KD2300 Biomedical Materials 7.5 credits

Biomedical Materials

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 KD2300 valid from Autumn 2011

Grading scale

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

Education cycle

Second cycle

Main field of study

Biotechnology,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 completion of the course the student will be able to:

• Give examples of application areas for different types of biomaterials.

• Apply knowledge from basic material courses to identify material properties that are critical for metallic, polymer and ceramic biomaterials, or their combination.

• Explain basic physical, chemical and mechanical processes that may occur on biomaterials in use.

• Analyse and evaluate corrosion and degradation reactions that occur for different biomaterials and their consequences.

• Suggest proper type of biomaterial for given applications, taking into account function, health risk and economic aspects.

Course contents

Various types of biomaterials for a wide range of biomedical applications. Fundamental structure-property relationships. Basic function and performance of passive and active implant materials. Physical, chemical and mechanical aspects of bulk and surface properties of metallic, polymer and ceramic biomaterials. Principles of surface engineering and combination of different materials. Host-tissue response, blood compatibility, extracellular matrix collagen, bioadhesion, protein adsorption, polymers for controlled drug release. Corrosion and degradation mechanisms of biomaterials in different applications. Selection of biomaterials based on function, biological environments, toxicity and economic aspects. Examples of biomaterials and implant objects and devices. Current research trends and medical device regulation.

Disposition

The course consists of lectures and also laboratory exercises including a small project work. The lectures focus on basic function and performance of various types of metallic, ceramic and polymer biomaterials, and their physical, chemical and mechanical properties including corrosion and degradation mechanisms of biomaterials in different applications. In addition to chosen chapters in the course book, the lectures also present current trends in biomaterial research.

The laboratory exercises consist of one polymer lab (making and testing hydrogels), and one metal lab (electrochemical measurements of corrosion resistance of stainless steel and titanium). Moreover, as a small project, the students chose an implantable medical device, search information about functions of the device and material or material combinations used for the device, make a presentation at a seminar to discuss material properties critical for the application and risk for material deterioration and failure prob

Course literature

Selected chapters in “Biomaterials Science, An Introduction to Materials in Medicine", edited by B.D. Ratner, A.S. Hoffman, F.J. Schoen, J.E. Lemons. 2nd edition, Academic Press (2004).

Other lecture materials.

Examination

- SEM1 - Project, 3.0 credits, grading scale: P, F
- TEN1 - Written exam, 4.5 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.

Laboratory Work: Report and seminar

Other requirements for final grade

Examination, 4,5 credits,
Lab (report and seminar), 3 credits

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.