Reg No: MTGB16/20231

Faculty of Health, Science and Technology
Materials Engineering

Syllabus

Materials Engineering for Engineering Science

Course Code:	MTGB16
Course Title:	Materials Engineering for Engineering Science *Materialteknik för civilingenjörer*
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has less than 60 credits in first-cycle course/s as entry requirements (G1F)

Major Field of Study:
MTA (Mechanical Engineering)
TKA (Engineering Physics)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2022-08-30, and is valid from the Spring semester 2023 at Karlstad University.

Prerequisites
Registered for Materia, 7.5 ECTS credits, or equivalent

Learning Outcomes
The aim of the course is for students to acquire basic knowledge of design materials in the main groups metals, polymers, and ceramics. Students learn about the structure of engineering materias and the link between structure, process, and properties as well as how materials are selected and used in designs.

Upon completion of the course, students should be able to:
- give an account of mechanical properties and mechanical testing,
- describe the structure of an engineering material at different structural levels,
- give an account of crystal defects and their importance in thermal and mechanical

processes,
- give an account of the basic connection between structure and properties,
- use binary phase diagrams and isothermal and continuous transformation diagrams to interpret micro structures and describe their development in phase transformations,
- give an account of the purpose and method in common heat treatments,
- describe and identify different types of failure: brittle, ductile, creep and fatigue,
- describe and identify the most common types of corrosion in metallic materials,
- perform qualitative comparisons between materials and state application areas for the most common engineering materials in the various material groups,
- use foundational materials engineering terminology correctly in Swedish when discussing materials issues with materials experts as well as non-specialists,
- analyse and discuss an already made material selection for a design based on the knowledge introduced in the course.

Content
The course deals with 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 application areas for metallic, ceramic, and polymer engineering materials. Students practice using light microscope, scanning electron microscope and equipment for mechanical testing (tensile testing, impact testing and hardness tests).

Instruction is in the form of lectures, seminars, and mandatory laboratory sessions.

Reading List
See separate document.

Examination
Assessment is based on a written exam, hand-in assignments, and participation in laboratory sessions.

If students have a decision from Karlstad University entitling them to Targeted Study 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 U (Fail), 3 (Pass), 4 (Pass with some distinction), or 5 (Pass with distinction) 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.