Structural optimization

Div. of Solid Mechanics

Course program, vt1 2019

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	21/1, F1	Course introduction and terminology+ introductory examples
Mathias Wallin	22/1, F2	Examples of Optimization of discrete parameter systems
Niklas Ivarsson	22/1	2.1,2.2
Mathias Wallin	23/1, F3	Convexity, KKT conditions
Niklas Ivarsson	24/1	2.5
Mathias Wallin	28/1, F4	Lagrange duality, Separable problems
Niklas Ivarsson	29/1	3.1, 3.2, 3.3ab
Mathias Wallin	29/1, F5	Sequential explicit approx.: SLP, SQP
Mathias Wallin	30/1, F6	Sequential explicit approx.: MMA, CONLIN
Niklas Ivarsson	31/1	3.3c, 3.4
Niklas Ivarsson	31/1	3.7, 4.1, 4.2a
Mathias Wallin	4/2, F7	Stiffness optimization of trusses, Chapter 5
Niklas Ivarsson	5/2	4.4, 4.5
Mathias Wallin	6/2, F8	Sensitivity analysis, Chapter 6
Niklas Ivarsson	7/2	6.1, 6.2

Mathias Wallin	11/2, F9	Topology optimization of distributed parameter systems, Chapter 8., Part 1
Niklas Ivarsson	12/2	Seminar on truss optimization,
Mathias Wallin	13/2, F10	Topology optimization of distributed parameter systems, Chapter 8., Part 2
Niklas Ivarsson	14/2	8.1, 8.2, 8.7
Mathias Wallin	18/2, F11	Overview of 2D shape optimization, Chapter 7
Niklas Ivarsson	18/2	Problem session
Niklas Ivarsson	19/2	Computer exercise, Truss system
Niklas Ivarsso	19/2	Problem session
Mathias Wallin	20/2	Mid term exam, 15.15-17.45 Chapter 1-6.3.1 and 8.
Niklas Ivarsson	21/2, F12	SIMP scheme + filter, Chapter 9.
Niklas Ivarsson	25/2, F13	Guest Lecture, P-O Jansell
Niklas Ivarsson	26/2	Problem session
Niklas Ivarsson	28/2	Computer exercise, Inspire Lab.
Niklas Ivarsson	4/3	2:nd Attempt. Mid-term exam. 10.05-12.35 Room will be allocated after 20/2
Niklas Ivarsson	5/3	Problem session
	13/3	Last day to hand in the assignment