Course syllabus

Material- och metodval
Material and Process Selection

MMTN20, 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: MPRR1
Elective for: M4-prr, MD4
Language of instruction: The course will be given in English

Aim

Material and process selection is a complex field of subject. To be able to carry out an optimal choice regarding materials and processes, a wide range of knowledge from different engineering areas is required. After the course, the participants will be able to use a stringent methodology regarding material and process selection to meet specified product requirements.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to perform a systematic material and process selection based on a methodology including the conception translation, screening and ranking.
- be able to understand and apply the conceptions function, constraints, objectives and free variables during translation of product specific design requirements to parameters related to material.
- optimize the selection process through derivation and formulation of material indices.
- understand and be able to create and use material property charts in correlation to predefined selection criteria.
- formulate condition consisting of multiple constraints and objectives.

Competences and skills
For a passing grade the student must

- be able to execute advanced material and process selection based on the software Ansys GRANTA EduPack.
- be able to critically analyze, estimate and formulate suggestions to durable solutions regarding materials.
- evaluate and develop solutions regarding materials in correlation to the specified design.
- be able to apply knowledge from previous courses.

Judgement and approach
For a passing grade the student must

- have a comprehension of the possibilities and limitations of the specified methodology during material and process selection
- be able to identify and utilize additional knowledge within selected areas of material and process selection.

Contents

The art of material and process selection is a complex field of subject. Finding the most suitable materials and processes for a specified product requires a stringent procedure and knowledge from different engineering areas. The course aims to give applied skills regarding methodology to perform advanced material and process selection through presented theories and by use of a software tool (GRANTA). The software consists of comprehensive databases covering material and process related data important to perform an optimized selection. Parameters and properties that determine the final choice of material can for example be mechanical loads, chemical environment, operating temperature etc. The selected material and the product design determine possible manufacturing processes. The outline of the course is:

- definitions and terminology
- design and design process
- engineering materials and their properties
- material property charts
- methodology during material and process selection

The course consists of a number of given lectures and exercises. However, a major part of the course is to individually perform compulsory exercises, computer modelling and projects.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Continuous examination during the course with compulsory assignments and project work. A written examination concludes the course.

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.

Admission

Assumed prior knowledge: MMT012/MMTF20 Production and Manufacturing Methods, FHL013/FHLF15 Solid Mechanics, basic course and FKM015/FKMA01 Materials Engineering, basic course.
The number of participants is limited to: No

Reading list

- Ashby, M. F.: Materials Selection in Mechanical Design, 5th Edition. Elsevier Butterworth-Heinemann, 2016, ISBN: eBook: 9780081006108, book: 9780081005996.
- Study literature compiled by the department https://www.grantadesign.com/education/students/.

Contact and other information

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