



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Biofotonik

Biophotonics

FBRN10, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED F/Pi

Date of Decision: 2023-04-18

General Information

Elective for: F4, F4-f, MFOT1

Language of instruction: The course will be given in English

Aim

The general aim of the course is that the students should acquire knowledge of the basic physical principles of interaction of light with biological tissue in living beings, organic material and our natural environment. The intention is that the students by understanding this interaction then should be able to choose appropriate measurement methods and design optimal instrumentation to characterise, classify or rank biological samples for example with regard to health/quality. The course gives an overview of experimental methods developed in biophotonics until today. The methods that are treated in the course include scales from microscopical cellular level via macroscopic scale up to scales for remote sensing of the biosphere. For increased understanding and practical experience, the course contains a creative experimental project where students in groups develop a basic setup for a measurement technique in biophotonics, use it to investigate a sample and present the study at the end of the course. The course provides the student knowledge with a unique set of methods valuable for development and application of modern photonics in life sciences.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to explain the principles of interaction between light and the types of biological samples covered in the course.

- be able to explain the principles of the diagnostic methods covered in the course.
- be able to explain the concepts for data analysis that are covered in the course.

Competences and skills

For a passing grade the student must

- be able to apply methods and instrumentation within biophotonics in experimental studies.
- be able to search and analyze information within the course topics from sources other than the course material, e.g. in scientific articles and advanced literature.
- be able to discuss and analyze results obtained from the methods covered in the course.
- be able to report and present results obtained from the methods covered in the course.
- be able to write reports on the course's laboratory exercises with analysis and discussion of results.

Judgement and approach

For a passing grade the student must

- be able to demonstrate an understanding of possibilities and limitations of methods and instrumentation that are covered in the course.
- be able to suggest appropriate methods and instrumentation for applications of biophotonics.
- be able to interpret and assess results of the methods covered in the course.
- be able to interpret and assess information in the field of the course from sources in addition to the course material, e.g. scientific articles and advanced literature.

Contents

The course gives an introduction to physical phenomena that are encountered in optical diagnostics of biological samples and organic material, and introduces methods and instrumentation for characterisation of biological tissue and organic material. These methods include optical remote sensing for studies of biological flora and fauna; laser spectroscopy based on diode lasers for measurement of absorption and fluorescence; polarisation techniques for the analysis of light scattered from biological samples; techniques for imaging and microscopy. The course also includes certain data analysis related to the methods that are treated.

Special emphasis is placed on projects where the students in groups arrange an instrumentation for studies of different biological samples. The experimental part of the projects includes optoelectronics, optomechanical design, signal collection and measurements, which are followed by interpretation of data and presentation. The course contains two additional laboratory sessions. The course also includes study visits at laboratories on Lund's university and local companies with activities in biophotonics.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Examination takes place through written examination at the end of the course, a seminar with oral presentation of the course project at the end of the course, and written laboratory reports during the course.

The examiner, in consultation with Disability Support Services, may deviate from the

regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0123. **Name:** Written Examination.

Credits: 4. **Grading scale:** TH. **Assessment:** Passed exam.

Code: 0223. **Name:** Laboratory Exercises and Course Project.

Credits: 3,5. **Grading scale:** UG. **Assessment:** Passed laboratory exercises and project.

Admission

Assumed prior knowledge: Basic courses in physics and optics, FAFN01 Lasers, FAFN25 Atomic and Molecular Spectroscopy.

The number of participants is limited to: No

Reading list

- C. Boudoux: Fundamentals of Biomedical Optics. Pollux, 2016, ISBN: 9781366451194.
- P.C.D. Hobbs: Building Electro-Optical Systems. Wiley, 2009, ISBN: 9780470402290.

Contact and other information

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