

SYLLABUS

Material Science I 10 credits B0008T

Materiallära I

Course syllabus admitted: Autumn 2012 Sp 1 - Spring 2013 Sp 4

**DECISION DATE
2012-04-03**

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Materiallära I

First cycle, B0008T

Education level	Grade scale	Subject	Subject group (SCB)
First cycle	G U 3 4 5	Maskinteknik	Mechanical Engineering

Entry requirements

In order to meet the general entry requirements for first cycle studies you must have successfully completed upper secondary education and documented skills in English language +

Swedish upper secondary school courses Physics 2, Chemistry 1, Mathematics 3c (specifik entry A8).

Or:

Swedish upper secondary school courses Physics B, Chemistry A, Mathematics D (specifik entry 8)

Selection

The selection is based on final school grades or Swedish Scholastic Aptitude Test.

Examiner

Lennart Wallström

Course Aim

After completed course the students shall be able to:

- * Explain the relation between atom structures, both one- and multiphases, and expected properties obtained in material created by such structures
- * Explain the diffusion and it's implications and to understand the phenomenon diffusion and make basic diffusion calculations basic diffusion calculations
- * Explain and to gauge phase diagram, both the unar, binary and tertial
- * Explain the energy- and structure changes related to phasetransformations, nucleations, translations and grain and particle growth
- * Explain the casting metallography
- * Explain the basic of the mechanical metallography
- * Have a basic knowledge of microscopic technology and by using these knowledges be able to characterize and identify the microstructure of a material
- * To perform laboratory investigations of steel samples prepared and investigated in optical

Contents

The course starts with atom structures and crystallography, where the influence and impact of different crystal structures are studied.

After that the conception diffusion is discussed, and the students shall be able to calculate diffusion processes by using the Fick's laws in case hardening of steel

The next part is interpretation and understanding of the phase diagram where both unar, binary and tertial systems are disussed and examples are given from the iron-carbon system, both steel and cast iron

Next section is the energy- and structure changes and the casting metallography with the focus on phase transformation, grain growth, growth and transformation diagram (both TTT- and CCT diagram) .Grain and nparticle growth are treated in terms of surface energy.

After that the mechanical metallography is discussed and exemplified by the different hardening mechanisms for a variety of alloys and hardening processes. Elastic and plastic deformation are discussed in terms of basic dislocation theories(edge- and screwdislocations)

The last part in the course is to study optical microscopes where the theories are mixed with a laboratory part in which the students shall study carbon steel with different C-contents and judge the phases and structures present in the samples. Practical sample preparation such as cutting, grinding, polishing, etching and structural determination is also included.

The laboration is based on a low-crbon steel with different carbon contents , which the students shall normalize, harden and temper. Further the students shall study the samples with different carbon contents, nd judge the different structures formed prior and after the heat treatment operations.

An individual laboratory report shall be written and be orally presented for the group and a written report shall be handed

Realization

Each course occasion's language and form is stated and appear on the course page on Luleå University of Technology's website.

Lectures, industrial lectures, factory visits, laboratory experiments.

Examination

If there is a decision on special educational support, in accordance with the Guideline Student's rights and obligations at Luleå University of Technology, an adapted or alternative form of examination can be provided.

Written examination and written and oral presentation of laboratory report.

Remarks

The course corresponds to MP1037.

Literature. Valid from Autumn 2012 Sp 1

Stemne L.. (2001) Metalliska material. kompendium. (150 s).

Stemne, L. (2001) Metallmikroskopering. Kompendium, Bergsskolan. (50 s).

Ullman, Erik. (2003) Materiallära, Karleboerien. 14 uppl. Stockholm : Liber. (530 s). ISBN 91-47-05178-7

Askeland, D. R., Fulay, P. P., Wright, W. J.. (2011) The science and engineering of materials. 6 uppl. Stamford, CT : Cengage Learning. (920 s). ISBN 978-0-495-29602-7

Course offered by

Department of Engineering Sciences and Mathematics

Items/credits

No items/credits available

Syllabus established

by Dept TVM Mats Näsström 2012-04-03