MF2031 Advanced Prototyping 6.0 credits

Avancerad prototypframtagning

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

Establishment

Course syllabus for MF2031 valid from Autumn 2015

Grading scale

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

Education cycle

Second cycle

Main field of study

Mechanical Engineering

Specific prerequisites

Degree of Bachelor of Science in Engineering within mechanical engineering or the like. CAD knowledge.

Language of instruction

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

Intended learning outcomes

After passing the course, the student should be able to:

- describe the importance of the prototype in the product realisation process
- describe the relation and the difference between virtual and physical prototypes
- explain when and why a prototype (physical or virtual) is required in the product realisation process
- describe different physical prototype manufacturing methods
- choose prototype manufacturing method based on purpose, cost, material, time and quality
- design 3D CAD models adjusted for prototype production
- build physical prototypes with the aid of a 3D scanner, 3D printer, laser cutter, prototype milling, and water jet machines
- create a virtual and physical prototype based on "reverse engineering" technology
- describe differences and relations between different digital 2D/3D format
- make a budget for prototype development

Course contents

The aim of the course is to give the student knowledge of available methods (theoretically and practically) for advanced physical prototype production. The emphasis lies on design and preparation for prototype building and "reverse engineering". Construction and preparation is carry out by means of CAD/CAM softwares and scanning equipment The production is made with 3D printers, milling and water jet machines The manufacturing documentation is based on 2D and 3D digital models. When and what kind of prototypes that are appropriate in the product realisation process is discussed, as well as material aspects and costs. Different material adding FFF (Free Form Fabrication) methods are discussed, their strengths and weaknesses and material removal prototyping equipment.

Disposition

Activities

The activities of the course intend give a general theoretical description of existing prototype manufacturing methods. Some of these, as 3D printing, milling, laser cutting, scanning and water jetting, are used in practice in the course. This means that a large part of the contents of the course is exercises and project work. Lectures together with the reading list give the theoretical part, while the practical part is trained in exercises and projects.

project work

In projects, groups of 3-4 students design and build a prototype by means of available machines. A large part of the contents of the course is focused on the project. The project

should be presented orally and in writing. Further information about the project is given at the beginning of the course.

Computer assignment

This is a compulsory component in the course that is carried out in groups of 1-2 students. A compulsory assignment should be completed before the first exercise session. Focus in this assignment is on so-called "Reverse engineering", to convert an existing physical product into a solid CAD model and finally into a physical prototype. To pass this assignment, it is required that the student delivers a solid CAD model, a mesh model and photos of original and physical prototypes. Timetabled exercise sessions are for this.

Course literature

Reverse Engineering- An Industrial Perspective

Editors: Vinesh Raja, Kiran J. Fernandes

ISBN: 978-1-84628-855-5 (Print) 978-1-84628-856-2 (Online)

Engineering Design and Rapid Prototyping

Authors: Ali K. Kamrani, Emad Abouel Nasr

ISBN: 978-0-387-95862-0 (Print) 978-0-387-95863-7 (Online)

Examination

- PRO6 - Project, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN3 - Written Exam, 2.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB3 - Laborations, 1.0 credits, grading scale: P, 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.

To pass is required the following:

- Approved computer assignments
- Approved examination
- Approved project
- Submission of an individual evaluation

The individual grade is based on the result in the written examination, 50%, and of the project, 50% A different grade can be awarded in special cases.

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.