Biosensor Technology

Programme course

6 credits

Biosensortechnik

TFTB34

Valid from: 2018 Spring semester

Determined by
Board of Studies for Chemistry, Biology and Biotechnology

Determining date
Main field of study

Biomedical Engineering, Engineering Biology

Course level

Second cycle

Advancement level

A1X

Course offered for

- Chemical Biology
- Engineering Biology, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Molecular and surface physics (can be taken in parallel), Biochemistry, Microbiology with immunology

Intended learning outcomes

The course will give insights into the complexities involved in combining biological materials such as enzymes, antibodies and DNA with optical, electrochemical and other transducers to provide practical and easy-to-use systems. In order to integrate this knowledge and to introduce the importance of intellectual property protection, students will participate in practical classes and a group project on patent litigation at the end of the course.

The overall purpose of the course is to give the student a thorough understanding of the fundamentals and applications of biosensor technology together with an appreciation of its current and future impact on society.
Following the course, the student should be able to:

- design and construct a simple biosensor,
- use biosensors in the laboratory
- explain how biosensors are constructed and manufactured
- show how biosensors can be used to solve real analytical problems
- reflect on the patenting and commercialisation of a biosensor

Course content

This course will provide a concise overview of biosensor technology and its application in healthcare, food safety, environmental monitoring and security. The lectures and practical exercises will focus on the construction, design and manufacture of biosensors, the principal and emerging materials and components used and three case studies of key devices. Lectures and a group project will examine some pivotal biosensor patents and an example of patent litigation. The course will conclude with a consideration of commercialisation routes, ethical issues and future perspectives.

Practical exercises will focus on enzyme electrodes, bioaffinity monitoring using two examples including the BIACore and a site visit to see the printing facilities for biosensor production in Norrköping. The group project will study a patent litigation case and will culminate in a mock court battle.

The course will cover, an introduction to biosensors, applications of biosensors, transducers and sensor systems, bioreceptors and their immobilisation, synthetic receptors and nanomaterials for biosensors, design parameters for catalytic biosensors, design of affinity biosensors, microfluidics and arrays, glucose biosensors for diabetes, surface plasmon resonance for bioaffinity monitoring, electronic noses and tongues, patenting and litigation in the field of biosensors, commercialising biosensors, ethics and future prospects.

Teaching and working methods

Lectures, practical exercises and a group assignment.

Examination

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Grade</th>
<th>Credits</th>
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<tbody>
<tr>
<td>TEN2</td>
<td>Written or oral examination</td>
<td>U,3,4,5</td>
<td>4 credits</td>
</tr>
<tr>
<td>UPG1</td>
<td>Project assignment</td>
<td>U,G</td>
<td>1 credits</td>
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<tr>
<td>LAB1</td>
<td>Laboratory Work</td>
<td>U,G</td>
<td>1 credits</td>
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The written examination will test the ability of the student to understand different biosensor technologies and concepts together with their practical application and commercialisation. During the practical laboratory exercises the student will be expected to construct and use enzyme electrodes for glucose measurement and to learn how to
operate the BiaCore system for bioaffinity monitoring. The site visit will be used to assess observation skills and inquisitiveness. The group project will test the student’s ability to work as part of a team to analyse a specific biosensor technology in detail, to present technical and commercial arguments and to individually reflect on the outcome.

Grades

F, 3, 4, 5

Subject area

Biology

Disciplinary domain

Technology

Department

Department of Physics, Chemistry and Biology (IFM)

Director of Studies

Magnus Boman

Examiner

Wing Cheung Mak

Course website and other links

http://www.ifm.liu.se/edu/courses.cms/tftb34

Education components

| Lecture | 28 h |
| Lab     | 20 h |
Group work 8 h

Recommended self-study hours

104 h