



FHK3002 Neural Interfacing: The Interface and its Biological Basis 7.5 credits

Neurala gränssnitt: Gränssnittet och dess biologiska bas

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 FHK3002 valid from Spring 2020

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Accepted for doctoral studies at KTH or KI and students at an advanced level. For students at an advanced level the course HL2005 or equivalent knowledge is mandatory.

Language of instruction

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

Intended learning outcomes

The course participants should after finishing course be able to:

- Give a survey of the neural interfaces in the scientific literature.
- Discuss the basic properties of the action potential using Hodgkin-Huxley based models.
- Explain current generation for an electrode in electrolyte and estimate if the electrode could be used for safe neural stimulation considering the electrochemical water window.
- For an active membrane model simulate the stimulation and recording with an electrode.
- Discuss and analyse different neural interfaces: their function; limitations and associated risks; clinical need.
- From basic physiological principles and anatomy reflect over the prerequisites for the interface in neural prosthetic applications

Course contents

- Anatomical and physiological background of the nervous system
- Nerve cell physiology.
- Passive (subthreshold) properties of cell membranes.
- Hodgkin Huxley based active membrane models
- Source field models
- Basic electrochemistry of current generation in electrolytes
- Electrode materials
- Applications in neuromodulation and neuroprosthetics
- Alternate interfacing strategies
- Neural prostheses

Examination

- RAP1 - Written report, 4.5 credits, grading scale: P, F
- SEM1 - Seminar, 3.0 credits, grading scale: P, 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.

Written report and oral presentation.

Other requirements for final grade

Pass, written report and oral presentation.

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.