

Engineering Design Techniques (6024-M)

5 ECTS

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Lectures: 30h | Tutorials: 8h | Labs: 22h | Project: 0h | Lang.: 

Objectives

- to learn about different approaches / models in product development at different levels of design,
- to learn what methods and tools to use in different phases of product development,
- to become familiar with characteristics of different design method and how to use them,
- and to consider the following approaches in the product development process: legislation, environment, costs, robustness, innovation, IT support.

Programme

The course introduces methods and tools for a systematic approach to product development and design of complex systems.

Course starts with the whole life cycle of the product and on the growth and maturity curve of the products. It is necessary to have the product in mind, from eco design, manufacturing, use, maintenance, to recycling. The entire life cycle of the product needs to be considered at the design stage. Several methods have been developed for a comprehensive approach to design: concurrent development, development for six sigma, quality requirements in the automotive industry, verification, and validation of prototypes. The aim is to develop a systemic mindset that is necessary in the design of products using methods such as TRIZ, APQP, FMEA, DFSS, SPC, MSA, DoE, ANOVA, etc. An important part of the content is dedicated to legislation that must be followed by any manufacturer who wants to sell the product on the market. An overview is given of the requirements and rules to be followed in the intellectual property. Particular attention is given to product safety and harmonised standards which constitute minimum requirements for the European market. Project work and product development is inextricably linked to the management of technical documentation. Knowledge of technical information systems (PLM) is of particular importance in complex and spatially distributed projects. Finally, methods for data modelling of processes and products are systematically presented.

Prerequisites

To successfully achieve this course, the students must have fundamental knowledge in:

- Engineering design methodology
- Machine elements 1, 2
- Technical drawing and 3D modelling

Learning outcomes

The student acquires in-depth theoretical, methodological and analytical knowledge of methods of engineering design techniques with elements of research, which is the basis for a comprehensive approach to the development of products at different levels of design.

The students will gain proficiency in complex work processes and methodological tools in the field of engineering design:

- Independent solving of technical problems in mechanical engineering.
- Capable of teamwork and interdisciplinary cooperation.

Planning and managing a workflow based on creative problem solving related to the field of engineering design:

- Ability to apply modern methods and procedures and ability to transfer of theoretical knowledge into practice.

Assessment

Theoretical content (lectures). 50%
Project work (exercises). 50%

Literature

1. K.T. Ulrich and S.D. Eppinger, Product Design and Development, Irwin McGraw-Hill, 2020
2. E. B. Magrab, S.K. Gupta, F.P. McCluskey, P. A. Sandborn, Integrated Product and Process Design and Development, The Product Realization Process, Taylor & Francis Group
3. G. Pahl, W. Beitz, J. Feldhusen, K.H. Grote, (2007), Engineering design, A Systematic Approach, Third Edition, Springer