CM2021 Magnetic Resonance Imaging 7.5 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 CM2021 valid from Autumn 2024

Grading scale

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

Education cycle

Second cycle

Main field of study

Medical Engineering

Specific prerequisites

Completed degree project 15 credits, 15 credits in mathematics, 15 credits in physics, 6 credits in programming. Alternatively, 1 year of professional experience in medical technology, technical physics, electrical engineering, or computer science. English 6/B.

Language of instruction

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

Intended learning outcomes

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

- describe the mechanisms of nuclear magnetic resonance (NMR) and the process to create MR images in the scanner.

- design basic MRI pulse sequences to achieve an optimal contrast between tissues while also considering image quality, acquisition time, and safety constraints.

- describe the theory behind the most used MRI pulse sequences used in clinics and research and their applications.

- describe the most common image artifacts associated with MRI and how they can be reduced/avoided during imaging and/or postprocessing.

- describe the most common postprocessing steps used for advanced MRI pulse sequences.

In order to:

- understand the factors and parameters that affect contrast, image quality, and acquisition time in MRI.

- understand the scope of use and limitations of different MRI pulse sequences.

- select the most appropriate pipeline for specific applications: from choosing the most appropriate MRI pulse sequences to acquiring and postprocessing the images.

- have a broad knowledge base that can ease understanding literature in the field.

Course contents

The course is divided into three modules:

- MRI basic principles. The goal of this module is to understand the necessary MR physics that makes it possible to generate MR images.

- MR imaging sequences. The goal of the module is to understand the basics of MRI pulse sequence programming and to get acquainted with the most common MRI pulse sequences used in clinics and research.

- MR postprocessing. The goal is to get acquainted with the most used postprocessing tools that are applied before further analysis of the acquired images.

Examination

- KONA - Partial exams, 3.0 credits, grading scale: A, B, C, D, E, FX, F

- LAB1 - Laboratory work, 3.0 credits, grading scale: P, F
- PRO1 - Project, 1.5 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.

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.