KF2370 Biological Composites and Implants 7.5 credits

Biologiska kompositer och implantat

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

Establishment

Course syllabus for KF2370 valid from Autumn 2007

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

Language of instruction

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

Intended learning outcomes

The student shall after completed course be able to:

• Describe considerations in the development of implants

• Describe existing biomaterial applications in structural repair such as in bone repair and orthopaedics

• Explain and analyse the biopolymer function in biocomposites and implants

• Explain the concepts of biomimetics and its possible role in implants

• Explain and evaluate the micromechanics of biocomposites

• Analyse biological composites by describing, explaining and evaluating the constituents of biocomposites from structure to properties using hierarchial level principles

• Propose and validate biocomposites for new implants

• Conduct literature and patent surveys on implant applications.

• Analyse the compiled literature and patent information and suggest additional work.

Course contents

The course gives a general overview of important biological structure of importance in biomedical context. Implants of the future will be better adapted to biological function. Biocomposites in nature and as implants are covered. The structure-property-function relationships in biological polymers and composites is presented and discussed. The micromechanics of composites. Hierarchical structures and biomimetic. The biological composites in tensile materials and strong fibers. The ceramic composites such as bone and teeth. The pliant composites such as skin, muscle. The role of different biopolymers in the composites (proteins, lipids, mucopolysaccharides and polysaccharides). Man-made composites as implants. Constituents, preparation (physical and chemical processing aspects), structure and properties. Classes of implants. Long-term properties and biological, chemical and mechanical compatibility. Case studies in implants.

Course literature

Material from Literature list

Biomaterials Science-An introduction to Materials in Medicin, 2nd Ed., B. Ratner, A. S. Hoffman, F. J. Schoen, J. E. Lemons, Elsevier Academic Press, 2004.

Structural Biological Materials-Design and Structure-Property Relationships, M. Elices (Ed.), Elsevier, 2000.

Structural Biomaterials, J. Vincent, Princeton University Press, 1990

Mechanical design in organisms, S. A. Wainwright, W.D. Biggs, J. D. Currey and J. M. Gosline, Princeton University Press, 1982

Examination

- TEN4 - Assignment, 1.5 credits, grading scale: P, F
- TEN3 - Assignment, 1.5 credits, grading scale: P, F
- TEN2 - Assignment, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- LAB1 - Laboratory Work, 1.5 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.

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

Other requirements for final grade

Written examination (TEN1; 1,5 credits) AF
Laboratory course (LAB1; 1,5 credits) PF
Assignment (TEN2; 1,5 credits) PF
Assignment (TEN3; 1,5 credits) PF
Assignment (TEN4; 1,5 credits) PF
Participation in educational visit

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.