



KD2260 Corrosion and Surface Protection, General Course 6.0 credits

Korrosion och ytskydd, allmän kurs

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

Establishment

Course syllabus for KD2260 valid from Autumn 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Materials Science

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.

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:

1. Describe different corrosion types on metals and alloys in air, water solutions and at high temperature ($>100^{\circ}\text{C}$)
2. From knowledge of the surrounding environment and the properties of metallic materials be able to explain why corrosion appears.
3. Account for the mechanisms of corrosion and degradation of polymer materials and the influence of various environmental parameters on these processes.
4. With help from standard potentials and Nernst equation construct and use potential pH diagrams (Pourbaix) to predict the corrosion state as a function of redox potential and pH.
5. Explain the relation between passivity and the properties of the surface film and describe how the supply of oxygen and salts affect the passivity.
6. Explain electrochemical polarisation by means of activation, concentration and resistance and how this affects the corrosion currents and corrosion potential for metals and alloys.
7. Make simple calculations and estimations on corrosion rates in solution using Nernst's and Tafel's equations and potential log i diagrams.
8. 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.
9. Search available information from producers, standard and scientific references to describe a corrosion problem and after own reflection and analysis suggest solutions and report this in a written and oral form to a potential principal.

Course contents

The main objective of the course is to give 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 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 invited lectures from 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

Course book is 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 - Case Project, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- ÖVN1 - Home Assignments, 0.5 credits, grading scale: P, F
- TEN2 - Examination, 3.5 credits, grading scale: A, B, C, D, E, FX, 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.

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

Requirements

ÖVN1 - Home assignments completed when >75% passed

PRO1 - a written and oral presentation and at least 75% attendance at the industry lectures

Other requirements for final grade

Case Project (PRO1; 2 credits)

Examination (TEN2; 3,5 credits)

Home Assignments (ÖVN1; 0,5 credits)

Final grade assigned based on:

PRO1 - A-F: 20% of final grade

TEN2 - 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.

