

## Advanced Material and Manufacturing Technologies 7.5 credits

Avancerade material- och tillverkningsstekniker 7.5 hp

Second cycle

Main field: Mechanical Engineering, Second cycle, has only first-cycle course/s as entry requirements (AIN)

Syllabus is adopted by the Research and Education Board (2023-03-05) and is valid for students admitted for the autumn semester 2024.

### Placement in the Academic System

The course is included Master's Programme (60 credits) in Mechanical Engineering.

### Prerequisites and Conditions of Admission

Degree of Bachelor of Science with a major in Mechanical Engineering. The degree must be equivalent to a Swedish teknologie kandidatexamen and must have been awarded from an internationally recognised university. English 6. Exemption of the requirement in Swedish is granted.

### Course Objectives

The course aims to provide knowledge and skills on modern and technologically advanced materials and production methods for both conventional macro- and the more recent micro- and nanotechnologies and their industrial application. The course will also provide knowledge and skills of the analysis of both advanced materials and manufacturing processes.

Following successful completion of the course the student should be able to:

#### Knowledge and understanding

- use material types for mechanical engineering applications.
- explain manufacturing processes for mechanical engineering applications.
- explain the difference between manufacturing processes for conventional machine technology applications and micro - mechanical- as well as nanotechnology application.

#### Skills and ability

- use property profiles for materials.
- discuss and set up process selection criterion for the manufacturing of a product
- perform a material selection for a design based on given requirements

- select process to manufacture products in selected materials outgoing from made material selections.
- communicate both process and results of performance analysis both orally and in written format.

#### Judgement and approach

- evaluate performed material and process selection and be able to suggest alternative and complementary options

### Primary Contents

#### Advanced materials

- polymeric-, ceramic-, composite- and metallic materials that are used when extreme characteristics are required.
- material analysis of polymeric-, composite- and metallic materials.

#### Manufacturing Technologies

- "Conventional" production methods with cutting and forming technologies.
- "Unconventional" production methods, e.g. electrical discharge machining, laser processing, electron beam manufacturing, chemical processing, and water-assisted machining.
- Development of "conventional processing methods" for the processing of advanced materials, e.g. for hydroforming and high speed machining.
- Micro- and nanofabrication
- Analysis of properties and control methodology for advanced manufacturing processes.

## Teaching Formats

The teaching is composed of lectures , computer exercises , field trips and project work. The purpose of computer exercises , field trips and project work, is that students group-wise will obtain knowledge and some practical skills in the moments that are being reviewed in the context of the course. The groups will process different parts of the course through study visits and practical tests and for the other students present the results in the form of oral seminars and written documentations.

The teaching is conducted in English.

## Examination

The overall grades of Fail, 3, 4 or 5 will be awarded for the course.

The course is examined by assignments

Name of the test		Grading
Assignments	7,5 credits	U/3/4/5

If there are special reasons, the examiner may make exceptions from the specified examination format and allow a student to be examined in another way. Special reasons can e.g. be a decision on learning support.

For elite sports students according to Riktlinjer för kombinationen studier och elitidrott vid Högskolan i Halmstad, DNR: L 2018/177, the examiner has the right to decide on an adapted examination component or let the student complete the examination in an alternative way.

## Course Evaluation

Course evaluation is part of the course. This evaluation should offer guidance in the future development and planning of the course. Course evaluations should be documented and made available to the students.

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## Course Literature and Other Study Resources

Kalpakjian S., Schmid S. *Manufacturing Engineering and Technology*. Fifth edition or later; Prentice Hall.

Ashby Michael F. *Materials Selection in Mechanical Design*. Fourth Edition or later; Elsevier Butterworth-Heinemann. Printed handouts and exercises.

Course material posted on Blackboard and given exercises.