MF2011 Systems Engineering 9.0 credits

Systemkonstruktion

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

Course syllabus for MF2011 valid from Spring 2023

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

A Bachelor´s degree in Mechanical Engineering or equivalent.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The main goal is that the students should develop their capabilities to treat systems engineering from a holistic and lifecycle perspective (interaction with the environment, existing and future customer needs and demands, the technological development, etc.). Further more, the course aims at that the students should acquire a thorough knowledge of available methods and frameworks for product modeling (CAD), product data management (PDM), and geometry-based simulations (CAE), as well as industrially relevant strategies and methods for integrated management of all product information during the products entire lifecycle, i.e. product lifecycle management (PLM).

After completing the cours the student should be abel to:

1. Demonstrate ability to creatively, critically and systematically integrate knowledge from previous courses to analyse, judge and deal with complex systems, even based on limited information.
2. Demonstrate the ability to criticise common models for planning and executing systems engineering;
3. Demonstrate the ability to design a technical system with the support of a master CAD model and related simulation models;
4. Demonstrate the ability to make design decisions based on the outcome of the Design Structure Matrix based analysis of the architecture of a complex system and identify module candidates;
5. Demonstrate ability to visualise and discuss engineering conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing;
6. Demonstrate the ability to establish a qualitative risk analysis;
7. Demonstrate ability to design a complex system, considering relevant scientific, social, economic and environmental aspects

Course contents

The course is based on an analysis and redesign scenario for an existing technical system. Topics treated are:

- the system development process and planning – V-model, Stage-gate model, network planning, Gantt-scheme;
- requirements specification (end user-, corporate-, regulatory- and societal requirements);
- the active environment and environmental impact;
- integration of components and interfaces between components;
- manufacturing, assembly, and service aspects;
- system architecture (integrated/modular) and methods, tools and frameworks for systems engineering (QFD,DfX,DSM,MFD).
- reliability engineering, design aspects of reliability and methodologies such as FTA anad FMEA;
- system dynamics and related phenomena and mechanisms, as well as constructive countermeasures;
- systems modeling and simulation, static and dynamic substructuring;

- System verification and validation;
- PLM (PDM and CAE) - frameworks, standards, and tools for collaborative engineering
- Threats and hazard evaluation

Examination

- INL1 - Assignment, 6.0 credits, grading scale: P, F
- TEN1 - Home exam, 3.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Other requirements for final grade

Final grading requires passed exercises and project assignments (INL1;6hp) and passed written examination (TEN1;3hp).

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.