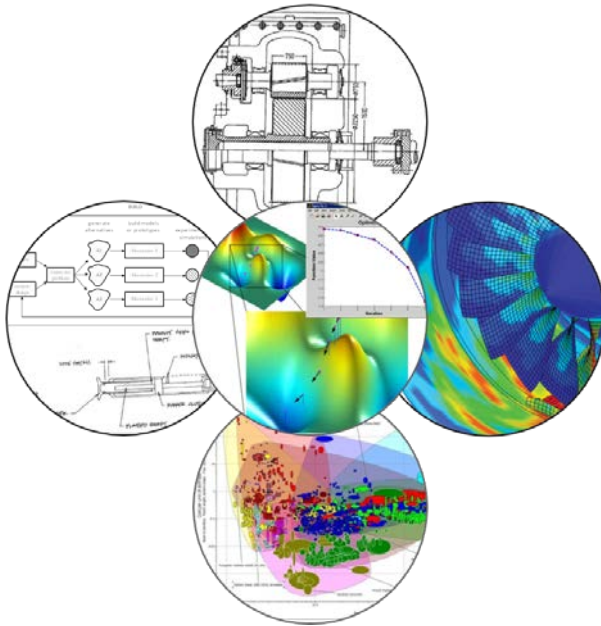


Course syllabus for

P60: Product Design Optimization

Syllabus adopted 2020-09-08 by Professor Bengt-Göran Rosén, Produktion2030 Head of Education



Credits	4 hec
Grading scale	Satisfactory/not satisfactory
Education cycle	Third-cycle
Examiner	Gauti Asbjörnsson, Chalmers University of Technology
Eligibility	A Master's degree in production engineering or equivalent
Aim	The course aims to put the concept of optimal design on a rigorous foundation and demonstrates the intimate relationship between the mathematical model that describes a design and the solution methods that optimize it.
Intended learning outcomes	<p>After completion of the course the course participant should be able to</p> <ul style="list-style-type: none"> • Formulate models suitable for optimization • Understand the basic principles for fundamental models • Formulate design of experiments to efficiently sample a design space

- Formulate empirical models using measured data
- Formulate appropriate optimization problems
- Analyse optimization formulations
- Understand the basic principles of common optimization algorithms
- Apply gradient based optimization algorithms
- Apply non gradient based algorithms
- Handle multiple systems, objectives and constraints
- Select appropriate optimization algorithms for a problem
- Implement and solve optimization problems using algorithms in a software
- Evaluate optimization results and provide design

Course content

The students will be introduced to the concept of design optimization and how to utilize its strength in the context of product and engineering design. An overall goal is to learn the skill on how to design not only products that meet the requirements, but that are also optimal! The course will both handle the theoretical background as well as hands on practice in Matlab. Topics such as e.g. design of experiments, meta-modelling, gradient-based optimization, gradient-free optimization as well as multi-objective optimization will be covered.

As a part of the course each student will conduct an optimization project, preferably as a part of their research project.

Course organisation

The course is structured in three blocks of time, where we will hold a total of five full-day class sessions. These sessions will include lecture-style discussions, in-class problem-solving exercises, and computer-based exercises, all activities can be done remotely online if necessary. The main assignment is a term project, where students will work on their own or in pairs to formulate, analyze, solve, and interpret the results for a design optimization problem of their choosing (preferably related to their research).

Examination

A successful completion of this course will be judged on the following:

- A written examination covering the lectured material (supported by complementary readings and exercises), administered at the end of day 5
- Term projects, evaluated based on oral presentations and written reports

Literature

Papalambros, P.Y. and Wilde, D.J. (2000) Principles of Optimal Design, 2nd Edition ISBN: 0521627273

Selected articles