HL2019 Medicinsk avbildning med joniserande strålning 6,0 hp

Ionising Radiation Imaging

När kurs inte längre ges har student möjlighet att examineras under ytterligare två läsår.

Fastställande

Kursplan för HL2019 gäller från och med VT13

Betygsskala

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

Utbildningsnivå

Avancerad nivå

Huvudområden

Medicinsk teknik

Särskild behörighet

Bachelor's degree in Engineering Physics, Electrical Engineering, Computer Science or equivalent.

Basic knowledge of anatomy. (SH1011, HL1007, HL1201, HL1202 or equivalent.)

Undervisningsspråk

Undervisningsspråk anges i kurstillfällesinformationen i kurs- och programkatalogen.

Lärandemål

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 involved, presents detectors andinstruments for medical imaging and gives a perspective on the advances in this eld. 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, uoroscopy) and in 3D mode (Computed Tomography). In emission imaging the physiology of the organ is studied in vivowith 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.

Image reconstruction is an indissoluble part of modern 3D medical imaging, the most common reconstruction techniques will be presented and hands-on reconstruction session will be part of the course.

The effect of quantum noise on image quality and reliability will be discussed. During the course the basic theory of radiation therapy will be also treated.

Different models for dose calculation will be treated and international dose protection regulation will be presented.

Following this course, you will gain a deeper knowledge and understanding:

About how ionising radiation interacts with matter

About nuclear structure, natural and arti cial radioactivity, and nuclear reactions

How ionising radiation like X-ray or radioactive substances for medical imaging are produced

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

and you will learn:

How dose is measured and calculated

About the rules for radiation exposure and protection

Kursinnehåll

You will explicitly learn about the di
erent 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

Dose calculation through computer simulations

Quantum noise effect on imaging

Regulations about radiation exposure

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

Kurslitteratur

Presently suggested reading:

The Essential Physics of Medical Imaging (2nd Edition),

J. T. Bushberg, J. A. Seibert, E. M. Leidholdt Jr. , J. M. Boone

Lippincott Williams & Wilkins; 2.00 edition (December 15, 2001) ISBN-10: 0683301187

ISBN-13: 978-0683301182

Examination

- LAB1 - Laborationer, 2,0 hp, betygsskala: P, F
- PRO1 - Projekt, 2,0 hp, betygsskala: P, F
- TEN1 - Tentamen, 2,0 hp, betygsskala: A, B, C, D, E, FX, F

Examinator beslutar, baserat på rekommendation från KTH:s handläggare av stöd till studenter med funktionsnedsättning, om eventuell anpassad examination för studenter med dokumenterad, varaktig funktionsnedsättning.

Examinator får medge annan examinationsform vid omexamination av enstaka studenter.

Passed written exam (TEN1; 2 cr.) grading A-F.

Passed lab work (LAB1; 2 cr.) grading P/F.

Passed project (PRO1; 2 cr.) grading P/F.

Etiskt förhållningssätt

- Vid grupparbete har alla i gruppen ansvar för gruppens arbete.
- Vid examination ska varje student ärligt redovisa hjälp som erhållits och källor som använts.
- Vid muntlig examination ska varje student kunna redogöra för hela uppgiften och hela lösningen.