SD2411 Lightweight Structures and FEM 8.0 credits

Lättkonstruktioner och FEM

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

Course syllabus for SD2411 valid from Autumn 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Language of instruction

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

Intended learning outcomes

The course will give the student basic knowledge of the structural behaviour of beams, plates and shells, and the analysis and design of these types of structures, specifically, strength, stiffness, and weight issues for unstiffened and stiffened thin-walled structures.

After the course the student should be able to

- explain the function and application of different structural elements in lightweight structures
- from a given problem statement, chose an appropriate lightweight structural element with respect to functionality and weight
- analyse and design thin-walled beams and stiffened shells with respect to strength, stiffness and structural stability
- comfortably work with concepts from basic courses in solid mechanics, such as centre of gravity and moments of inertia, as well as more advanced concepts introduced in this course, such as shear flow, warping and different buckling mechanisms
- describe the principles of finite element codes and use them for analysis of basic structural elements
- write a small finite element code in MatLab and use it to analyse beam problems
- explain discrepancies in results from different analytical methods through knowledge about the different approximations they involve

Course contents

Analysis of structural elements and design methods for lightweight structures. Introduction to the finite element method. Bending, shear, torsion and warping of open and closed thin-walled beams, with and without stiffeners. Kirchhoff plate theory. Local and global instability of beams and thin plates.

Specific prerequisites

Calculus, differential equations, linear algebra, solid mechanics, strength of materials and basic computer programming skills. Some previous experience of FEM and Matlab programming is also beneficial but not formally required.

Course literature

Megson, T.H.G., Aircraft structures for engineering students, 4th Edition, Edward Arnold 2007. (2nd or 3rd edition work too except for page and chapter references.)

Compendiums

Examination

- LAB1 - Laboratory Work, 2.0 credits, grading scale: P, F
- LAB2 - Laboratory Work, 2.0 credits, grading scale: P, F

• TEN1 - Examination, 4.0 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.

- LAB1 - Laboratory Work, 2.0 credits, grade scale: P, F
- LAB2 - Laboratory Work, 2.0 credits, grade scale: P, F
- TEN1 - Examination, 4.0 credits, grade scale: A, B, C, D, E, FX, F

Other requirements for final grade

Written exam (TEN1; 4 credits), computer assignments (ÖVN1 and ÖVN2; 2+2 credits).

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.