



COURSE SYLLABUS

Functional Materials and Surfaces, 7.5 credits

Funktionella material och ytor, 7,5 högskolepoäng

Course Code: TFYS29	Education Cycle: Second-cycle level
Confirmed by: Dean Dec 1, 2018	Disciplinary domain: Technology
Valid From: Jan 1, 2019	Subject group: MA2
Version: 1	Specialised in: A1F
	Main field of study: Product Development

Intended Learning Outcomes (ILO)

At the end of the course, the student should be able to:

Knowledge and understanding

- Demonstrate comprehension of the concept of surface engineering in the context of product development
- Show familiarity with the mechanisms behind corrosion and wear of surfaces in different application environments
- Display 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 familiarity with cleaner production and environment protection measures and industrial safety aspects related to surface treatment industry.

Skills and abilities

- Demonstrate independent ability to perform written calculations regarding process parameters and coating properties
- Demonstrate the 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
- Demonstrate skills of FEA tools application for evaluating process parameters and properties of metal coatings in the design phase of a product
- Demonstrate the 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

- Demonstrate the ability to motivate the choice of and evaluate surface treatment processes and process parameters, 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
- 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, computer exercises and coursework assignments.

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. Proof of English proficiency is required (or the equivalent).

Examination and grades

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

Registration of examination:

Name of the Test	Value	Grading
Written examination [†]	4.5 credits	5/4/3/U
Laboratory exercises and coursework assignments	3 credits	U/G

[†] Determines the final grade of the course, which is issued only when all course units have been passed.

Course literature

Literature

Title: Advanced Surface Technology vol 1 and 2

Author: Per Møller & Lars Pleth Nielsen

Publisher: M&N, Denmark, 2012

ISBN: 9788792765246 and 9788792765253

Supplementary reading

Course materials, Journal papers indicated during the course

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