



LTH

FACULTY OF
ENGINEERING

Course syllabus

Avancerad materialteknologi Advanced Materials Technology

FKMN20, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED M

Date of Decision: 2023-04-11

General Information

Main field: Production and Materials Engineering.

Compulsory for: MPRR1

Elective for: F5, F5-bem, K5-m, M4-pu, M4-bem, M4-prr, MD4, N4-m

Language of instruction: The course will be given in English

Aim

To provide the students with a deep and broad insight into the basic concepts and processes in metallic materials science that are necessary to choose, modify and use materials in various applications.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- show an understanding of important phenomena and processes which affect the behaviour of materials under different conditions.
- show an understanding of materials characterization principles.

Competences and skills

For a passing grade the student must

- show the ability to identify structure - property correlations.
- show the ability to use scanning electron microscopy for materials characterization.
- show the ability to develop materials treatment processes for getting desirable structures and properties.

Judgement and approach

For a passing grade the student must

- show the ability to analyse material behaviour
- show the ability to conduct experiments in a group, prepare and present written reports and take part in technical discussions.

Contents

Crystal structures, single crystals, stereographic projections and pole figures. Phase equilibria, solidification processes, binary and ternary phase diagrams. Alloy theory. Crystal defects, Thomson tetrahedron and partial dislocations. Materials characterization using optical and scanning electron microscopy, thermal analysis and mechanical testing. Thermophysical properties. Diffusion, Kirkendall effect. Plastic deformation, Creep. Common engineering materials including light alloys. Corrosion and surface engineering.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Examination takes place through compulsory assignments and projects with oral and written presentation. Optional quizzes for continuous knowledge assessment. In the assignments, the students work individually and in the projects in groups of 3–5 students. Approved assignments and projects are required for a passing grade.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: Materials Engineering, Basic Course, Linear Algebra, Calculus in One Variable, Thermodynamics and Fluid Mechanics and a course in Physics.

The number of participants is limited to: No

Reading list

- Smallman, R.E., Ngan, A.H.W.: Modern Physical Metallurgy, 8th edition. Butterworth-Heinemann (Elsevier), 2014, ISBN: 978-0-08-098204-5.

Contact and other information

Course coordinator: Professor Dmytro Orlov, Dmytro.Orlov@material.lth.se

Course administrator: Rose-Marie Hermansson, rose-marie.hermansson@mel.lth.se

Course homepage: <http://www.material.lth.se>