



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Medicinsk fysik

Physics for Biomedicine

FAFF45, 8 credits, G2 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED N

Date of Decision: 2023-04-17

General Information

Main field: Technology.

Compulsory for: BME2

Language of instruction: The course will be given in Swedish

Aim

The student will develop an understanding of basic concepts and relationships in physics which is relevant to medical technology. The student will deepen their understanding of the important physical concepts, laws and theories which are of particular relevance to medical technology. The course also aims to train problem solving, experimental work and model thinking.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- understand the connections between experiments, models and theories
- understand the physical principles underlying the most important biomedical measurement systems
- be able to describe the principles and analyze different types of medical measurement systems based on physical concepts
- have knowledge of the basic physics required to communicate with experts in an interdisciplinary field of technology and be able to contribute in the development of medical technology of tomorrow.

Competences and skills

For a passing grade the student must

- be able to use basic skills in physics and with different degrees of approximation apply models to analyze, understand and describe common technical problems
- demonstrate an ability to use basic physics to identify, formulate, solve and analyze engineering tasks
- be able to use computers for calculations and analysis
- be able to communicate and present technical problems and achievements for people with different educational backgrounds.

Judgement and approach

For a passing grade the student must

- demonstrate an understanding of the scientific method and the possibilities and limitations of physics models
- demonstrate an ability to identify the need for additional knowledge in other areas
- be aware of both opportunities and constraints in developing health services providing optimal results for the patient, and with minimal impact on staff and environment.

Contents

Deepening of fundamental physics. Problem solving methodology: handling, analysis and presentation of measurement data. Basics of Atomic and nuclear physics: The dualistic nature of the electron. Atoms - size and mass. Temperature radiation and photoelectric effect. Models of the atom. The periodic table of elements. Energy levels. Stimulated emission. Generation and absorption of x-rays. Radioactivity. Ionizing radiation: decay, activity, nuclear reactions, interaction with matter, radiation biology, dosimetry, accelerator physics, detectors. Medical laser physics: wave equation, laser, Light interaction with tissue, applications and measurement methods. Introduction to MatLab.

Examination details

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

Assessment: Written exam, passed laboratory exercises and project and active participation in mandatory parts.

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: 0117. **Name:** Laboratory Works.

Credits: 2. **Grading scale:** UG. **Assessment:** Approved laboratory works.

Code: 0217. **Name:** Written Examination.

Credits: 4. **Grading scale:** TH. **Assessment:** Written examination.

Code: 0317. **Name:** Introduction to Matlab.

Credits: 0,5. **Grading scale:** UG. **Assessment:** Attendance at lectures and computer exercises is mandatory.

Contents: Matlab introduction.

Code: 0417. **Name:** Project - Dosimetry Calculations.

Credits: 1,5. **Grading scale:** UG. **Assessment:** The project is examined with oral presentations. Attendance at the presentations is mandatory.

Admission

Assumed prior knowledge: FAF65 Thermodynamics, Waves and Optics

The number of participants is limited to: No

The course overlaps following course/s: FAF35, FAF36

Reading list

- According to the course homepage, at least five weeks before the start of the course.

Contact and other information

Course coordinator: Jörgen Larsson, jorgen.larsson@fysik.lth.se

Course homepage:

<http://www.atomic.physics.lu.se/education/mandatory-courses/faff45-medicinsk-fysik-foer-bme/>

Further information: It is mandatory to attend the first lecture in order to be admitted to the course. Some elements may be taught and assessed in English. This includes a maximum of 1.5 hp, in the form of laboratory sessions or written assignments.