Reg No: MTGC16/20262

Faculty of Health, Science and Technology
Materials Engineering

Syllabus

Materials Engineering, advanced course

Course Code:	MTGC16
Course Title:	Materials Engineering, advanced course *Materialteknik fördjupningskurs*
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

Major Field of Study:
MTA (Mechanical Engineering)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2024-09-12, and is valid from the Autumn semester 2026 at Karlstad University.

Prerequisites
Registered for Materials engineering, 7.5 ECTS credits, Manufacturing technology, 7.5 ECTS credits, and Solid mechanics, 7.5 ECTS, or equivalent

Learning Outcomes
The aim of the course is for students to develop and broaden their knowledge of materials engineering.

Upon completion of the course, students should be able to:
1. explain the advantages and disadvantages of the main properties and key applications of common construction materials, as well as their classification and subdivision into subgroups,
2. describe and explain the connection between specific properties and the microstructure of

materials,
3. give an account of mechanical properties and mechanical testing,
4. describe the arrangement of atoms and bonding forces in solid materials,
5. give an account of crystal defects and their significance in thermal and mechanical processes,
6. use binary phase diagrams as well as isothermal and continuous transformation diagrams to interpret microstructures and describe their development during phase transformations,
7. describe and identify the most common types of corrosion in metallic materials, and
8. give an account of the properties of different types of polymeric materials: amorphous and semi-crystalline thermoplastics, rubbers, and thermosets.

Content
The course has a special emphasis on concepts and terminology, as well as the connection between mechanical properties and the microstructure of materials.

The course includes:
- lectures and seminars covering mechanical properties and testing, deformation mechanisms, hardening mechanisms, fractures, phase transformations, phase diagrams, transformation diagrams, and corrosion, as well as the structure, properties, and applications of metallic, ceramic, and polymeric construction materials, and
- mandatory laboratory sessions where students use microscopes and equipment for mechanical testing.

Reading List
See separate document.

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

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 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) 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.