MEC-E1005: Modeling in Applied Mechanics

General Information

Arttu Polojärvi & Jouni Freund Aalto University School of Engineering 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 assistants:
 - Ville-Pekka Lilja (email: firstname.lastname@aalto.fi)
 - Markku Malmivuori (email: firstname.lastname@aalto.fi)
- Language center:
 - Kenneth Pennington (email: firstname.lastname@aalto.fi)
- Five 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 2-3 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.



Teaching events

- Task kick-offs (every other week, Wed 12-): Introduction to and description of the three engineering tasks. (Jouni Freund)
- Visiting lecturers (Tue 10-12 & Wed 12-14): Visitors from industry working on topics related to mechanics.
- Ansys-hours (Thu 14-15.30^{*}): Support for the numerical modelling work using ANSYS available. (Ville Lilja)
- Modelling hours (Fri 12:15-14:00*): More general questions related to the measurements and modelling. (Jouni Freund & Markku Malmivuori)

*note that there are some exceptions on these times



MEC-E1005 - Modelling in Applied Mechanics Preliminary schedule for spring 2021 course (date: 15.4.2021)

Week	Mon	Tue	Wed	Thu	Fri		
16 (19-25.4)	"General information"- lecture available in MyCourses		Introduction to assignment 1 & Scientific writing, Ken Pennington		Modeling hours	PROJECT 1	
			12.13-14.00		12.13-14.00		
17 (26-2.5)		Ansys training 08:00-16:00	Ansys training 08:00-16:00	Modeling hours 12:15-14:00 Ansys hours 14:15-15:30	vappu eve		RESERVE TIME FOR WRITING CLINIC!
18 (3.5-9.5)	REPORT 1 DEADLINE	Industry presentation Arttu Kalliovalkama (Etteplan)	Introduction to assignment 2 & Industry lecture: Susanna Hurme (Murata Electronics	Ansys hours	Modelling hours	PROJECT 2 PROJECT 3	
	23:55	10:15-12:00	12:15-14:00	14:15-15:30	12:15-14:00		OBLIGATORY WRITING CLINIC DURING WEEKS 18-20
19 (10.5-16.5)		Kari Saine (Wärtsilä): Vibration measurements versus simulations 1 10:15-12:00	Kari Saine (Wärtsilä): Vibration measurements versus simulations 2 12:15-14:00	ascension day	Modeling hours 12:15-14:00 Ansvs hours 14:15-15:30		
20 (17-23.5)	REPORT 2 DEADLINE	Industry presentation (HEFMEC)	Introduction to assignment 3 & Industry presentation: EDRMedeso	Ansys hours	Modelling hours		
	23:55	10:15-12:00	12:15-14:00	14:15-15:30	12:15-14:00		
21 (24-30.5)				Ansys hours	Modelling hours		
				14:15-15:30	12:15-14:00		OPTIONAL WRITING CLINIC DURING WEEKS 21-22
22 (31.5-6.6)							
23 (7-13.6)					REPORTS 1-3 DEADLINE 24:00		

Three modeling tasks

Effective polar moment of open thin-walled profile Dynamic properties of three-story building Spring coefficient of a disk



Three modeling tasks

- Fairly simple structures used for measurement and analysis. Measurement results will be handed out to groups.
- Use of simplified, analytical or other, engineering models for modelling the problem.
- More sophisticated modelling of the same problem using FEsoftware (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 scientific writing on Wed 21.4!
- Writing clinics will help you to improve your reports: The assessment is done based on final versions of the reports.
- It will be obligatory for each group to attend one writing clinic meeting-second one is voluntary.
- Ken Pennington will provide more details on technical/scientific writing and writing clinics on Wed 21.4.



Writing clinic

- Each group works on the first version of report 1 and returns it according to the deadline (3.5, start of week 18).
- During week 17, the groups reserve a visit to writing clinic, which takes place during weeks 18-20. This meeting is obligatory.
- During the writing clinic the groups get support for writing the second version of report 1; you are encouraged to use the feedback when writing reports 2 & 3.
- The groups can attend another, voluntary, writing clinic after returning report 2. These meetings would be during weeks 21-22. Reservations done during week 20.



Hands-on workshop on Ansys

- Second week (*Tue & Wed*, *27-28.4*) of the course includes a twoday intensive hands-on ANSYS training.
- Training starts from the basics: No previous ANSYS training is needed to attend the course.
- You will learn the basics and the a number of different basic analysis types.
- ANSYS course will be given by Dr. Antti Ylinen from EDRMedeso who distribute the software in Finland.



Course software

• The training "organized online and you should have the student version of the Ansys installed to your computer.

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

• For the tasks 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...1 p each
- 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 + 6 = 24 p
- Passing the course requires at least 12 p





Thank you! In case you have questions, send me an email.