

# Syllabus

for research course

**Imaging in neuroscience: with a focus on functional magnetic resonance imaging methods (expanded course)** **7.5 Higher Education Credits**

**Hjärnabbildning inom neurovetenskap: Fokus på metoder inom funktionell magnetresonanstomografi (fördjupad kurs)** **7.5 ECTS credits**

**Course code:** LI101SF  
**Valid from:** Spring 2022  
**Department** Department of Linguistics

## Prerequisites and special admittance requirements

Admitted to PhD studies and a background in a humanistic discipline where neuroimaging is used as an experimental tool, cognitive sciences, psychology, medicine, biomedicine, biology, medical imaging, computational biology or similar.

## Learning outcomes

In order to pass the course, students are expected to be able to:

- follow the usual preprocessing steps of fMRI
- give an overview of different methods to analyze the data and explain when to use them
- conduct fMRI analysis using several methods
- propose experimental designs to answer different questions using fMRI
- give a brief overview of the usage of magnetic resonance imaging to study brain structure and function
- give a brief overview of other techniques to study brain function non-invasively and describe their relative merits and challenges.

## Content

The course focuses on experimental design and analysis of fMRI data. We will briefly introduce the basis of the blood-oxygen-level dependent (BOLD) signal and how it is measured. The image processing steps, before statistical analysis, will be explained. The application of general linear model analysis to fMRI data will be explained, including random effects analysis and correction for multiple comparisons. We will discuss experimental designs for fMRI studies. The study of functional connectivity using fMRI data will be explained. We will also introduce machine learning techniques for analysis of fMRI data. Finally, structural measures of gray and white matter will be introduced as well as other techniques to measure functional and metabolic brain activity non-invasively. Theoretical content is applied in assignments during hands-on sessions and in individual assignments.

**Mandatory exams**

Attendance of at least 90 % on all parts of the course moments is compulsory.

In certain cases the examiner can, after consulting with the responsible teacher, exempt students from participation in a moment of the course. In these cases the student can be asked to complete compensatory assignment.

**Forms of examination**

The students will be assessed i) continuously during the course during group discussions and practical exercises, ii) individual assignments and iii) presentation of an independent project.

**Form of instruction**

The course occasions consist of lectures, hands-on sessions, group discussions and student presentations. Teaching and examination language is English.

**Additional information**

The course is planned and offered in cooperation with the Department of Psychology at Stockholm University and the Department of Clinical Neuroscience at Karolinska Institutet.

Part of this course, corresponding to 1,5 higher education credits, is overlapping with the course *LI002SF Imaging in neuroscience: with a focus on functional magnetic resonance imaging methods*, 1,5 higher education credits as well as with the course *Imaging in neuroscience: with a focus on functional magnetic resonance imaging methods*, 1,5 higher education credits offered at Karolinska Institutet.