MEC-E1005: Modeling in Applied Mechanics

General Information 2024

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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.

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Personnel

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

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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. (Notice the limitation related to writing clinic!)

Week	Mon	Tue	Wed	Thu	Fri

DISPLACEMENT AND ROTATION OF CANTILEVER BEAM

Week	Mon	Tue	Wed	Thu	Fri
17	**10:15-12:00** Introduction and assignments 216	**12:15-14:00** Mathematica workshop 215	**10:15-12:00** Scientific writing 215	**10:15-12:00** Modelling hours 215	**08:00-16:00** Abaqus workshop Y338
				Measurements	
18	**08:00-16:00** Abaqus workshop Y338		**May Day**	**10:15-12:00** Abaqus hours Y338 **12:15-14:00** Modelling hours 215	

FREE VIBRATION OF THREE-STORY BUILDING

Week	Mon	Tue	Wed	Thu	Fri
19	**23:55** Report 1 DL	**12:15-14:00** Johanna Sjölund Elomatic OY 215	**10:15-12:00** Modelling hours 216 **12:15-14:00** Abaqus hours Y338	**Ascension Day**	
				Measurements	
20		**12:15-14:00** Eetu Kivelä, Etteplan 215	**10:15-12:00** Ilkka Mikkonen EDRMedeso 216	**10:15-12:00** Modelling hours 215	**10:15-12:00** Abaqus hours Y338

BENDING RIGIDITY OF CIRCULAR PLATE

| Week	Mon	Tue	Wed	Thu	Fri
21	**23:55** Report 2 DL	**12:15-14:00** Kilwa Ärölä PLM Group 215	**10:15-12:00** Gabriela Roivainen Kone 216	**10:15-12:00** Abaqus hours Y338 **12:15-14:00** Modelling hours 215	
				Measurements	
22				**12:15-14:00** Modelling hours 215	
23					
24					**23:55** Report 1,2,3 DL

Three modelling tasks

Displacement and rotation of a cantilever beam
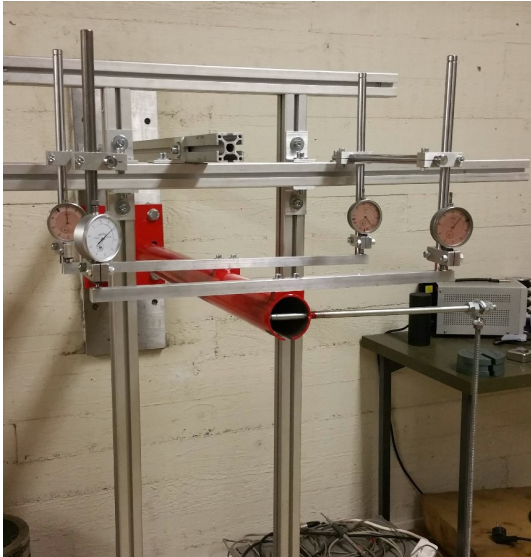
Free vibration of a three-story building
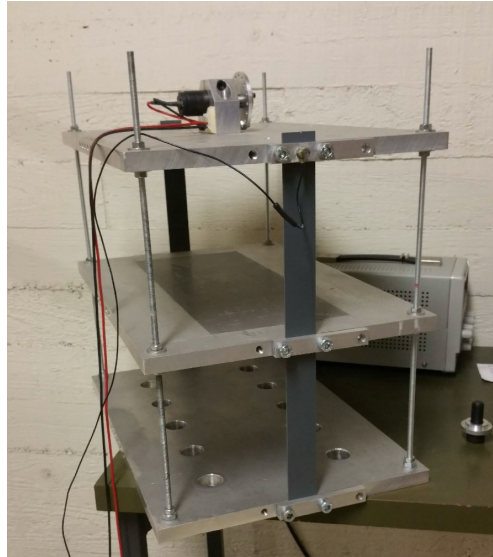
Bending rigidity of a circular plate

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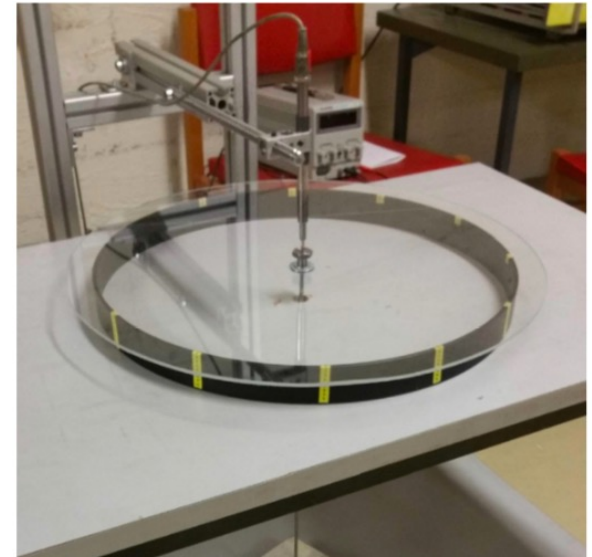
Three modeling tasks

- 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 24.4!

- Writing clinic 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 meeting on his lecture on Wed 24.4.

- Note: To keep the workload of the language center reasonable, writing clinic will be primarily offered for groups of three students (not individual students).

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Hands-on workshop on Abaqus

- During **Fri 26.4 & Mon 29.4** there will be a two-day intensive hands-on Abaqus 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 PLM group

Course software

- It is recommended that you would have the student version of the Abaqus installed to your computer (have this installed by 26.4!).

- 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.

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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.

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?