

*Course syllabus*

# Lätta material Light Materials

**FKMN15, 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

**Elective for:** M4, MD4, MP RR2

**Language of instruction:** The course will be given in English

## Aim

The objective of the course is to introduce the students to the materials used in light constructions, e.g. light metals and composites. Focus will be on the light metals Ti, Al, and Mg, but polymer-matrix and other types of composites will also be discussed.

Manufacturing methods, heat treatments, properties, and environmental aspects will be discussed in the course. Special focus will be on controlling structure-property relationship in light material performance and comparison of approaches.

## Learning outcomes

*Knowledge and understanding*

For a passing grade the student must

- know the most common types of Ti-, Al- and Mg alloys, how they are manufactured and heat treated, and their properties.
- know the different types of composites, and what materials are used as fibers and matrix.
- know the manufacturing methods, properties and approaches to control them.

*Competences and skills*

For a passing grade the student must

- be able to tailor material properties to a desired specification.
- be able to do a material selection for light constructions.

### *Judgement and approach*

For a passing grade the student must

be able to analyze cons and pros of a material selection with respect to properties, manufacturing methods, and environmental considerations.

## Contents

Light metals: aluminum, titanium, magnesium. Types of alloys, manufacturing, heat treatment, properties, use, recycling.

Composites: Types, fibers, matrices, manufacturing, properties, use, environmental aspects.

## 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 and/or Advanced Materials Technology and Linear Algebra, Calculus in One Variable, Thermodynamics and Fluid Mechanics and a course in Physics.

**The number of participants is limited to:** No

**The course might be cancelled:** If the number of applicants is less than 12.

**The course overlaps following course/s:** MMT175

## Reading list

- D. Hull och T.W. Clyne: An Introduction to Composite Materials, 2nd ed., Cambridge Solid State Science Series. Cambridge University Press, 1996, ISBN: 9781139170130. Online publication date: June 2012 DOI: <https://doi.org/10.1017/CBO9781139170130>.
- Ian Polmear, David StJohn, Jian-Feng Nie, Ma Qian: Light Alloys 5th Edition, Metallurgy of the Light Metals. (Butterworth-Heinemann), 2017, ISBN: Hardcover: 9780080994314; eBook: 97800809. Key Features: - Provides a definitive, single volume overview on the light alloys; - Presents new material on the processing, characteristics, and applications of these essential metals; - Covers the latest applications and processes in the auto and aero industries;.

## Contact and other information

**Course coordinator:** Professor Dmytro Orlov, [Dmytro.Orlov@material.lth.se](mailto:Dmytro.Orlov@material.lth.se)

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