HL2011 Magnetic Resonance Imaging 4.5 credits

Magnetresonansavbildning

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 HL2011 valid from Spring 2013

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 aim of the course is to provide the students with a thorough understanding of the underlying physics and principles of Magnetic Resonance Imaging (MRI). Topics include nuclear magnetic resonance, image formation, sources of contrast, sources of noise and artifacts, instrumentation and clinical aspects.

Course contents

After successful completion of the course the students should be able to

- describe in detail the mechanisms of nuclear magnetic resonance and explain how it can be used to form the basis for the MRI signal.
- explain the imaging process of MRI, from spin excitation to slice selection to phase and frequency encoding.
- design and draw sequence diagrams to achieve a given imaging scheme.
- compute gradient amplitudes and times for a given sampling of k-space.
- describe which basic image artifacts that are associated with MRI and, if possible, how they can be avoided when designing imaging sequences.
- select a basic imaging sequence and compute adequate parameters to achieve a desired contrast between tissues of given material parameters.

Course literature

Principles of Magnetic Resonance Imaging: A Signal Processing Perspective, Liang, Z.-P. and Lauterbur, P.C.

A limited number of copies of the book are available for loan (1000:- deposit required).

Examination

- ANN1 - Assignment, 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.

Other requirements for final grade

Passed written exam (TEN1; 3 cr.) grading A-F.
Passed lab/home work (ANN1; 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.