UNIVERSITY OF GOTHENBURG

FACULTY OF SCIENCE

FIM615, Biotechnical Physics, 7,5 higher education credits

Biotechnical Physics, 7.5 högskolepoäng

Second Cycle

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1. Confirmation

The course syllabus was confirmed by Department of Physics on 2008-11-24 to be valid from 2009-01-01.

Field of education: Science 100 %
Department: Physics

2. Position in the educational system

The course Biotechnical Physics, 7.5 higher education credits, is a single subject course given within the Physics of materials and biological systems masters program, and is also given as a stand-alone advanced course in physics at the Department of Phys

Main field of studies	*Specialization*
Physics	A1N, Second cycle, has only first-cycle course/s as entry requirements

3. Entry requirements

To be eligible for the course the student must have knowledge in physics equivalent of a Bachelor degree.

Applicants must prove knowledge of English: TOEFL test result of at least 600 points (computerized 250 points, on Internet 100 points) or IELTS test result of at least 6.0, in-cluding at least 6.5 for the Writing. This requirement does not apply to students with a Bachelor degree from an English speaking university, or to students having passed English level B at Swedish/Nordic Upper Secondary School.

4. Course content

The course covers three main topics: biological objects and their properties, biointerfac-es e.g. when artificial surfaces interact with life, and biotechnical physics in applications.

- Basic definitions and properties of biological structures (tissues, cells, lipids, proteins, DNA, etc)
- Surface properties affecting biological responses

- (Bio)Surface analysis and characterization methods
- Surface engineering - preparation & modification methods
- Artificial materials inside the body - material science and clinical aspects of biomaterials
- Biomimetics - what can engineers learn from nature?
- Biosensors, bioarrays and biochips - basic principles and future trends
- Bionics, bioelectronics and signal transduction in biostructures Commercialization of biotechnical innovations - IPR and project management

The aim of this course is to present engineering concepts, technologies and underlying physical principles used to address biological and medical challenges of relevance in both fundamental and industrial contexts. Examples include biomimetic concepts (shark skin, lotus effect, synthetic life), biomaterials (medical implants, tissue engineer-ing), biosensor (SPR and QCM-D) and advanced (bio)analytical tool (microscopy, TOF-SIMS) development and applications. A substantial part of the course aims at giving the students hands-on experience in performing biochemical laboratory work and us-ing bioanalytical tools.

5. Learning outcomes

After the course the student is expected to:

- understand main physical concepts behind properties of biological systems, (bio)interactions and methods for (bio)material modification or characterization
- know the general concept of biocompatibility and how it can be achieved in dif-ferent situations
- evaluate and choose which engineering tools and methods can be used to con-trol biological systems and their response
- choose proper techniques for analysis, modification or control of biological sys-tems and interactions
- know the meaning and actively use relevant biological and physical terms, i.e. communicate in the interdisciplinary environment
- follow current literature in biotechnical fields
- write scientific reports, present orally and discuss scientific material
- know about bio-oriented research taking place at the Fysicum Physics Centre of University of Gothenburg and Chalmers University of Technology
- choose and continue studies in more advanced and specialized courses in the fields of biomaterials, biophysics or biotechnology.

6. Literature

See separate literature list.

7. Assessment

The course is organized in lectures, demo labs, and tours.

The examination will be based on 4-6 quizzes and project report based on literature study during the course and oral presentation of the report during mini-seminar at the end of the course.

8. Grading scale

The grading scale comprises Fail (U), Pass (G), Pass with Distinction (VG).

ECTS grades are also given on this course.

9. Course evaluation

The results of the evaluation will be communicated to the students and will function as a guide for the development of the course.

10. Additional information

Language of instruction: English.

The course is given jointly with Chalmers University of Technology. The Chalmers code for the course is TIF040.