



COURSE SYLLABUS

Functional Materials and Surfaces, 6 credits

Funktionella material och ytor, 6 högskolepoäng

Course Code: TFYS27	Education Cycle: Second-cycle level
Confirmed by: Dean Mar 1, 2016	Disciplinary domain: Technology (95%) and social sciences (5%)
Valid From: Jan 2, 2017	Subject group: MA2
Version: 1	Specialised in: A1F
Reg number: JTH 2016/603-313	Main field of study: Product Development

Intended Learning Outcomes (ILO)

On completion of the course, the student should

Knowledge and understanding

- Show systematic understanding of the concept of surface engineering in the context of product development.
- Show a basic knowledge of the mechanisms behind corrosion and wear of surfaces in different application environments.
- Show detailed knowledge of electroplated coatings, anodizing and electro-polishing processes, process parameters, as well as selected analysis methods for functional surface characterization and problem identification, and current relevant areas of research and development.
- Show a basic knowledge on cleaner production and environment protection measures and industrial safety aspects related to surface treatment industry.

Skills and abilities

- Show independent ability to perform written calculations regarding process parameters and coating properties.
- Show critical ability to identify and combine appropriate analysis methods for characterization of functional surface coatings, within the given timeframes, both in research and product development environments.
- Show the basic ability to apply FEA tools for evaluating process parameters and properties of metal coatings in the design phase of a product.
- Show critical ability to formulate a specification of functional surface properties and show basic ability to choose test and qualification standards for functional coatings.

Judgement and approach

- Show independent ability to motivate the choice of and evaluate surface treatment processes and process parameters in written, based on available knowledge, and taking into account functional, environmental, safety and cost efficiency criteria.

Contents

The course treats surface finishing as part of product development, and introduces industrial processes and the most important process parameters that define properties of functional surfaces. Sustainability aspects related to surface coating industry are discussed. Computer simulation in combination with experimental methods is introduced as a tool for improving quality of electrodeposits.

The course covers the following topics:

- Introduction to surface engineering of components including castings.
- Overview of surface treatment processes and factors affecting the process selection, on examples of electroplating, anodizing and electro-polishing.
- Analysis techniques for surface characterization (e.g. hardness and thickness measurements).
- Electroplating of metals, including fundamentals of electrochemistry and thermodynamics, and applications of FEA as a design tool for electroplating process.
- Sustainability aspects including cleaner production measures, environment protection directives and industrial safety aspects, test and qualification standards.

Type of instruction

Lectures, exercises, laboratory sessions.

The teaching is conducted in English.

Prerequisites

Passed courses 180 credits in first cycle, at least 90 credits within the major subject Mechanical Engineering, and 21 credits Mathematics, and completed course Materials and Design, 6 credits, and English Language requirements corresponding to English 6 or English B in the Swedish upper secondary school (or the equivalent).

Examination and grades

The course is graded 5,4,3 or Fail.

In order to obtain grade 3, it is required to complete exercise assignments and laboratory assignments (2.5 credits), and pass a written exam (3.5 credits). The written exam is the basis for the grade higher than 3.

Registration of examination:

Name of the Test	Value	Grading
Examination	3.5 credits	5/4/3/U
Assignments and Laboratory Work	2.5 credits	U/G

Other information

Exemption from entry requirement allowed according to the selection groups of the program, where the course is included.

Course literature

Literature

The literature is preliminary until one month before the course starts.

Title: Advanced Surface Technology

Author: Per Møller & Lars Pleth Nielsen

Publisher: M&N, Denmark, 2012

ISBN:

Supplementary reading

Course Compendium