SD2413 Fibre Composites - Analysis and Design 6.0 credits

Fiberkompositer- analys och design

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

The course syllabus is valid from Spring 2024 according to the school principal's decision: S-2023-1329 Decision date: 2023-10-13

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Specific prerequisites

Completed degree project on Bachelor level with major in technology.

English B / English 6

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After completing course the student shall be able to

- Explain the mechanical behaviour of anisotropic materials and how they differ from classical construction materials
- Apply classical lamination theory to analyse the stiffness and strength of composite laminates
- Design a composite laminate with given requirements
- To formulate and solve a composites design problem and communicate and defend the results orally

For higher grades, the student shall also

- Be able to analyse composite plates subjected to various loads
- Be familiar with methods for more advanced tools of composites analysis and design including failure theories and their implementation, the effect of holes, fatigue, and models for the prediction of compressive failure mechanisms and describe potential problems and ways to analyse composite structures with FEM.

Course contents

This course deals with the theory, analysis and design of fibre reinforced composite materials. Composite materials, e.g. carbon fibre composites, are highly efficient materials for structural applications enabling substantial weight savings and thereby reduced energy consumption and environmental impact for especially vehicles such as a cars, trucks, airliners, ships and trains. A composite material is built up of two or more constituents; a fibre phase and a matrix phase. The architecture is such that enables tailoring of properties by utilising the stiff and strong fibre in the directions where they are most useful. However, this creates an anisotropic material which requires special treatment in its analysis and design.

In this course we develop the theory for composite laminates in order to predict stiffness and strength properties. We develop a special computer code for its application to general types of laminates. We then extend this to study composite plates. We also study some other special features of composite laminates including an overview of how to use FEM when designing composite structures. At the end of the course an open-ended design problem is solved in order to train engineering skills. Industrial relevance of the course contents are provided by guest lectures from industry.

Examination

- HEM1 - Take-home assignments, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - Oral exam, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

Report from assignment (HEM1; 3 university credits)

Oral exam (TEN2; 3 university credits)

Transitional regulations

Students from previous years can choose to be examined according to the course plan that was in effect the year they took the course

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.