UNIVERSITY OF SKÖVDE

TRANSLATION FROM SWEDISH

COURSE SYLLABUS

Research Methods and Data Processing in Cognitive Neuroscience A1N

7.5 credits

Course code: KU730A
Version number: 1
Valid from: 1 January 2027
Ratified by: Curriculum Committee for Bioscience
Date of ratification: 11 June 2026

1. General information about the course

The course is provided by the University of Skövde and is named Research Methods and Data Processing in Cognitive Neuroscience A1N (Forskningsmetoder och datahantering inom kognitiv neurovetenskap A1N). It comprises 7.5 credits and is a second-cycle course. The level of progression is A1N.

The course is a part of the main field of study in Cognitive Neuroscience. The disciplinary domain of the course is Natural Sciences.

2. Entry requirements

The prerequisite for this course is passed course KU538G Bachelor Degree Project in Cognitive Neuroscience G2E (or equivalent).

A further requirement is proof of skills in English, equivalent of studies at upper secondary level in Sweden, known as English 6 or English level 2. This is normally demonstrated by means of an internationally recognized test, e.g., IELTS, TOEFL, or an equivalent.

3. Course content

This course provides a comprehensive overview and critical examination of the most commonly used research methods in cognitive neuroscience. The curriculum introduces a range of neuroimaging and electrophysiological modalities, including EEG, fMRI, and related techniques, examining the neurophysiological and biophysical principles that underlie each. This establishes a theoretical foundation for understanding what each method measures, how the methods relate to one another, and what their respective strengths and limitations are.

An important component of the course is cultivating a critical perspective, training students to evaluate methodological rigor, experimental design, and the interpretation of findings in published literature using these methods. This critical lens is developed through hands-on engagement with methods that synthesize research findings, such as meta-analytic approaches of neuroimaging or electrophysiological findings. Such methods frequently rely on openly accessible data, raising practical questions about how data are organised, handled, and processed.

Building on this, the course further provides a practical introduction to the full data pipeline in empirical research: from extracting raw data through pre-processing and quality control to organizing and transferring data in formats ready for analysis. To engage with these workflows, students are introduced to script-based data processing using dedicated software platforms (such as MATLAB or R), with a focus on understanding existing scripts, adjusting key parameters, and interpreting how data are transformed. Open science principles inform the approach throughout, positioning reproducibility and transparency as emerging standards of contemporary scientific practice.

4. Objectives

After completed course the student should be able to:

- compare and contrast the neurophysiological bases, practical applications, and limitations of the most common neuroimaging and electrophysiological methods in cognitive neuroscience,
- evaluate the methodological rigor and validity of conclusions in published cognitive neuroscience literature by critically assessing research design, data acquisition, and interpretation of findings,
- implement basic data extraction, preprocessing, and quality control workflows for neurophysiological data using foundational scripting, and
- evaluate the methodological decisions involved in data processing and interpret their implications for reproducibility and transparent scientific practice.

5. Examination

The course is graded A (Excellent), B (Very good), C (Good), D (Satisfactory), E (Sufficient) or F (Fail).

A final grade of the course is only issued when all the examination parts have been passed and is determined by the weighted average of grade for the Individual written examination and Unsupervised written examination.

The examinations of the course consist of the following modes of assessment:

- **Individual written examination**
  6 credits, grades: A/B/C/D/E/F
- **Unsupervised written examination**
  1.5 credits, grades: A/B/C/D/E/F

Students with a permanent disability who have been approved for directed educational support may be offered adapted modes of assessment.

6. Types of instruction and language of instruction

The teaching is comprised of workshops, seminars and lectures.

The teaching is conducted in English.

7. Course literature and other educational materials

Beeck, H. O. de, Nakatani, C. (2025). *Introduction to human neuroimaging* (2nd ed.). [Electronic] Cambridge University Press. ISBN 9781009349925.

Scientific articles and other relevant materials may be added according to the teacher's instructions.

8. Student influence

Student influence in the course is ensured by means of course evaluation. The students are informed about the results of the evaluation and potential measures that have been taken or are planned, based on the course evaluation.

9. Additional information

The content of the course corresponds completely or partially with the following course(s) and cannot be included in the required credits of a degree qualification:

- KU725A - Research Methods and Data Processing in Cognitive Neuroscience A1N 7.5 credits

Further information about the course, as well as national and local governing documents for higher education, is available on the website of the University of Skövde.