited university) with at least 90 credits in Materials and Manufacturing, Mechanical Engineering, Chemical Engineering, Product Development or Engineering Physics or 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 Fail.

Registration of examination:

Name of the Test	Value	Grading
Examination ¹	3 credits	5/4/3/U
Laboratory and projectwork	3 credits	U/G
Assignment and quizzes	1.5 credits	U/G

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

Course literature

Course literature is determined one month before the course starts.

Literature (tentative):

- S. Kalpakjian and S.R. Schmid, Manufacturing Engineering and Technology, 6th ed, 2009, ISBN-13: 9780136081685.
- Hand-outs