Engineering Materials for Lightweight Applications

Programme course

6 credits

Lättkonstruktion - lätta konstruktionsmaterial

TMKM09

Valid from: 2017 Spring semester

Determined by
Board of Studies for Mechanical Engineering and Design

Date determined
2017-01-25

Offered for the last time
Spring semester 2020

Main field of study
Mechanical Engineering

Course level
Second cycle

Advancement level
A1X

Course offered for
- Mechanical Engineering, M Sc in Engineering
- Energy-Environment-Management
- Mechanical Engineering, Master's programme

Entry requirements
Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites
Algebra, Solid Mechanics, Engineering Materials

Intended learning outcomes
The course will cover two important types of engineering materials, namely fibre-reinforced plastics (FRPs) and light alloys. A comprehensive overview will be given of these two types of materials, to provide the students with good knowledge about relationships between composition, processing, microstructure and engineering properties.

The aim of the course is to present basic knowledge about polymer based composites. The student will be able to calculate stiffness, stress and strain condition and predict failure for some simple geometry. The student will obtain increased knowledge about manufacturing and testing of fibre composites and see some practical examples where the anisotropic nature of the composite is used. He/she will obtain increased knowledge about light alloys for advanced applications, their physical metallurgy, processing and mechanical properties including fatigue. This knowledge should also be applied in communicating and solving industrial problems.

Course content

Classification of composite materials. Micro- and macro-mechanics of the ply. Basic concepts of laminate theory. Fibre, matrix and matrix-fibre interface properties. Analysis, manufacturing and testing of laminated structures.
Light alloys and their processing. Structure and properties of aluminium alloys and forging alloys. Aluminium alloys for casting. Magnesium alloys. Titanium alloys.

Teaching and working methods

The course is given in the form of lectures and laboratory classes. In addition there will be a study visit and a homework assignment that must be handed in to the examiner.

Examination

UPG2	Written report	1 credits	U, G
UPG1	Calculation tasks	1 credits	U, G
LAB1	Laboratory work	1 credits	U, G
TEN1	Written examination	3 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent

Mikael Segersäll

Examiner

Johan Moverare

Course website and other links

Education components

Preliminary scheduled hours: 56 h
Recommended self-study hours: 104 h

Course literature

Ian Polmear: Light Alloys - From Traditional Alloys to Nanocrystals Extramaterial som delas ut under kursen gång

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.