

Cognitive Neuroscience

Master's Programme

Master Specialisation Cognitive Neuroscience

Faculty of Psychology and Neuroscience

Auditory and Higher Order Language Processing

Full course description

Although the human visual system has been studied extensively in cognitive neuroscience, so far only little is known about the auditory and speech system: How do we segregate the sound of a Ferrari from the background sounds of other running car engines, or the voice of a friend from that of many others in a crowd? How is auditory information integrated with other senses such as vision or touch? In the last few years cognitive neuroscience research has set a number of milestones in our understanding about how our brain manages these tasks. This knowledge is crucial because hearing and communicating with the environment and with others is one of the most essential human cognitive skills.

This course aims to develop students' knowledge about the human auditory and speech system. The course starts with basic neural anatomy and considers how this might constrain but also assist auditory processing. Students learn about the basics of speech segregation and perception. Bottom-up and top-down processes are addressed. Finally, the course discusses how the human mind selects relevant auditory, visual and linguistic information in order to communicate.

Course objectives

Students are able to understand:

- anatomy and function of the auditory system, of the speech system (separately for comprehension and production), and of cross modal integration;
- methods used in CN to study anatomy and function (in animals, humans: staining, electrophysiology, psychophysics, fMRI, TMS), understanding relevant aspects of the method to quantify cognition (EEG oscillation, ERP components, fMRI);
- experimental design to study open questions in hearing and speech processing (tasks, stimuli);
- most relevant open issues of how the brains solves problems like Gestalt processing/grouping, figure ground segregation/streaming, comprehension, production, error monitoring, multisensory/cross modal integration;
- acquiring critical thinking skills of limits of methods, designs, tasks and theories in the context of auditory and language processing;
- acquiring creative thinking skills to come with new ideas by merging knowledge from different fields (i.e. comprehension and production, or by transferring ideas from one to another field (speech motor integration and it's role in production)).

PSY4051

Period 1

3 Sep 2018

26 Oct 2018

[Print course description](#)

ECTS credits:

4.0

Instruction language:

English

Coordinator:

[B.M. Jansma - Schmitt](#)

Teaching methods:

Lecture(s), PBL

Assessment methods:

Attendance, Written exam

Keywords:

Auditory processing, language comprehension, language production, cross modal integration

Faculty of Psychology and Neuroscience

Perception and Attention

Full course description

The objective of the course is to present the groundwork based on which students will be able to understand current neuro-cognitive theories and experimental methods in the field of visual perception and attention. This will be achieved via discussion of a set of core papers in this field.

Vision is a complex cognitive process which provides us with a richer stream of information than any other sense. The primate visual cortex is composed of a network of at least 30 highly interconnected functionally specialized regions. The regions where visual information first enters the cortex are called early visual areas. Neurons in these areas have relatively simple properties, and their small receptive fields are arranged to form retinotopic maps of the environment on the cortex. Higher level visual processing occurs in a ventral and dorsal stream, which are respectively contributing to object perception and the perception of motion.

The network contributing to visual perception can adapt to the task that the organism is faced with. This is the case, for example, when looking for someone in a crowd and attending to one face at a time. There are many kinds of attention, but attention can be generally described as involving some type of information selection.

In this course, neural mechanisms underlying prototypical examples of low and high level perception will be studied, as well as neural mechanisms underlying selective attention. The course will discuss both historically important papers, as well as more recent research in visual perception and attention, involving different empirical methods including psychophysics, neurophysiology, and functional brain imaging but with an emphasis on animal neurophysiology.

Course objectives

Students will

- gain knowledge and understanding of the human and non-human primate visual system (structure and function), in terms of low-level and high-level visual perception as well as visual attention;

- gain knowledge regarding acquisition and analysis of data in the methodological fields of neurophysiology and psychophysics;
- acquire the capability of detailed, in-depth reading of scientific papers, which involves (I) the understanding and evaluation of methods, (II) the understanding/contrasting of (quantitative) theories and models and the evaluation of their fit with the data, and (III) the critical evaluation of interpretations of presented data by the article's authors;
- improve their ability to use scientific terminology while verbalizing and discussing insights and questions raised by the readings;
- be able to apply the acquired scientific reading and evaluation skills to papers outside the field of visual perception and attention;
- generally improve their ability of theorizing, hypothesis formation, and experimental design.

PSY4052

Period 1

3 Sep 2018

26 Oct 2018

[Print course description](#)

ECTS credits:

4.0

Instruction language:

English

Coordinator:

[P.H.M. de Weerd](#)

Teaching methods:

Lecture(s), PBL

Assessment methods:

Attendance, Written exam

Keywords:

Visual system, illusions, Perception, Attention, neurophysiology, monkey

Faculty of Psychology and Neuroscience

Practical Training: EEG and ERP

Full course description

Electroencephalography (EEG) and Event Related Potentials (ERP) offer a combination of precise measurements for the time course of brain processes. These are low cost, non-invasive measurements and are widely available. For these reasons they make a unique contribution to cognitive neuroscience. Scientific interest in EEG and ERP is growing, and results have been increasingly integrated with other neuro-imaging techniques during the last few decades.

Lectures and basic literature provide an introduction for students to the basics of EEG and ERP research, EEG and ERP terminology and the possibilities and limitations of EEG and ERP. For a Midterm paper students study an empirical data article from the literature and answer questions about its EEG and ERP methods and interpretation based on lectures, basic literature and other sources. Students also study practical measurement issues, such as electrode placement and types of artefacts. Finally, students must interpret the resulting data. Successful measurement requires an

understanding of the basics of EEG and ERP signal analysis techniques, such as artefact management, spectral analysis, filtering, ERP averaging, time-frequency analysis etc. Students also receive hands-on training in smaller groups in running an ERP experiment, including electrode application, minimising artefacts, and health and safety in the lab. A number of simple experimental paradigms will be used that provide interesting and reliable results. Data processing will include a number of common EEG analyses, e.g. analyses in the time and frequency domain.

Course objectives

Students are able to understand:

basic EEG/ERP paradigms, EEG recording systems, measurement settings, electrode application, data quality verification, analogue-digital conversion, basic EEG / ERP components, interpreting topographical plots, neural origins of EEG, time domain analysis, frequency domain analysis, time-frequency analysis, filtering, ocular artefact control, muscle artefact control, choice of reference, re-referencing.

PSY4034

Period 1

3 Sep 2018

26 Oct 2018

[Print course description](#)

ECTS credits:

2.0

Instruction language:

English

Coordinator:

[F.T.Y. Smulders](#)

Teaching methods:

Lecture(s), Paper(s), Skills, Training(s), Work in subgroups

Assessment methods:

Attendance, Final paper

Keywords:

Electroencephalography (EEG), Event-related potentials (ERP), electrophysiology, measurement, analysis of brain potentials

Faculty of Psychology and Neuroscience

Neuroimaging: Functional MRI

Full course description

The investigation of human brain functions using a range of imaging methods (such as electro- and magneto-encephalography, Positron Emission Tomography and Magnetic Resonance Imaging) represents the most influential development in Cognitive Neuroscience in the last years. In this course, students will learn about the essential facts of functional Magnetic Resonance Imaging (fMRI). fMRI presents clear advantages over the other methods, particularly in terms of increased spatial

resolution. Since its invention in 1992, fMRI has led to major advances in understanding the neural mechanisms that underlie higher levels of human mental activity and has established a strong link between cognitive psychology and neuroscientific research. The other Cognitive Neuroimaging programmes confront student with several applications of fMRI in specific cognitive domains (visual perception and attention, sensorimotor integration, auditory perception). In this course, however, students will gain a deeper knowledge of fundamental and methodological aspects of fMRI.

The tasks will address questions such as: How can the fMRI signal be related to neural activity? How are functional images obtained with an MRI scanner? What do I need for performing a good fMRI measurement? How are “activation maps” created? Some of the tasks are directly linked to a practical part of the course and are intended to provide the necessary theoretical framework for the design, analysis, measurement and interpretation of results in fMRI investigations. Practical sessions on acquisition and analysis of fMRI data of cognitive functions such as auditory and visual processing will be integrated in to the group meetings.

Course objectives

Students are able to understand:

nuclear Magnetic Resonance, Magnetic Resonance Imaging, functional MRI, physical basis (f)MRI, neurophysiologic basis fMRI, neuronal firing, local field potentials, blood oxygenation level dependent contrast, fMRI design, blocked designs, event related designs, fMRI analysis, motion correction, spatial and temporal filtering, univariate statistics, general linear models, single-subject statistics, multi-subject statistics, correction for multiple comparisons, false discovery rate, brain comparison and normalisation, Talairach transformation.

PSY4054

Period 2

29 Oct 2018

21 Dec 2018

[Print course description](#)

ECTS credits:

4.0

Instruction language:

English

Coordinator:

[E. Formisano](#)

Teaching methods:

Lecture(s), PBL

Assessment methods:

Attendance, Written exam

Keywords:

Functional Neuroimaging, magnetic resonance imaging, experimental design, analysis methods

Sensorimotor Processing

Full course description

Every day activities such as riding a bicycle, typing a summary and drinking a cup of coffee require the continuous interaction of brain systems that serve sensory perception and systems that control the body's muscles. In other words, most of the things people do require sensorimotor integration. Since sensory perception (visual as well as auditory) is covered extensively in other courses, the main focus here will be on the somatosensory and motor system as well as on the transformation and processing of sensory information for motor control. Initially, basic processes are covered, such as the representations used by primary and secondary somatosensory and motor areas (which parameters are represented, e.g. muscle contractions, joint angles or whole movements?), types of motor control (since processing perceptual feedback takes time, how should individuals use past information to control future actions?), and coordinate transformations (how to get from incoming visual information, coded with respect to our current eye position, to motor commands, coded with respect to our current body posture?). Later in the course, the focus will shift to higher level issues such as motor learning, action selection and decision making, and predicting the actions of others. All topics will be discussed in the context of cognitive neuroscience research so that students learn how these topics can be investigated using a range of different techniques from behavioural experiments to electrophysiological recordings and brain imaging methods.

Course objectives

- describe and explain the neural mechanisms underlying sensorimotor processing (internal models, coordinate transformations, action selection);
- critically assess opposing views, the supporting experimental data and the research methods used to obtain them;
- explain the neuro-behavioral correlates of motor learning and decision making, and the role of mirror neurons in action understanding.

PSY4055

Period 2

29 Oct 2018

21 Dec 2018

[Print course description](#)

ECTS credits:

4.0

Instruction language:

English

Coordinators:

[J. Reithler](#)

[A.L. Kaas](#)

Teaching methods:

PBL, Lecture(s)

Assessment methods:

Attendance, Written exam

Keywords:

Neural correlates of motor control, Somatosensory perception, Sensorimotor coordination, reference frames, coordinate transformations, Motor learning, action selection, mirror neuron system

Faculty of Psychology and Neuroscience

Practical Training: fMRI

Full course description

The primary goal of this course is to provide hands-on experience in experimental design, acquisition and analysis of fMRI experiments. In the first tutorial, each student group will separately formulate an experimental question/hypothesis to be tested with fMRI and will select an appropriate experimental design. In a subsequent meeting, each group will give an oral presentation to the other groups. The proposal will comprise of an fMRI study. All studies are to be discussed and evaluated; at the end of the meeting one study is selected.

In the group meetings and independent study, all students are involved in implementing the experimental set-up required for performing the selected study (e.g. selection and preparation of stimuli, implementation of the design) and participating in the fMRI measurements. During the latter course meetings, all students must perform the statistical analysis of the datasets. Assistance and prior preparation, especially in the implementation stage (stimulus programming) and data analysis stage (preparation of data in usable format for analysis in Brain Voyager QX), is provided by the tutors. Finally, students describe and discuss their findings in an individually written report.

Course objectives

Students are able to understand:

experimental design, hypothesis formulation, operationalization, fMRI blocked designs, fMRI event related designs, parameters for MRI scanning, MR safety and procedures, fMRI measurements, pre-processing fMRI data, statistical analysis fMRI data, results interpretation.

PSY4056

Period 2

29 Oct 2018

21 Dec 2018

[Print course description](#)

ECTS credits:

2.0

Instruction language:

English

Coordinators:

[E. Formisano](#)

[F. de Martino](#)

Teaching methods:

Lecture(s), Presentation(s), Research, Working visit(s), Work in subgroups, Skills

Assessment methods:

Attendance, Final paper

Keywords:

functional MRI, experimental design, fMRI data acquisition, fMRI data analysis

Internships

Research Internship

Faculty of Psychology and Neuroscience

Research Proposal

Full course description

- The research proposal is drafted in preparation for the research internship. To ensure a timely process, PSY4074 is done in conjunction with PSY4075, which serves to support the development of the research proposal and subsequent internship via assignments, workshops, and lectures that allow students to practice and develop the following skills: Conducting literature reviews
- Using Endnote
- Choosing a research design
- Selecting appropriate statistical methods
- Managing data and applying statistics
- Writing a research proposal using academic writing
- Providing peer feedback on a research proposals
- Understanding research ethics
- Applying for approval from the ERCPN
- Planning for their future career
- This module is not applicable for students of the Master Neuropsychology that attend a clinical internship.

Course objectives

- to produce a scientifically sound research proposal;
- to adequately prepare for a research internship.

PSY4074

Year

1 Sep 2018

31 Aug 2019

[Print course description](#)

ECTS credits:

5.0

Instruction language:

English

Coordinator:

[S. Stutterheim](#)

Teaching methods:

Assignment(s)

Assessment methods:

Final paper

Keywords:

Academic skills, research skills, methods, statistics, Writing, Internship

Faculty of Psychology and Neuroscience

Academic Skills

Full course description

This module offers students an opportunity to practice and apply academic writing and research skills, and prepares students for their research internship. To achieve this, a series of assignments, workshops, and lectures will be scheduled in the 3rd period (four weeks). In addition, students will be encouraged to consider their future career. The following topics and activities will be covered:

- Conducting literature reviews
- Using Endnote
- Choosing a research design
- Selecting appropriate statistical methods
- Managing data and applying statistics
- Writing a research proposal using academic writing
- Providing peer feedback on a research proposals
- Understanding research ethics
- Applying for approval from the ERCPN
- Planning for their future career

This module is not applicable for students of the Master Neuropsychology that attend a clinical internship.

Course objectives

- students are able to execute a literature review;
- students are able to use Endnote;
- students are able to c select a research design and corresponding methods for a research project;
- students understand and apply statistical techniques;
- students can explain characteristics of academic writing and are able implement apply that knowledge to the writing of a research proposal;
- students are able to execute a peer review that is both constructive and encouraging;
- students recognize ethical aspects of conducting research and are able to complete an ethics application;
- students are able to produce a research proposal;
- students recognize career perspectives for their future.

PSY4075

Period 3

7 Jan 2019

1 Feb 2019

[Print course description](#)

ECTS credits:

0.0

Instruction language:

English

Coordinator:

[S. Stutterheim](#)

Teaching methods:

Assignment(s), Skills, Lecture(s)

Assessment methods:

Attendance, Assessment

Keywords:

Academic skills, research skills, methods, statistics, career skills, Writing, peer reviewing, ethics in research

Faculty of Psychology and Neuroscience Research Internship Graded

Full course description

The second part of the one-year master's program (from period 3 onwards), is devoted to conducting a research internship that involves 1) writing of a research proposal, and preparing and planning of the research project, 2) conducting the research project, and 3) analyzing the results of the research project. This work will result in an individually written 4) master's thesis. Step 1 will be done in period 3, steps 2 to 4 from period 4 onwards.

The internship can be carried out at Maastricht University, at an external research institute or at other, more practically oriented institutions. In all cases, a student's research proposal and master's thesis will be evaluated by two assessors. At least one of these assessors is a staff member at the Faculty of Psychology and Neuroscience (FPN). The other assessor can be an external researcher. One of the assessors must hold a PhD, the other can be a PhD candidate.

Information about research internships offered by faculty members can be found on [AskPsy > Curriculum > internships/ stages](#).

Each specialisation has its own internship coordinator:

Legal Psychology: Kim van Oorsouw

Phone (043) 38 84050, 40 Universiteitssingel East, Room 3.767,

Email: k.vanoorsouw@maastrichtuniversity.nl

Health and Social Psychology: Ghislaine Schyns

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Email: ghislaine.schyns@maastrichtuniversity.nl

Work and Social Psychology: Robert van Doorn

Phone (043) 38 81926, 40 Universiteitssingel East, Room 4.765,

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Developmental Psychology: Hans Stauder

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Cognitive Neuroscience: Amanda Kaas

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Email: a.kaas@maastrichtuniversity.nl

Neuropsychology: Esther Keulers

Phone (043) 38 82932, 40 Universiteitssingel East, Room 2.755,

Email: esther.keulers@maastrichtuniversity.nl

This module is not applicable for students of the Master Neuropsychology that attend a clinical internship.

Course objectives

Students are able to understand:

- conducting a supervised empirical research project and summarising this research in a master's thesis.

Prerequisites

The Research Internship can only be started when at least 8 credits of the compulsory courses have been obtained of the modules offered in periods 1 and 2. Furthermore, the research proposal must be assessed as sufficient by both assessors and must be ethically approved before the start. In addition:

- Certain Research Internships may require that practical or skills training(s) have been completed.

PSY4078

Year

1 Sep 2018

31 Aug 2019

[Print course description](#)

ECTS credits:

10.0

Instruction language:

English

Coordinator:

[G.C. Kraag](#)

Teaching methods:

Assignment(s), Paper(s), Research, Skills, Working visit(s)

Assessment methods:

Attendance, Final paper, Observation, Participation

Keywords:

Academic skills, Internship, Research, Research proposal, master's thesis

Faculty of Psychology and Neuroscience

Research Internship Ungraded

Full course description

The second part of the one-year master's program (from period 3 onwards), is devoted to conducting a research internship that involves 1) writing of a research proposal, and preparing and planning of the research project, 2) conducting the research project, and 3) analyzing the results of the research project. This work will result in an individually written 4) master's thesis. Step 1 will be done in period 3, steps 2 to 4 from period 4 onwards.

The internship can be carried out at Maastricht University, at an external research institute or at other, more practically oriented institutions. In all cases, a student's research proposal and master's thesis will be evaluated by two assessors. At least one of these assessors is a staff member at the Faculty of Psychology and Neuroscience (FPN). The other assessor can be an external researcher. One of the assessors must hold a PhD, the other can be a PhD candidate.

Information about research internships offered by faculty members can be found on [AskPsy > Curriculum > internships/ stages](#).

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This module is not applicable for students of the Master Neuropsychology that attend a clinical internship.

Course objectives

Students are able to understand:

- conducting a supervised empirical research project and summarising this research in a master's thesis.

Prerequisites

The Research Internship can only be started when at least 8 credits of the compulsory courses have been obtained of the modules offered in periods 1 and 2. Furthermore, the research proposal must be assessed as sufficient by both assessors and must be ethically approved before the start. In addition:

- Certain Research Internships may require that practical or skills training(s) have been completed.

Year

1 Sep 2018

31 Aug 2019

[Print course description](#)

ECTS credits:

15.0

Instruction language:

English

Coordinator:

[G.C. Kraag](#)

Teaching methods:

Assignment(s), Paper(s), Research, Skills, Working visit(s)

Assessment methods:

Attendance, Final paper, Observation, Participation

Keywords:

Academic skills, Internship, Research, Research proposal, master's thesis

Thesis

Master's Thesis

Faculty of Psychology and Neuroscience

Master's Thesis

Full course description

The second part of the one-year master's program (from period 3 onwards), is devoted to conducting a research internship that involves 1) writing of a research proposal, and preparing and planning of the research project, 2) conducting the research project, and 3) analyzing the results of the research project. This work will result in an individually written 4) master's thesis. Step 1 will be done in period 3, steps 2 to 4 from period 4 onwards.

The internship can be carried out at Maastricht University, at an external research institute or at other, more practically oriented institutions. In all cases, a student's research proposal and master's thesis will be evaluated by two assessors. At least one of these assessors is a staff member at the Faculty of Psychology and Neuroscience (FPN). The other assessor can be an external researcher. One of the assessors must hold a PhD, the other can be a PhD candidate.

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Email: esther.keulers@maastrichtuniversity.nl

This module is not applicable for students of the Master Neuropsychology that attend a clinical internship.

Course objectives

Students are able to understand:

- conducting a supervised empirical research project and summarising this research in a master's thesis.

Prerequisites

The Research Internship can only be started when at least 8 credits of the compulsory courses have been obtained of the modules offered in periods 1 and 2. Furthermore, the research proposal must be assessed as sufficient by both assessors and must be ethically approved before the start. In addition:

- Certain Research Internships may require that practical or skills training(s) have been completed.

PSY4091

Year

1 Sep 2018

31 Aug 2019

[Print course description](#)

ECTS credits:

10.0

Instruction language:

English

Coordinators:

[R.R.A. van Doorn](#)

[G.C. Kraag](#)

Teaching methods:

Assignment(s), Paper(s), Research, Skills, Working visit(s)

Assessment methods:

Attendance, Final paper, Observation, Participation

Keywords:

Academic skills, Internship, Research, Research proposal, master's thesis