MF2011 Systems Engineering 9.0 credits

Systemkonstruktion

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

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

Establishment

Course syllabus for MF2011 valid from Spring 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

At least 60 credits and

MF1013/MF1039/MF1044/4F1813, MF1015/4F1815,
MF101X/MF102X/MF104X/MF111X/MF112X/MF114X/MF116X/MF1025/MF1026

Masterstudents: TIPUM/TIPDM/TAEEM och MF2006

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 shall 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 shall 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).

A student that has completed the course shall:

- be able to integrate and apply component- and tribological knowledge to systems engineering;
- be able to describe common models for planning and executing systems engineering;
- have planned and performed a distributed collaborative technical design project with the support from a master CAD-model and related simulation models;
- have applied the FBS method to systematic funktion analysis and synthesis;
- have performed a DSM-based analysis of the architecture of a complex product and identified module candidates with the MFD tool;
- be able to describe the most industrially relevant product model standards and neutral formats that enable collaborative engineering, and be able to discuss their pros and cons;
- have performed an integrated FEM- and MBS-simulation;
- have performed a qualitative as well as a quantitative risk analysis with the aid of Fault-Tree Analysis (FTA) and Failure-Mode and Effect Analysis (FMEA);
- be able to elaborate on the business motives for using PDM-, PLM-, CAD- and CAE-in technical development and engineering;
- be able to describe the pros and cons for the most important formats and standards for product data and models;

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

Computer exercises

Project assignments

Written examination

Course literature

Hand-outs of scientific articles on current research in the field.

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.

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.