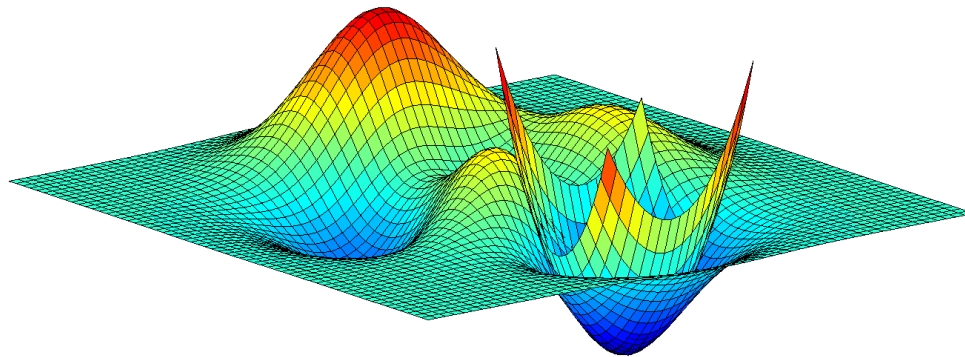# Welcome

Design Optimization

TMKT48

Content

- Who am I?
- Course Content
- Course Organization
- Course Homepage
- Schedule

Johan Persson

- Work at the Division of Machine Design

- Studied Mechanical Engineering @ LiU

- Performed Master Thesis @ ABB Corporate Research

- Worked as optimization expert @ Volvo Car Corporation

- Current research
  - Efficient Optimization
- Application
  - Industrial Robots
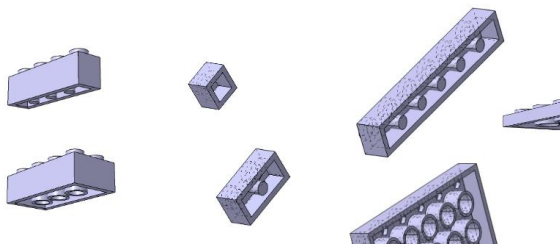
Place in Course Package

- Optimization knowledge

VT1

TMKT48 Design Optimization

HT1

TMKT79 Collaborative Multidisciplinary Optimization

| TMKT57 Product Modelling |
| --- |

VT2

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Course Content – First Half

- Design versus optimization
  - Formulating a design problem as an optimziation problem
- Basic mathematical concepts
- Optimization Methods
  - Traditional methods, The Complex Method, Genetic Algorithms, Particle Swarm Optimization

Course Content – Second Half

- Simulation and Optimization
- Objective Function Formulation
- Multi-Objective Optimization
- Sensitivity Analysis
- Surrogate Models
- Probabilistic Optimization
- Product Portfolios

Course Idea

Scheduled

Outside of Class

Examination

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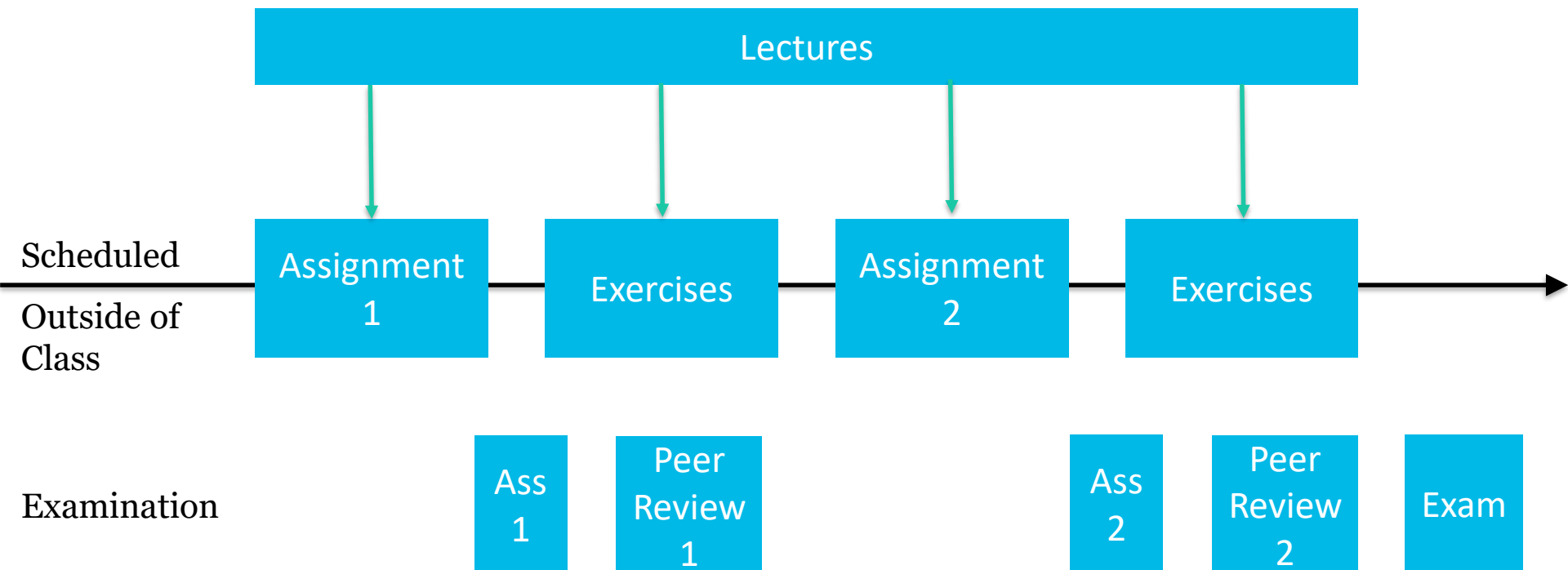
Course Organization

- Lectures (LE)
  - Johan Persson
  - Johan Ölvander
- Computer Exercises/Labs
  - Anton Wiberg
  - Athanasios Papageorgiou
  - Johan Persson

Examinations

- Two computer assignments that should be solved working in groups of 2-3 students.
  - You are not allowed to copy results from other groups
  - Grade = Fail or Pass
- Peer-review of assignments
  - Grade = Fail or Pass
- Written examination in the Computer Lab
  - Grade = Fail, 3, 4, 5

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Written Exam

- Will take place in the computer Lab

- Theoretical questions that you need to answer in writing using English or Swedish and do strict mathematical formulations

- Practical problems solved using MATLAB

- Answer using paper and pen

- You are allowed to use

  – ALL material that you have used during the course and <u>put on your computer account</u>, including for example

    - MATLAB files

    - Lectures

    - Own notes

  – Dictionary

  – Paper and pen

- You should work individually

You are NOT allowed to communicate with other people during the exam

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Course Goal	Assignment 1	Assignment 2	Exam
Should understand and be able to describe the function of a set of iterative optimization methods such as Genetic Algorithms, the Complex Method, and gradient methods (Newton methods)	X		x
Should be able to compare and evaluate the suitability of different optimization methods for different problem types.	X		X
Should be able to formulate design problems as mathematical optimization problems.	X	X	X
Should be able to implement mathematical models of design problems in MATLAB and solve them using numerical optimization methods.	X	X	X
Should be able to describe how simulation and optimization could be connected.		X	X
Should be able to implement the connection between simulation and optimization in the MATLAB/Simulink environment		X	X
Should be able to analyze the sensitivity of the obtain optimal solutions.		X	X
Should be able to discuss the plausibility of the results.	X	X	X

Schedule

- Timeedit

- An overview of the schedule can be found on Lisam under "Syllibus"

- The laborations will be held in Alfheim

Course Material can be Found on Lisam

- Reading Material
  - A compendium
  - Copies from books
  - Scientific articles
- Handouts from lectures
- Computer exercises
- Source code

Additional Information

- Create a note on the help list on Lisam when you want help

- Sign up your group on Lisam -> TMKT48 -> Collaborative Workspace -> Groups

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Changes to 2018

- The changes are based on the course evaluation
  - Grade for 2017 - 4.69 so quite popular

Comment	Change
Difficult start of the course if you do not know MATLAB	Two more scheduled hours for the first assignment (replaces the theoretical exercise)
I didn't know that Surrogate Models and Particle Swarm Optimization were that important	The Surrogate Modelling section has been moved to the middle of the course (instead of in the end)
I would like to know if I have answered Assignment 2 correctly since I could use it during the exam	We will upload "correct" answers to all exercises and assignments at the end of the course
	We will try to correct your Assignment before the exam, but the schedule is tight
	Added a concluding lecture in the end

Changes to 2019

- The changes are based on the course evaluation
  - Grade for 2018 - 4.58 so quite popular

Comment	Change
Difficult start of the course if you do not know MATLAB	Recommend that you read the document "matlab_basics"
	Added an introductory task in Assignment 1
The exam was too long	It is fast if you know the course content. It takes time if you need to look up things.
We received the results from the Assignments early, but we wanted more feedback	Go to the peer review seminars and request feedback there. Or ask for feedback during the labs.
We would have liked to be finished with the assignments earlier than the end of the course.	Surrogate Models have been moved back to the end of the course

Questions?