



Faculty of Health, Science and Technology
Materials Engineering

Syllabus

Materials Engineering I

Course Code:	MTGA10
Course Title:	Materials Engineering I <i>Materialteknik I</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has only upper-secondary level entry requirements (G1N)

Major Field of Study:
MTA (Mechanical Engineering)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2020-03-11, and is valid from the Spring semester 2020 at Karlstad University.

Prerequisites

General admission requirements plus upper secondary level Mathematics 3C, Physics 2, and Chemistry 1 (field-specific entry requirements A8), or equivalent

Or employer selected (when this course is offered as contract education)

Learning Outcomes

The aim of the course is that students will obtain the basic knowledge of materials engineering needed to understand materials-related issues in design and manufacturing. Much attention is devoted to concepts and terminology as well as the connection between the mechanical properties and the microstructure of materials. The course covers engineering materials in the groups metals, polymers, and ceramics.

Upon completion of the course, students should be able to:

- give an account of mechanical properties and mechanical testing
- describe the atomic structure and interatomic bonding of solid materials
- give an account of crystal defects and their significance in thermal and mechanical processes
- give an account of the connection between mechanical properties and the microstructure of materials
- describe and identify different types of fracture: brittle, ductile, creep, and fatigue fractures
- use binary phase diagrams as well as isothermal and continuous cooling transformation diagrams to interpret microstructures and describe their development in phase transformations
- give an account of the purpose and procedure of common heat treatments
- describe and identify the most common types of corrosion of metallic materials
- give an account of the properties of the different types of polymeric materials: amorphous and semi-crystalline thermoplastics, rubber, and thermosetting polymers
- describe in general terms the main types of metallic, ceramic, and polymeric engineering materials, their properties, and applications
- use the basic Swedish terminology of materials engineering correctly in order to discuss materials issues, with materials specialists as well as non-specialists
- assimilate information about materials engineering in English.

Content

Special emphasis is placed on concepts and terminology as well as the connection between mechanical properties and the microstructure of materials.

The course contains:

- lectures and seminars treating mechanical properties and testing, deformation mechanisms, strengthening mechanisms, fractures, phase transformations, phase diagrams, transformation diagrams, heat treatment, and corrosion, as well as the structure, properties, and applications of metallic, ceramic, and polymeric engineering materials
- obligatory laboratory assignments where students are trained in the use of light microscopes, scanning electron microscope, and equipment for mechanical testing (tensile, impact, and hardness tests).

Reading List

See separate document.

Examination

Examination is in the form of a written exam, mandatory laboratory assignments, hand-in assignments, and laboratory reports.

If students have a decision from Karlstad University entitling them to special pedagogical support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Fail (U), Pass (3), Some Distinction (4), or Distinction (5) is awarded in the examination of the course.

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.