KD2380 Corrosion and Surface Protection 7.5 credits

Korrosion och ytskydd

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for KD2380 valid from Autumn 2011

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Chemical Science and Engineering,Chemistry and Chemical Engineering

Specific prerequisites

Admission requirements for programme students at KTH:
At least 150 credits from grades 1, 2 and 3 of which at least 110 credits from years 1 and 2, and bachelor's work must be completed, within a programme that includes:
75 university credits (hp) in chemistry or chemical engineering, 20 university credits (hp) in mathematics and 6 university credits (hp) in computer science or corresponding.

Admission requirements for independent students:
75 university credits (hp) in chemistry or chemical engineering, 20 university credits (hp) in mathematics and 6 university credits (hp) in computer science or corresponding. Documented proficiency in English corresponding to English B.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After taken the course, the student should be able to:

- Describe different corrosion types on metals and alloys in air, water solutions and at high temperatures (> 100°C)
- Explain why corrosion appears from knowledge of the surounding environment and the properties of the metallic materials.
- Account for the mechanisms of corrosion and degradation of polymer materials and the influence of various environmental parameters on these processes.
- Predict the corrosion state as a function of redox potential and pH with help from standard potentials and Nernst equation construct and use of potential pH diagrams (Pourbaix).
- Explain the relation between passivity and the properties of the surface film and describe how the supply of oxygen and salts affect the passivity.
- Explain electrochemical polarisation by means of activation, concentration and resistance and how this affects the corrosion currents and corrosion potential for metals and alloys.
- Make simple calculations and estimations on corrosion rates in solution using Nernst's and Tafel's equations and polarisation diagrams (potential log i diagrams).
- Recall industry relevant surface treatments methods and corrosion protection and from knowledge about material and environment suggest suitable corrosion prevention strategies and design from a corrosion perspective.
- Search available information from producers, standard and scientific references to describe a corrosion problem and after own reflection and analysis suggest solutions an report this in a written and oral form to a potential principal.

Course contents

The main objective of the course is to develop fundamental and deep knowledge in the theory for degradation and corrosion of materials in various environments and to present existing protection strategies for prevention of corrosion in different contexts.

The course concerns fundamental theory of the thermodynamics and kinetics of the corrosion process of metals and alloys as well as polymer materials both in atmosphere and water solutions. Focus is put on electrochemical aspects and the influences of the properties of the metals and the their oxides on the corrosion behaviour, which is exemplified by different corrosion types. Existing corrosion protection strategies, including surface treatments and coatings are described and choice of material is discussed from a corrosion point of view.

In addition to lectures and exercises, the course includes visits to Swedish industry related to corrosion protection and a group project in which a specific corrosion relevant case is analysed and discussed both in an oral and a written report.

Course literature

D. E. J. Talbot och J. D. R. Talbot, "Corrosion Science and Technology, 2nd Ed" (ISBN-10 0-8493-9248-9), CRC Press, 2007.

Additional literature, lecture notes and calculation problems is handed out in the course.

Examination

- PRO1 - Project, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Written exam, 5.0 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Home Assignments, 0.5 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

Other requirements for final grade

Project (PRO1; 2 credits)
Examination (TEN1; 5 credits)
Home assignments (ÖVN1; 0.5 credits). Requirement for pass: >75% completed

Final grade assigned based on:
PRO1 - A-F: 20% of final grade
TEN1 - A-F: 80% of final grade

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.