Structural optimization

Div. of Solid Mechanics

Course program, vt1 2020

Aims of the course

The objective of stuctural optimization is to find the 'optimal' design. The term 'optimal' design can apply to various aspects and the common features that are optimized are minimum weight or maximum stiffness of a structure. The course is aimed to give the student knowledge and fundamental understanding of modern tools that are commercially available.

Lectures

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Exercises

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Course literature

Christensen, P.W. And Klarbring, A.
An introduction to Structural Optimization, Springer Verlag.
Note that the course book is availble as E-book at the University library.

CALFEM-manual, computer program for learning the finite element method, Structural Mechanics and Solid Mechanics, Lund 1999.

Assignment

The course includes a mandatory assignment. The assignment is performed in groups of two or individually. **The assignment shall be handed in not later than March 13/3 at 16.00.** The assignment will be graded with up to 30 points, which is included in the final grade of the course. A report that is handed in too late will **NOT** be corrected. Note that **both** a paper version an electronic version of the assignment should be handed in. The electronic version

should be emailed to FHLN01@solid.lth.se. Name and program must be stated in the subject of the email.

Examination

The examination of the course consists of a mid-term exam and an assignment. The total points and required points for passing is

Mid-term exam	total points 30, points for pass 15
Project	total points 30, points for pass 15

For a final grade on the course, the mid-term exam and the assignment must individually have a passing grade. If a passing grade is not achieved on the mid-term exam a new opportunity will be given one week later.

Preliminary lecture schedule

Mathias Wallin	20/1, F1	Course introduction and terminology+ introductory examples
Mathias Wallin	21/1, F2	Examples of Optimization of discrete parameter systems
Niklas Ivarsson	21/1	2.1,2.2
Mathias Wallin	22/1, F3	Convexity, KKT conditions
Niklas Ivarsson	23/1	2.5
Mathias Wallin	27/1, F4	Lagrange duality, Separable problems
Niklas Ivarsson	28/1	3.1, 3.2, 3.3ab
Mathias Wallin	28/1, F5	Sequential explicit approx.: SLP, SQP
Mathias Wallin	29/1, F6	Sequential explicit approx.: MMA, CONLIN
Anna Dalklint	30/1	3.3c, 3.4
Anna Dalklint	30/1	3.7, 4.1, 4.2a
Mathias Wallin	3/2, F7	Stiffness optimization of trusses, Chapter 5
Niklas Ivarsson	4/2	4.4, 4.5
Mathias Wallin	5/2, F8	Sensitivity analysis, Chapter 6 Overview of 2D shape optimization, Chapter 7
Niklas Ivarsson	6/2	6.1, 6.2

Mathias Wallin	10/2, F9	Topology optimization of distributed parameter systems, Chapter 8., Part 1
Niklas Ivarsson	11/2	Seminar on truss optimization,
Mathias Wallin	12/2, F10	Topology optimization of distributed parameter systems, Chapter 8., Part 2
Niklas Ivarsson	13/2	8.1, 8.2, 8.7
Mathias Wallin	17/2, F11	Eigenfrequency optimization, Stress optimization Reserach examples
Niklas Ivarsson	18/2	Problem session
Niklas Ivarsson	18/2	Computer exercise, Truss system
Niklas Ivarsso	18/2	Problem session
Mathias Wallin	19/2	Mid term exam, 15.15-17.45 Chapter 1-6.3.1 and 8.
Niklas Ivarsson	20/2, F12	SIMP scheme + filter, Chapter 9.
Niklas Ivarsson	24/2, F13	Guest Lecture
Niklas Ivarsson	25/2	Problem session
Niklas Ivarsson	27/2	Computer exercise, Shape Optimization, Trinitas
Niklas Ivarsson	3/3	2:nd Attempt. Mid-term exam. 10.05-12.35 Room will be allocated after 19/2
Niklas Ivarsson	3/3	Problem session
	13/3	Last day to hand in the assignment