FSD3405 Analysis and Design of Sandwich Structures 10.0 credits

Analys och konstruktion av sandwichstrukturer

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 FSD3405 valid from Autumn 2018

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Doctoral students.

Language of instruction

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

Intended learning outcomes

Upon completion of the course, the student is supposed to:

- Design sandwich beams subjected to transverse loads and in-plane loads regarding transverse displacement, strength, critical buckling load, natural frequencies and local buckling.
- Design isotropc and orthotropic sandwich plates subjected to transverse loads and in-plane loads regarding transverse displacement, strength, critical buckling load, natural frequencies and local buckling.
- Determine where a sandwich structure is preferred to other structural concepts based on knowledge of the properties of sandwich structures.
- Formulate a finite element for sandwich beams and use plate and shell elements with sandwich properties.
- Read and understand scientific papers on a topic of choice regading sandwich structures and explain the content in an understabdable way.
- Turn the content of scientific literature into e.g. own computer code, analysis methods or experimental methods.

Course contents

The course is divided into four modules. Module 0, 1 and 2 each correspond to 2 credits and module 3 to 4 credits.

Module 0 contains basic sandwich theory, materials, stresses and deformations in beams and plates.

Module 1 contains beam bending analysis. Implementation of sandwich beam finite elements and construction of a general beam analysis computer program. Buckling and free vibration of sandwich beams along with implementation of these analyses in beam finite element program.

Module 2 contains bending analysis of isotropic and anisotropic sandwich plates. Buckling and free vibration of sandwich plates. Representation of boundary conditions. Solutions by energy methods and by finite elements.

Module 3 consists of an individual literature survey or project work. Preparation of lecture notes and a one hour lecture on the chosen topic.

Disposition

For module 0, the student is recommended to follow selected lectures in the course SD2416 "Structural Optimisation and Sandwich Design" or read the material in self studies. Oral examination.

One written homework assignment is performed during module 1. At least one seminar with teacher is planned covering applicable parts of the theory.

During module 2 a second homework assignment is performed. Five to six seminars will be given during the module.

Module 3 is an individual work on a topic decided upon jointly by the student, the student's supervisor and the examiner. The work is presented at an approximately one hour long seminar and documented through a set of lecture notes. All students taking the course are invited to the seminar.

Course literature

A compilation of common relevant papers will be distributed.

Equipment

Access to commercial finite element code and MATLAB

Examination

- INL1 - Home Assignment, 6.0 credits, grading scale: P, F
- INL2 - Presentation of own project work, 4.0 credits, grading scale: P, 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.

Examination is through an oral exam for the first module, through the two home work assignments and through the presentation of own project work along with lecture notes.

Other requirements for final grade

Passed the oral exam, home work 1 and 2 along with work presented at a seminar including lecture notes.

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.