

Course syllabus

Konstruktionsteknik Engineering Design Techniques

MMKN55, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED M

Date of Decision: 2023-04-11

General Information

Compulsory for: MD4

Elective for: M4-me, M4-pu

Language of instruction: The course will be given in Swedish

Aim

The course is to provide knowledge of the role of engineering design within the context of general product development, for the purpose of determining the conditions for designing a specific product or product component. To this end, the engineering design process, as well as the synthesis and analysis that are part of that process, shall be introduced. Specifically, the course will address some of the techniques that are crucial to the design engineer, such as mechanical joint design and embodiment design.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- determine the conditions for designing a specific product or product component
- identify and carry out necessary synthesis and analysis in the engineering design process
- based on a provided principal solution, propose suitable product architecture
- based on a chosen product architecture, identify and formulate the need for existing design solutions (components – completed and/or standardised design solutions)
- based on a chosen product architecture, identify and formulate the need for unique design solutions
- draw up suitable solutions (syntheses) and choose the most appropriate design for

the unique engineering design solutions identified through the principal solution

- analyse developed proposals (quantitatively and qualitatively)
- provide suitable descriptions of a developed design solution to an employer (usually an industrial company) with reference to a completed process – orally and in writing, independently or in groups

Competences and skills

For a passing grade the student must

- independently or in groups, identify the conditions for designing a product or product component, based on a provided principal solution (product concept)
- independently or in groups, present the conditions for developing (synthesis), assessing and choosing a design solution, based on a provided principal solution (product concept)
- independently develop and analyse different proposed solutions for mechanical joints (welded and bolted joints), based on a provided principal solution (product concept)
- independently or in groups, analyse the need for a unique design solution
- independently or in groups, communicate a design solution with reference to a completed process, both orally and in writing, to an industrial company/equivalent
- independently draw up a blueprint for a manufacturing workshop

Judgement and approach

For a passing grade the student must

- with a scholarly approach, assess and reflect on developed design solutions, and on that basis propose further and/or alternative solutions
- identify possible needs for in-depth analyses of developed proposals

Contents

The course is comprised of three components:

- From the perspective of the product development process, the course introduces a model for the engineering design process and how to identify the conditions for designing a specific product or product component. Based on this process model, the course describes the synthesis and analysis components of engineering design. In this course component, emphasis is placed on the synthesis of the design work. The component concludes with a group assignment aimed at developing a mode of operation for a specific product/product component.
- The second component deals with embodiment design, laying down the general rules and guidelines for engineering design techniques. The required reading for this part of the course is based on the latest research findings and personal research and experience in the field. The component concludes with an individual assignment.
- The final component of the course concerns mechanical joint design and dimensioning of welded and bolted joints. The theory on welded and bolted joints is based on the standards stipulated in Eurocode 3.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: To receive a final passing grade, three approved assignments are required. The first submission assignment refers to the preparation of the working principle of a given product or product part (synthesis). The assignment is conducted in groups of 3-5 students and is considered either approved or failed. Other assignments are done individually - one in mechanical joint design and one in embodiment design. Each assignment consists of a basic task (passing grade – 3), and two optional sub-tasks for those who would like to have a higher grade (4 or 5). In the case of failure of the basic task, this must be supplemented. For other sub-tasks, these may be supplemented if the student did a serious solution to the failed sub-task. The

final grade will be the integer average of the points earned on the two individual assignments.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0123. **Name:** Task 1 - Design Principle.

Credits: 1. **Grading scale:** UG. **Assessment:** Group assignment with oral presentation. **Contents:** This assignment concerns the analysis of the design principle of a product.

Code: 0223. **Name:** Task 2 - Embodiment Design.

Credits: 3. **Grading scale:** UG. **Assessment:** Individual assignment. The results are presented in a written report which will be assessed based on a criteria list, which is distributed by the instructor when the assignment is introduced. **Contents:** This assignment concerns the development and analysis of an embodiment design for a solution principle. Actual solution alternatives are based on casted and/or welded solution principles.

Code: 0323. **Name:** Task 3 - Design of Mechanical Joint.

Credits: 3,5. **Grading scale:** UG. **Assessment:** Individual assignment. The results are presented in a written report which will be assessed based on a criteria list, which is distributed by the instructor when the assignment is introduced. **Contents:** This assignment concerns the development and analysis of a joint: design - bolted, welded and/or bonded joints.

Admission

Assumed prior knowledge: MMKF01 Product Development or equivalent course.

The number of participants is limited to: No

The course overlaps following course/s: MMKN05, MMK095, MMK097

Reading list

- Sundström, J., Bjärnemo, R. and Andersson, P.E. Konstruktiv utformning - Del 1: Syntes (in Swedish), Division of Machine Design, Lund University, Faculty of Engineering, 2004.

Contact and other information

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