



Course Analysis MF2011

Systems Engineering Spring 2023

Date and author: 2023-08-15 by Ellen Bergseth

1 Course information

This course is based on an analysis and redesign scenario for an existing technical system combined with lectures, computer exercises, and seminars to support the project and to understand the discipline and practice of systems engineering.

Summary of the course layout:

The Systems Engineering course, in Swedish Systemkonstruktion, at the Department of Engineering Design at KTH has yearly about 60 students from three different master programs. The students have a bachelor's degree in mechanical engineering, Design and Product Realisation, or equivalent. About 25 percent of the students are international students. The primary purpose of the course is to introduce technical complexity and uncertainty, balancing desired and undesired effects when developing a system or product. The students must apply theoretical knowledge in a more practical and bigger picture context. Project work constitutes the main part of the course and is based on an analysis and redesign of an existing technical system. The whole class is one project group with one common goal divided into several subgroups of 4-6 students. That makes it possible to solve problems with a higher degree of complexity. One member of each development group will also be a member of a system integration group responsible for architecture definition, systems model updating, interface flaw detections, system performance verification etc. A stage-gate process and the V-model support the project development progress. Students should put in 240 hours in total, with 60 hours scheduled.

Course responsible teacher:

Ellen Bergseth

Other teachers in the course:

No other teachers

Examiner:

Ellen Bergseth

Learning activities:

Lectures, computer exercises, seminars, project gate meetings, workshops, final presentations, project work (non-scheduled), and individual logbook writing (non-scheduled).

2 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.

Overall, this experience was more awarding than last year, this was my second time. I had formative course evaluations when running the course.

Changes of the course before this course offering:

All learning goals were re-formulated for this course round. More open communication rounds in the workshops.

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

That the course project gives insight into real-world industry problems.

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

The projects have, up till now, been linked to the energy or the ground transport sector, for example, redesigning a wave energy harvester system or creating a conceptual design of an autonomous heavy-duty truck. The 2023s task was to redesign an old train into a new conceptual metro train running on electricity in the Stockholm metro system. Work is mixed with lectures and seminars involving researchers and industry representatives to support the project's progress. The industry involvement is appreciated, and the quality of the course is highly dependent on this. This was very appreciated by the students. The companies are involved in the project. SL was there at the final presentation giving feedback.

Having the course as one large project brings the main challenge of handling the integration difficulties. Since there is no single authority in the class, the system integration group has more than ten members; this is a shortcoming. Perhaps, one of the teachers act chief architect (next course round we are more than 1 teacher). Another challenge is pushing the students to work with limited information and better communicate the main requirements early without the need for detailed subtask knowledge. A3 sheets is suggested to help on this matter. The project work requires high demands on planning and communication within the group and makes all subgroup members use their unique skills and be brave enough to act in the group. I will add some new conceptual models to mitigate this problem. Also with more teacher, we can be divided in smaller groups to make everyone brave enough to talk.

The newly introduced topic threats and hazard evaluation was challenging the student, in a good way. I will keep it.

Next course round three more teachers will help me, which will really increase the supervision of the project and strengthen the course by having colleagues to discuss the course.

Proposed changes to the next course round:

- Add that "vid hemtentamen så tar examinatorn hänsyn till om studenten har lämnat in i tid, betyg kan sänkas."
- Add creating future scenarios in the project.
- Add systigrams using Visio if available in computer rooms to get a common understanding.
- Use A3 sheets to increase understanding among project progress.