Aalto University

MEC-E1005: Modeling in Applied Mechanics

General Information

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Department of Mechanical Engineering

Introduction

- The students will develop understanding on mechanical modelling and related tools.
- The students will work on three modelling projects related to applied mechanics.

Intended learning outcomes

After this course the student is able to

- *Apply* the principles and methods used in problem solving in the field of applied mechanics.
- *Use some common numerical modelling tools* on solving typical mechanical engineering problems.
- Perform a *critical evaluation, validation, and analysis* on the modelling results.

Personnel

- Teachers-in-charge:
  - Arttu Polojärvi (email: firstname.lastname@aalto.fi)
  - Jouni Freund (email: firstname.lastname@aalto.fi)

- Course assistant:
  - Akseli Leraillez (email: firstname.lastname@aalto.fi)

- Language center:
  - Kenneth Pennington (email: firstname.lastname@aalto.fi)

- Visiting lecturers from industry

Some practicalities

- All course materials can be found from MyCourses: Problem descriptions, example reports, results, etc.

- The three engineering tasks of the course in groups of, preferably, about 3 students. We will open a possibility to enroll to groups in MyCourses.

- If you wish to work alone: It is enough you just enroll to the course, no need to enroll to a group.

Week	Mon	Tue	Wed	Thu	Fri
			PERIODIC STRUCTURE DISPLACEMENT		
17	**10:15-12:00** Introduction and assignments 216 (JF&AP)	**12:15-14:00** Mathematica introduction 215 (JF)	**10:15-12:00** Scientific writing 216 (KP)	**12:15-14:00** Modelling hours 215 (JF) **14:15-16:00** Mathematica hours Y338 (JF)	
				Measurements	
18	May Day	**09:15-11:45** Abaqus workshop 1 **12:30-16:00** Abaqus workshop 2 Kilwa Ärölä (Rand Simulation) Y338	**09:15-11:45** Abaqus workshop 3 **12:30-16:00** Abaqus workshop 4 Kilwa Ärölä (Rand Simulation) Y338	**12:15-14:00** Modelling hours 215 (JF) **14:15-15:30** Abaqus hours Y338 (AL)	
			CRYSTAL SINGING BOWL FREQUENCY		
19	**23:55** Report 1 DL	**12:15-14:00** Kari Saine (Wärtsilä) 215 (AP)	**10:15-12:00** Kari Saine (Wärtsilä) 216 (AP)	**12:15-14:00** Modelling hours 215 (JF) **14:15-15:30** Abaqus hours Y338 (AL)	
				Measurements	
20		**12:15-14:00** Johanna Sjölund (Elomatic) 215 (AP)	**10:15-12:00** Modelling hours 216 (JF)	Ascension Day	
			RIGIDITY OF RECTANGULAR PLATE		
21	**23:55** Report 2 DL	**12:15-14:00** Jani Paavilainen (Rand Simulation) 216 (AP)	**10:15-12:00** TBA (Hefmec) 215 (AP)	**12:15-14:00** Modelling hours 215 (JF) **14:15-15:30** Abaqus hours Y338 (AL)	
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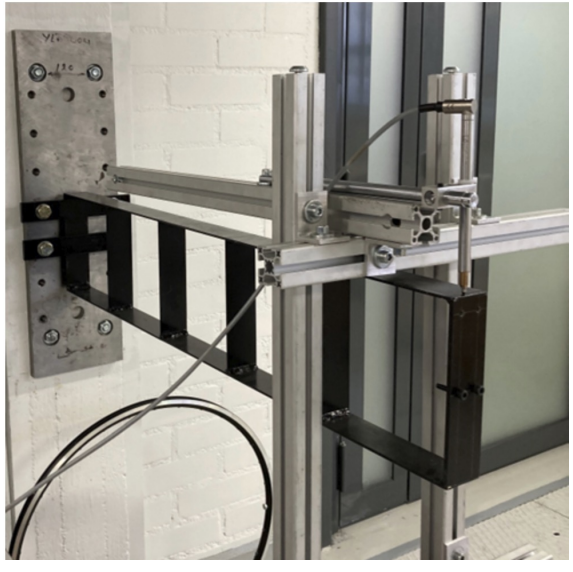
23					
24					**23:55** Report 1,2,3 DL

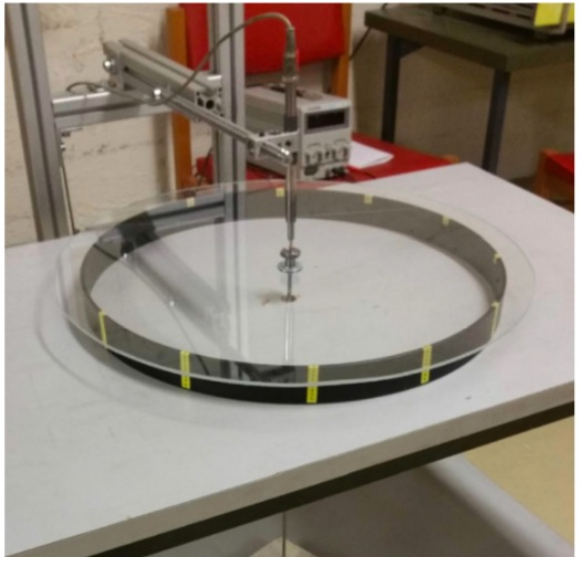
Three modelling tasks

Periodic structure displacement



Young's modulus of quartz crystal

Rectangular plate bending



Three modeling tasks

- Fairly simple structures used for measurement and analysis. Measurements will be performed by the groups.
- Use of simplified, analytical or other, engineering models for modelling the problem.
- More sophisticated modelling of the same problem using FE-software (or Mathematica code).
- Reports 1 & 2: Draft report at the end of the two week period and final report at the and of the course

Report writing

- Writing technical reports is of importance in engineering work: Your results are only as good as your reporting on it.
- You will find an example report at the course home page + there will a lecture on this topic on Wed 26.4!
- Writing clinics will help you to improve your reports: The assessment is done based on final versions of the reports.
- Ken Pennington will provide more details on technical writing and feedback meetings on his lecture on Wed 26.4.

Hands-on workshop on Abaqus

- Second week (***Tue & Wed, 2-3.5***) of the course includes a two-day intensive hands-on Abaqu training.
- Training starts from the basics: no previous Abaqus training is needed to attend the course.
- You will learn the basics and the a number of different analysis types.
- Abaqus training will be given by Dr. Kilwa Ärölä from Rand Simulations

Course software

- The training is also organized online, you should have the student version of the Abaqus installed to your computer.

- MyCourses has links for downloading the software and also links, which you might find useful for practising using Abaqus.

- You can also use the Mathematica code of the finite element method courses MEC-E1050 and MEC-E8001.

Assessment

- There is no exam in the end of this course – instead you will work out a reports based on modelling and measurements.
- Final project reports will be handed in the end of the course and they are assessed.
- Instruction and assessment criteria for the final reports will follow later during the course.
- Points will also be given for attendance during the lectures by the visitors from industry.

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Grading

- Industry presentations: Participation 0.5 p each (2 p in total)

- Report draft:
  - OK: likely to be accepted in the present form (2…6 p)
  - IM: may not be accepted in the present form (0…1 p)

- Final report:
  - Each report 0…6 p
  - Accepted report 1…6 p

- Course:
  - All three reports need to be accepted
  - Max points 6 + 6 + 6 + 2 = 20 p

- Passing the course requires at least 8 p

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Thank you! Any questions?