Course Analysis MF2019

CAD 3D-modelling and Visualization
Spring 2020

Date and author: 2020-06-26 by Ellen Bergseth

1 Course information

This course supports virtual prototyping. Designers and engineers need a common understanding of the performance aspects of the design before physical prototyping. In this course, students create 3D CAD-models that support efficient cooperation between individuals and groups of individuals with different types of competence. The models can be used with different purposes, for example, explaining the function and manufacturability of a product, eliminating interferences between parts as the mechanism moves through the real operating range, or generating operating loads to check the design criteria using Finite Element Analysis.

After completing the course, the student should be able to:
1. Create a CAD part with product manufacturing information (PMI) in a system context.
2. Create a CAD assembly with mixed technological content, e.g. mechanical and electrical parts.
3. Master modeling modules (i.e. applications and environments) in a CAD system for the design of machine components.
4. Make a force- and motion analysis of a mechanism model.
5. Making interference analysis.
6. Create communicative representations of CAD-models to present and describe the design and behaviour of a product.

Course responsible teacher:

Ellen Bergseth

Other teachers in the course:

Student assistants Johan Ankre and Hampus Andersson

Examiner:

Ellen Bergseth

Learning activities:

Lectures, computer exercises, one seminar, home assignments (ÖVN1), and a project task (ÖVN2).

Additional Comments

The student suggests the individual project task. The project proposal and scope are assessed and have to be accepted before the project start.

2 Students' view of the course

Summary of students' view of the course based on for example LEQ survey and/or interviews or other activities.

This course started just a few days after the campus was closed due to the Coronavirus. Yet, I could switch to distance education. Online lectures, seminars, and computer exercises turned out very well. The students I met during lectures, the seminar, and exercises online were good at using the chat and rising hand tools in the video conference platform. I got direct feedback.

Response rate of LEQ course evaluation survey:

We have to take into consideration the response rate was only 25% (16 students out of 64 registered).

Brief summary of students' responses from the LEQ survey and/or other types of course evaluation:

In the survey, the students give it a high rating in meaningfulness (Q1-6) as well as for the comprehensibility (cognitive) level (Q7-11). On the manageable level (Q17-22), students also had a high rating except the question that dealt with learning by collaborating with others, which was lower rated than the others. On the manageable level, students from year 3 taking the course gave lower ratings than the students from year 4-5. Females gave higher scores on average.

Additional Comments

I got an excellent suggestion in the comments that I should more clear bring up from the assignments, what I would like them to apply also in their project. I had this in mind assessing the projects this year and have a lot of examples to bring to the next course round. I am aware that some have felt it was hard to select a product to model. I will put some extra time into this next course round. As many students comment, one has to choose a product early on to have enough time to work on the model and report.

I am pleased to read this since this is something a put lot of effort in:

- *Ellen's lectures were easy to follow and very structured with mixed examples.*

I appreciate it when students catch the core of the course:

- *A very needed course for people who need to start thinking more about modelling, it's quite easy to model a simple product given some dimensions, however, thinking of how to approach modelling and how to convey an idea with a model is also important.*

3 Teacher analysis of the course

The analysis should present the development of the quality of the course as well as measures that have been taken after previous course analysis. The course's strengths and weaknesses based on the course evaluation and the teacher's reflection.

Changes of the course before this course offering:

I integrated PowerPoint slides with live demonstrations in my lectures. The students wanted more live demonstrations as one improvement from last course analysis, written by the previous course responsible and examiner.

I moved the peer review assignment. Instead of peer-reviewing a final project, they reviewed a report draft and the model approach. The purpose was to help the students finalize their project, i.e. students start their writing process earlier on and are forced to formulate a purpose and planned methodology.

Also, get inspired by the approach by their peers. 75% (49 students out of 64 registered) finished the project. For comparison, my last time as a course responsible in spring 2016, only 42% (31 out of 73 registered) finished their project. But there may be other reasons for this increase, e.g. the distance education due to closed campus might have helped – this course is easily taken at a distance.

I added one task in assignment 1 to make them practice using the Solid Edge Design Optimization tool. From a parametrized part, one can, for example, minimize the mass of a part by changing the carefully selected dimensions with constraints. Some of the students, in their project, used this tool as a downstream activity. I also introduced the Topology Optimization tool.

The course's strengths (based on the students' experiences and the teacher analysis):

The project is individual, and the students can plan their work on their own but can always get guiding by assistants or me at scheduled exercises. The lectures are well presented, informative, and helpful. This also gave me feedback on how well the structure of the course page was. The assignments are clearly structured, and the assessment of the individual project work is clear for most of the students.

Areas for improvement of the course (based on student experiences and teacher analysis):

The individual project is still challenging for some of the students, it can be hard working alone, even though there are scheduled exercises for discussing the project. Unfortunately, not too may showed up at these exercises, and it was almost the same students that showed up. At the beginning of the course, I planned for a second seminar later on but did not manage timewise. Adding an extra workshop can help to ease this challenge. The discussion platform in Canvas worked well when students had questions, but I have to be clear that they ask the questions via Canvas and not send me emails, it is better to have all messages in one place.

Proposed changes to the next course round:

- Have two scheduled seminars to aid the feeling of belonging and being able to discuss the product to model with course mates together with comments from me.
- I will replace one task and make them practice the Topology Optimization tool (not available in the current CAD-system version, but I have asked IT to add it in the next version), useful now and in the future when additive manufacturing now is an option to traditional manufacturing.
- For the peer review, I will use the Canvas speed grader.
- Give outlines what I want to see in the project, a checklist of possible things to include.

Additional Comments

I noticed that more than 15% of the students select to re-design existing products. Still, most students choose to reverse engineer existing products, for example, handheld tools (chain saws, drills, etc.).