HL2009 Ionising Radiation Imaging 6.0 credits

Medicinsk avbildning med joniserande strålning

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

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

Establishment

Course syllabus for HL2009 valid from Autumn 2007

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

Bachelor's degree in Engineering Physics, Electrical Engineering, Computer Science or equivalent. Basic knowledge of anatomy.

Language of instruction

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

Intended learning outcomes

The two major medical imaging modalities, transmission and emission, are both based on ionising electromagnetic radiation as information carrier from the organ to be depicted to the imaging detector system. The course treats the theory of the physical processes and presents detectors and instruments and gives a perspective on the advances in this field. Consequences of ionising radiation on living tissues are presented.

Transmission imaging where the anatomy of the organ is shown is the most widely used technique and is performed both in 2D (i.e. radiography, fluoroscopy) and in 3D mode (Computed Tomography). In emission imaging the physiology of the organ is studied in vivo with high sensitivity in systems that can produce images in 2D (Gamma Camera) or in 3D (SPECT and PET). All these imaging systems will be discussed thoroughly. The laboratory exercises of the course are devoted to the presentation of medical imaging systems with working demonstrators.

Following this course, you will gain knowledge and understanding:

- About nuclear structure, natural and artificial radioactivity, and nuclear reactions
- How ionising radiation like X-ray or radioactive substances for medical imaging are produced
- How the ionising radiation interact with matter
- How dose is measured and calculated
- How detectors for ionising radiation are constructed and their signals are treated
- How imaging systems for ionising radiation are functioning, data collected, and images are reconstructed

Course contents

You will explicitly learn about the different imaging systems, their function and application. These systems are:

- 2D X-ray radiography with different imaging techniques
- Fluoroscopy and image intensifiers
- 3D Computer Tomography
- Gamma Camera and scintigraphy
- Single Photon Computed Tomography
- Positron Emission Tomography

You will also get an insight to the development of new detection and imaging techniques and organ dedicated imaging systems.

Course literature

To be decided.

Examination

- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, F
- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 3.0 credits, grading scale: A, B, C, D, E, FX, 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.

Passed written exam (TEN1; 3 cr.) grading A-F.
Passed lab work (LAB1; 1.5 cr.) grading P/F.
Passed project (PRO1; 1.5 cr.) grading P/F.

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.