First year courses

Research Master Specialisation Cognitive Neuroscience Year 1

Faculty of Psychology and Neuroscience

Real-Time fMRI and Neurofeedback

Full course description

Recent progress in computer hard- and software allows real-time analysis of fMRI data, providing the basis for brain-computer interface (BCI) applications such as neurofeedback, control of external devices and motor-independent communication. In neurofeedback studies, subjects can see different kinds of representations of their own brain activity while they are being measured in the MRI scanner. FMRI-based Neurofeedback is performed by reading, analysing and visualising the hemodynamic brain signals in real-time during an ongoing experiment. This real-time approach is in contrast to the standard analysis approach in which the huge amount of incoming fMRI signals are recorded first and then analysed hours or days after the experiment. During this course, there will be a discussion of fMRI neurofeedback applications which have demonstrated that with sufficient practice, subjects are indeed able to learn to modulate activity in certain brain areas. These results are extremely important for basic neuroscience research, because they allow researchers to study the degree to which the brain can modulate its own activity and to potentially unravel the function of hitherto unknown brain areas. Neurofeedback research also touches on deep philosophical issues, such as the neural correlates of free will. It might also be possible in the future to help people with pain or depression by regulating at will the activity in relevant brain areas. In fMRI-based communication studies, activation patterns evoked by participants are 'decoded' and interpreted online, e.g. as letters of the alphabet, offering the possibility for people with severe motor impairments to 'write' letters purely controlled by mental imagery. In this course, a number of online analysis strategies will be discussed for decoding mental states, including analysis of the mean signal of regions-of-interest (ROIs) and the use of pattern classifiers operating at the voxel level.

Course objectives

Knowledge of: Principles of real-time fMRI, setup and conduction of real-time fMRI scanning, serving as subjects (two students) in a real-time brain- computer interface (BCI) session, basics of real-time fMRI data analysis (Turbo-BrainVoyager software).

Recommended reading

Articles and a users guide for the real-time analysis software.

PSY4231
Period 4

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

3 Feb 2025
4 Apr 2025
Print course description
ECTS credits:
1.0
Instruction language:
English
Coordinators:

- R.W. Goebel
- B. Sorger

Teaching methods:
Lecture(s), Work in subgroups
Assessment methods:
Final paper, Attendance
Keywords:
Real-time fMRI, neurofeedback, brain-computer interface (BCI), brain reading.
Faculty of Psychology and Neuroscience

Methods of Deactivation

Full course description

In three consecutive practical training sessions, students acquire direct hands-on experience with non-invasive magnetic brain stimulation (transcranial magnetic stimulation (TMS)). Students learn how to use the brain stimulator devices, how to evoke muscle responses and how to induce visual experiences. Students act as both the experimenter, applying the brain stimulation, and the participant, receiving the magnetic pulses. Practical I: Technical introduction/motor thresholds/motor excitability. Practical II: TMS-induced visual experiences (phosphenes). Practical III: TMS Neuronavigation (frameless stereotaxy). There are a variety of ways in which activity in a brain region can be prevented or influenced. Some studies use anatomical lesion methods (in animals), while others use reversible methods such as cooling, and pharmacological or genetic manipulations in animals, or TMS in human participants. The training will end with a lecture that provides an overview of these different methodologies, including a discussion of the advantages and limitations of the different techniques and of the issues related to data interpretation.

Course objectives

Knowledge of: Trans-cranial magnetic stimulation, application of TMS, motor threshold determination, phosphene threshold determination, Neuronavigation, cooling, various other deactivation methods.

Recommended reading

Journal articles, book chapters.

PSY4233
Period 3
6 Jan 2025

31 Jan 2025
Print course description
ECTS credits:
1.0
Instruction language:
English
Coordinator:

- T. Schuhmann

Teaching methods:
Assignment(s), Lecture(s), Skills, Training(s)
Assessment methods:
Attendance, Assignment
Keywords:
Transcranial Magnetic Stimulation, Non-invasive Brain Stimulation, fMRI- guided Neuronavigation.
Faculty of Psychology and Neuroscience

Colloquia

Full course description

Each specialisation organizes two colloquia, in which senior researchers from Maastricht University or visiting lecturers present their scientific insights. Each colloquium focuses in depth on one of a wide range of topics, with issues transcending the courses and specialisations. Each colloquium lecture will be followed by active discussion, chaired by the lecturer or the host of the guest lecturer. A total of ten colloquia will be offered.

The final assessment for this course is pass or fail - and not a numerical grade between 0,0 and 10,0.

Course objectives

Students are able to understand:

- key research domains from different specialisations;
- interdisciplinary research.
- Students are able to interact with students from different specialisations.

PSY4100
Period 3
6 Jan 2025
11 Jul 2025
Print course description
ECTS credits:
1.0
Instruction language:
English
Coordinator:

- R. Schreiber

Teaching methods:

Lecture(s)
Assessment methods:
Attendance
Keywords:
interdisciplinary knowledge
Faculty of Psychology and Neuroscience

Applied Statistics I

Full course description

The course consists of eights units.

In the first four units, students will be given an in-depth training in the following standard statistical methods: factorial ANOVA for between-subject designs, analysis of covariance (ANCOVA), multivariate ANOVA (MANOVA), discriminant analysis and multiple linear regression. Students are assumed to have background knowledge of balanced two-way factorial ANOVA and multiple regression. These methods will be briefly reviewed. The following advanced topics will then be covered: unbalanced factorial designs, contrast analysis, interaction in multiple regression, simple slope analysis, dummy coding, centering covariates, different coding schemes, collinearity and residuals checks and data transformation.

The second half of the core course consists of four units, two on repeated measures ANOVA and two on mixed linear regression for repeated measures. The first two units cover classical repeated measures ANOVA for the one- and two-way within-subject design and the split-plot (between x within) design. Special attention is given to: a) the choice between multivariate and univariate data formats and method of analysis, and the sphericity assumption; b) the distinction between the within-subjects and between-subjects part of a split-plot ANOVA, and how to obtain both using regression analysis;
Subsequently, two units are devoted to mixed (multilevel) regression for repeated measures. This starts with a unit on marginal models for repeated measures as an alternative to repeated measures ANOVA in cases of missing data and/or of within-subject covariates. Students are shown the pros and cons of various models for the correlational structure of repeated measures, such as compound symmetry and AR1. The second unit covers the random intercept and random slope model for repeated measures as a method to include individual effects into models for longitudinal data (growth curves) or single trial analyses of lab data (response times, ERP, fMRI). Students learn how this can be combined with e.g. ARMA modelling to distinguish between inter-personal and intra-personal outcome variation.

Course objectives

Students are able to understand:

- oneway analysis of variance, contrast analysis, unbalanced designs, multivariate analysis of variance, discriminant analysis, linear regression with interaction terms, linear regression with dummy variables, data transformations, simple slope analysis, analysis of covariance
- repeated measures ANOVA for within-subject and split-plot (between x within) designs, mixed (multilevel) linear regression with random effects and autocorrelation, and so-called marginal models;
- Specifically, students are able to choose the correct method of analysis, and specify a

statistical model to compare different models and choose the best model (based on checking assumptions, model fit and parsimony on top of plausibility), and to interpret effect estimates and significance tests obtained with that model.

Prerequisites

Good understanding of descriptive and inferential statistics at the elementary and intermediate level, including t-tests

PSY4162
Period 1
2 Sep 2024
25 Oct 2024
[Print course description]
ECTS credits:
4.0
Instruction language:
English
Coordinator:

- [J. Schepers]

Teaching methods:
Lecture(s), Skills, Assignment(s)
Assessment methods:
Attendance, Written exam, Assignment
Keywords:
Univariate analysis of variance, multivariate analysis of variance, regression analysis, Within-subject designs, repeated measures ANOVA, mixed (multilevel) regression, marginal versus random effects models
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

Knowledge of: 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.

Recommended reading

Huettel, S.A., Song, A.W., & McCarthy, G. (2009). Functional Magnetic Resonance Imaging. (2nd ed.). Sunderland, MA: Sinauer, Associates, Inc. Publishers; Jezzard, P., Matthews, P.M., & Smith, S.S. (2001). Functional MRI: An introduction to methods. Oxford, UK: Oxford University Press; Journal articles, book chapters.

PSY4253
Period 2
28 Oct 2024
20 Dec 2024
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.
Faculty of Psychology and Neuroscience

Sensorimotor Processing

Full course description

Every day activities such a 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. In this course, several important aspects of sensorimotor integration in the brain will be studied, particularly in the context of visual perception. Since sensory perception (visual as well as auditory) is covered extensively in other courses, the main focus here will be on the motor system and in the transformation and processing of sensory information for motor control. Initially, basic processes are covered, such as types of motor control (since visual perception takes time, how should individuals use past information to control future actions?), the representations used by primary and secondary motor areas (which parameter is under ultimate control: muscle contractions, joint angles or whole movements?) 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 both with classical behavioural experiments and with modern techniques such as functional Magnetic Resonance Imaging.

Course objectives

Knowledge of: Processing involved in sensorimotor coordination, neural mechanisms behind sensorimotor integration, brain anatomy of action representations, neuro-behavioural correlates of motor learning, relevant research methods.

Recommended reading

Journal articles, book chapters.

PSY4254
Period 2
28 Oct 2024
20 Dec 2024
Print course description
ECTS credits:
4.0
Instruction language:
English
Coordinator:

- J. Reithler

Teaching methods:
Lecture(s), PBL
Assessment methods:
Attendance, Written exam
Keywords:
Somatosensory perception, Sensorimotor coordination, reference frames, coordinate transformations, Motor learning, action selection, mirror neuron system.
Faculty of Psychology and Neuroscience

Diffusion Weighted Imaging and Fibre Tracking

Full course description

Diffusion weighted imaging and fibre tracking are a set of techniques that use Magnetic Resonance

Imaging (MRI) to probe fibre-bundles, which connect different regions of the brain. Thus, instead of the cerebral grey matter, it is the white matter that is the main object of study. The connections between brain-regions are the substrate of the interaction and communication between different brain systems. Thus, knowledge about the anatomy of these structural connections is of great importance to cognitive neuroscientists. The anatomy of fibre-tracts is imaged indirectly, by measuring the diffusion of water in the brain. Water diffuses more easily in a parallel way rather than perpendicular to the direction of surrounding axon bundles. Thus, by measuring the direction of local diffusion of water, inferences about the trajectories of fibre-bundles can be drawn. After completing this training, student will have knowledge of: i) how the MR scanner can be made sensitive to directed diffusion of water and how the resulting diffusion weighted images can be processed; ii) different models for local water diffusion within a voxel, along with useful quantities that can be derived from these models; iii) fibre tracking or tractography- how to get from local models of water diffusion to measures of global connectivity between brain regions. Furthermore, student will gain hands-on experience in analysing and visualising diffusion weighted MR data and in using tractography algorithms and assessing the results.

Course objectives

Students are able to understand:

- how to make the MR scanner sensitive to directed diffusion of water and how the resulting diffusion weighted images can be processed;
- different models for local water diffusion within a voxel, along with useful quantities that can be derived from these models;
- fibre tracking or tractography - how to get from local models of water diffusion to measures of global connectivity between brain regions.

Recommended reading

Journal articles, handouts.

PSY4228
Period 4
3 Feb 2025
4 Apr 2025
Print course description
ECTS credits:
1.0
Instruction language:
English
Coordinators:

- A.F. Roebroeck
- L.J. Edwards

Teaching methods:
Assignment(s), Lecture(s), Skills
Assessment methods:
Assignment, Attendance
Keywords:
diffusion, MRI, DTI, tractography

Translational Neuroscience: Towards Clinical Applications for Disorders of Consciousness

Full course description

Translational Neuroscience aims at expanding our understanding of brain structure, function, and disease in order to finally translate this knowledge into clinical applications and novel diagnostics and therapies of nervous-system disorders.

After the students had been introduced with the main state-of-the-art neuroscience methods (EEG, TMS, [real-time] fMRI, DWI etc.) in previous courses and workshops, this core course focuses on the (multi-modal) application of these neuroscientific tools in one particular context: the neuroscientific investigation of disorders of consciousness and the development of related clinical neuroscientific applications (diagnostics and treatment).

After a general introduction to Translational Neuroscience, the students will be familiarised with the different disorders of consciousness. Then, the students will present and critically review several Translational Neuroscience (including brain-computer interface) studies focusing on improving diagnostics and treatment for patients with disorders of consciousness.

At the end of the course, we will discuss (un-)related novel ideas for Translational Neuroscience research.

Course objectives

Students are able to understand:

- introduction to Translational Neuroscience;
- intensive discussion of Translational Neuroscience possibilities in the context of disorders of consciousness;
- critical evaluation of empirical Translational Neuroscience articles;
- practical application of methodological knowledge in a clinical context;
- generation of own Translational Neuroscience ideas.

Recommended reading

Journal articles.

PSY4257
Period 5
7 Apr 2025
6 Jun 2025
Print course description
ECTS credits:
4.0
Instruction language:
English

Coordinator:

- B. Sorger

Teaching methods:
Presentation(s), Lecture(s), PBL
Assessment methods:
Attendance, Presentation, Final paper
Keywords:
Translational Neuroscience, Clinical Neuroscience, consciousness, disorders of consciousness, brain imaging methods, brain-computer interfacing
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

Knowledge of: The basic cognitive and neural principles of auditory and speech processing; critical thinking with regard to research in the domain of auditory/speech processing; and employment of event-related potential (ERP) and fMRI studies.

Recommended reading

E-reader.

PSY4251
Period 1
2 Sep 2024
25 Oct 2024
Print course description
ECTS credits:
4.0
Instruction language:
English
Coordinator:

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

- B.M. Jansma

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

Timing Neural Processing with EEG and MEG

Full course description

Cognitive neuroscientists can currently choose from a range of different imaging methods to investigate human brain function. Each of these methods has its own strengths and limitations, which determine its suitability for studying a particular research question. Both electroencephalography (EEG) and magnetoencephalography (MEG) are important in characterising the time course of activation of neural systems involved in perceptual and cognitive processes. These processes include auditory and visual perception, attention, language, memory and development. EEG and MEG signals reflect complementary aspects of brain activity, with MEG having some advantages over EEG in the localisation of underlying neural sources. This course provides detailed knowledge on EEG and MEG, both of which have a clear advantage over other neuroimaging methods in terms of temporal precision. The study of EEG and MEG experimental design, data acquisition and data analysis will be combined with detailed literature discussions on theoretical and methodological issues. Based on different types of empirical questions, there will be discussion of the potential of a range of methods for advanced EEG and MEG analysis, including analysis in the time and frequency domain, source localisation, the combination with functional magnetic resonance imaging (fMRI) and transcranial magnetic stimulation (TMS) methods, independent component analysis and analyses of functional connectivity.

Course objectives

Knowledge of: Electro-encephalography, event-related potentials, magneto- encephalography, dipole source analysis, distributed source analysis, Fourier analysis, wavelet analysis, independent component analysis, connectivity analysis, application: mental chronometry, application: attention, lateralised event-related potentials, combination electro- encephalography and functional magnetic resonance imaging, combination electro-encephalography and trans-cranial magnetic stimulation.

Recommended reading

Journal articles, book chapters.

PSY4256
Period 5
7 Apr 2025
6 Jun 2025
Print course description
ECTS credits:

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

4.0
Instruction language:
English
Coordinator:

- F.T.Y. Smulders

Teaching methods:
Lecture(s), Paper(s), Presentation(s), Working visit(s), PBL
Assessment methods:
Attendance, Final paper, Presentation, Oral exam
Keywords:
electroencephalography, magnetoencephalography, biological signal analysis, source localisation.
Faculty of Psychology and Neuroscience

Advanced fMRI

Full course description

Building on the course Neuroimaging, this course will examine advanced topics of fMRI methodology and applications. In the first week, students learn how knowledge about vascular effects may help to detect BOLD artefacts. In the second week, the principles of real-time fMRI will be presented. This is followed by an overview of fMRI neurofeedback studies and a discussion of its use as a new therapeutic tool. In addition, machine learning techniques for the real-time decoding of mental states and the application of these techniques in brain-computer interfaces will be discussed. In the third week, students examine advanced methods to establish correspondence between different brains. The course also discusses the importance of brain normalisation for random-effects statistical analysis, creation of probabilistic atlases and meta- analyses. In the fourth week, the possibilities and challenges of ultra- high field fMRI will be discussed focusing on studies with sub-millimeter spatial resolution aiming to unravel the columnar and laminar organization of the cortex.

Course objectives

Knowledge of: Effects of vascular system on the interpretability of the BOLD fMRI signal; real time fMRI data analysis during ongoing experiments; possibilities and limitations of fMRI-based brain-computer interfaces (BCIs); fMRI neurofeedback training as a new therapeutic tool; real-time decoding of mental states; advanced methods of brain normalisation; opportunities and challenges of high-resolution fMRI at ultra-high magnetic field strengths.

Prerequisites

Research master course ‘Neuroimaging’.

Recommended reading

Journal articles, book chapters.

PSY4215
Period 4

3 Feb 2025
4 Apr 2025
Print course description
ECTS credits:
4.0
Instruction language:
English
Coordinator:

- R.W. Goebel

Teaching methods:
Paper(s), PBL, Presentation(s)
Assessment methods:
Attendance, Written exam, Presentation
Keywords:
neurovascular coupling, Real-time fMRI, neurofeedback, BCI, brain normalisation, ultra-high field fMRI, columnar-level imaging, cortical layers
Faculty of Psychology and Neuroscience

Neuroanatomy

Full course description

The aim of this practical training is to become acquainted with the neuroanatomical terminology and to gain insight into the spatial and functional organisation of the brain. It is essential to have a basic knowledge of the brain anatomy when working in the field of neuropsychology or neurobiology. Many specific brain areas can be linked to particular functions. Thus, knowledge of the brain anatomy and its main functions allows direct linkage of specific neurological or psychiatric disorders to particular brain areas. After a short theoretical introduction, students will study whole brains and brain material of mammals at both macroscopical (visual inspection) and microscopical level. The emphasis will be on major brain systems, including the basal ganglia and limbic system.

Course objectives

Knowledge of: Limbic system, basal ganglia, plastinated human brains, brain dissection, microscopical slices.

Recommended reading

Papers from scientific journals and book chapters from books are provided.

PSY4108
Period 3
6 Jan 2025
31 Jan 2025
Print course description
ECTS credits:
1.0
Instruction language:

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

English
Coordinator:

- D.L.A. van den Hove

Teaching methods:
Lecture(s), Skills, Work in subgroups
Assessment methods:
Attendance, Written exam
Keywords:
Neuroanatomy, limbic system, basal ganglia.
Faculty of Psychology and Neuroscience

Programming in Matlab Basic Course

Full course description

Matlab provides a powerful environment for numerical computation, data analysis and visualisation. It is, in essence, a programming environment that has built-in primitives for common scientific tasks that in other languages, such as C or Pascal, require many operations. Examples are tasks such as matrix algebra (used in statistical analysis of data), Fourier transforms (used in signal processing) and 2D or 3D plots for visualisation of data or analysis-results. Many complete packages for the analysis of cognitive neuroimaging data (e.g. fMRI data or EEG/MEG data) are implemented in Matlab. Thus, usage of these packages requires at least a basic understanding of Matlab. Furthermore, if more advanced analysis or visualisation is needed than what is offered by existing packages, developing new functionalities in Matlab is often the most convenient option. The first part of the course will deal with how Matlab primarily represents and processes data, i.e. as matrices. Subsequently, attention is focused on the usage of the environment: the prompt; the workspace; the help options; and loading, saving and visualising data. The principles behind programming will be introduced, with particular emphasis on neuroimaging applications.

Course objectives

Knowledge of: Matlab environment, Matlab variables, vectors, matrices, matrix algebra, 2D and 3D plots, conditional loops, scripts, functions, file Input- Output, structures, cells.

Recommended reading

Andrew Knight – Basics of Matlab and beyond – Chapman and Hall/CRC, (Selected Chapters);
Wallisch et al. Matlab for Neuroscientists , Associated Press (Selected Chapters)

PSY4224
Period 3
6 Jan 2025
31 Jan 2025
Print course description
ECTS credits:
2.0
Instruction language:
English

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

Coordinator:

- G. Valente

Teaching methods:
Assignment(s), Lecture(s), Skills, Work in subgroups
Assessment methods:
Attendance, Take home exam
Keywords:
Programming principles, scripts and functions, data analysis.
Faculty of Psychology and Neuroscience

Noninvasive Brain Stimulation (NIBS)

Full course description

This course will provide students with an in-depth knowledge of; non- invasive magnetic brain stimulation techniques, including the mechanisms of action; the physico-physiological principles; various application protocols; functional magnetic brain stimulation paradigms and approaches for combining brain stimulation with brain imaging techniques simultaneously within the same experimental session. Since the very beginning of experimental brain research, neuroscientists have dreamed about not only observing the brain at work, but actually changing and modulating the neuronal activity in the brain without causing harm to patients or subjects. With the development of Transcranial Magnetic Stimulation (TMS) it is now possible to non- invasively reach into the skull of a patient or healthy subject and to temporarily alter brain activity at a specific location. This possibility of TMS opens the door to a wide range of experimental and clinical applications. In combination with methods of functional imaging, it is not only possible to passively measure the brain activity during the execution of a particular function, but TMS can also be used to increase or decrease the neuronal activity in the task-related brain area and reveal behavioural changes in the actual task performance. This enables identification of those brain areas that are functionally relevant to a particular function. In a clinical context, TMS has also been used to treat neurological and psychiatric diseases that are accompanied by a pathologically increased or decreased activity in a specific brain region. Since TMS offers the possibility to increase or decrease neuronal activity beyond the stimulation itself, it might, in the future, become a powerful therapeutic tool to help treat diseases like depression or schizophrenia.

Course objectives

Knowledge of: Physics and mechanisms of action of TMS, physiological effects of TMS, TMS protocols and application paradigms, animal studies using TMS, TMS in human cognitive neuroscience, combining TMS with functional imaging, clinical applications of TMS.

Recommended reading

Journal articles.

PSY4216
Period 3
6 Jan 2025
31 Jan 2025

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

Print course description
ECTS credits:
4.0
Instruction language:
English
Coordinator:

- A.T. Sack

Teaching methods:
Assignment(s), Lecture(s), Presentation(s), Work in subgroups, PBL
Assessment methods:
Attendance, Presentation, Final paper
Keywords:
Non-invasive brain stimulation, functional magnetic brain interference, multi-modal imaging.
Faculty of Psychology and Neuroscience

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 within EEG and ERP. One topic that students will learn is how to set up an experimental paradigm that is suitable for EEG and ERP measurements. 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 utilised; these 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

Knowledge of: 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.

Recommended reading

Journal articles, handbooks.

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

PSY4221
Period 1
2 Sep 2024
25 Oct 2024
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

Perception and Attention

Full course description

The objective of the course is to present the 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 at least 30 highly interconnected functionally specialised 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, each of which is composed of regions specialised for representation of more complex visual content (including motion, faces and places). This network of functionally specialised perceptual regions 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, functional brain imaging and evoked potentials, with an emphasis on neurophysiology.

Course objectives

Knowledge of: Visual system (structure and function), low-level and high-level visual perception, visual attention, animal models perception and attention, neurophysiology and related methods, neurophysiology/psychophysics data analysis methods.

Recommended reading

E-reader.

PSY4252
Period 1
2 Sep 2024
25 Oct 2024
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

fMRI

Full course description

The primary goal is to provide hands-on experience in experimental design, acquisition and analysis of fMRI experiments. In the first tutorial, each student group separately formulates an experimental question/hypothesis to be tested with fMRI and elaborates an appropriate experimental design. In a subsequent meeting, each group present to the other groups (in an oral presentation) its proposal for an fMRI study and all studies are 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. In the last meetings, all students 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

Knowledge of: Experimental design, hypothesis formulation, operationalisation, 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.

Recommended reading

Huettel, S.A., Song, A.W., & McCarthy, G. (2009). Functional Magnetic Resonance Imaging (2nd ed.). Sunderland, MA: Sinauer, Associates, Inc.; Jezzard, P., Matthews, P.M., & Smith, S.S. (2001). Functional MRI: An introduction to methods. Oxford, UK: Oxford; University Press; Journal articles, book chapters.

PSY4227
Period 2
28 Oct 2024
20 Dec 2024
Print course description
ECTS credits:
2.0
Instruction language:
English
Coordinator:

- F. de Martino

Teaching methods:
Lecture(s), Presentation(s), Research, Skills, Working visit(s), Work in subgroups
Assessment methods:
Attendance, Final paper
Keywords:
functional MRI, experimental design, fMRI data acquisition, fMRI data analysis.
Faculty of Psychology and Neuroscience

Brain Connectivity and Connectomics

Full course description

This course introduces the fields of human brain connectivity and connectomics. The human brain is one of the largest and most complex biological networks known to exist. It contains about 85 billion neurons each making on average ten thousand connections with other neurons. Today, the map or annotated graph of all connections in the brain is called the connectome and the emerging field of connectomics endeavours to measure and understand the connectome. It has become increasingly clear over a century of neuroscience endeavours since Ramon y Cajal that the particular organisation of brain connectivity plays a crucial role in enabling human abilities. Two general principles of this organisation became clear early on and remain important to this day: i) the multi-scale organization of brain connectivity (from macroscale white matter organization to microscale cortical circuits) and ii) the interplay between structure and function (with structure determining function and function driving structural plasticity). With recent advances in methods, neuroimaging investigations of human perception and cognition are increasingly interpreted in terms of connectivity, inter-areal interactions and cortical circuit computations. This course will discuss both structural connectivity and functional interactions, with an emphasis on the human brain, and how these can be measured and analysed in cognitive neuroscience experiments. The different spatial and temporal scales at which connectivity is organized will be treated in depth, with an emphasis on neuroanatomy of layered cortical circuits and the large scale organization of white matter fiber tracts.

Course objectives

Students are able to understand:

Structural connectivity, Functional connectivity, Effective connectivity, Layers in the neocortex, Cytoarchitecture, Myeloarchitecture, Receptor architecture, Canonical cortical microcircuits, Cortical computation, Realistic neural network models, Diffusion MRI tractography and connectomics, Graph analysis, Connectivity analyses in fMRI and M/EEG, Granger causality, Dynamic Causal Modeling, Histology and microscopy, Tracer studies, White matter organization, Myelination, White matter plasticity.

Recommended reading

Journal articles, book chapters.

PSY4255
Period 4
3 Feb 2025
4 Apr 2025
Print course description
ECTS credits:
4.0
Instruction language:
English
Coordinator:

- A.F. Roebroeck

Teaching methods:
Lecture(s), PBL
Assessment methods:
Attendance, Written exam
Keywords:
Brain connectivity, Connectomics, Functional connectivity, Effective connectivity, Cortical microcircuits, white matter organisation
Faculty of Psychology and Neuroscience

Basic Mathematical Methods

Full course description

Neuroscientific research has greatly benefited from recent developments in data analysis methods. The aim of this course is to provide participants with the basic 'tools' needed to gain a better understanding of the data analysis methodologies and to help them develop methods and strategies to tackle their research problems. The course will cover the basic aspects of number representation, with an emphasis on complex numbers, needed for Fourier analysis, and will then focus on basic algebra. The course will cover in detail vectors and matrices and their operations, including sums, products, inversion and eigenvalue decomposition and linear systems of equations. The course will also focus on the basic concepts of calculus, including infinitesimals, differential and integral calculus. Each session of the course has a practical component attached, in which the participants solve, with the aid of the tutor, a number of exercises. These are both pen-and-paper and MATLAB computer-based exercises. Furthermore, a selected range of applications of the illustrated concepts in the field of neuroscience are provided throughout the course.

Course objectives

Knowledge of: Trigonometry, exponentials and logarithms, complex numbers, polar representation, functions of one variable, algebra, solutions of a system of linear equations.

Recommended reading

Material provided by the coordinator.

PSY4237
Period 5
7 Apr 2025
6 Jun 2025
Print course description
ECTS credits:
2.0
Instruction language:
English
Coordinator:

- G. Valente

Teaching methods:
Assignment(s), Lecture(s), Skills, Work in subgroups
Assessment methods:
Attendance, Take home exam
Keywords:
Algebra, complex numbers, pre-calculus.
Faculty of Psychology and Neuroscience

Research Grant Writing Workshop

PSY4114
Period 6
9 Jun 2025
4 Jul 2025
Print course description
ECTS credits:
2.0
Instruction language:
English
Coordinators:

- S. Köhler
- R.L.H. Handels

Faculty of Psychology and Neuroscience

Applied Statistics II: A

Full course description

Theme 1, Period 4, offered in PSY4163 & PSY4164

Course lecturer: Gerard van Breukelen

Sample size calculation and nested designs: This course provides an introduction to sample size/power calculation for elementary and often encountered research designs in psychology and neuroscience. First, sample size calculation is explained and practiced for comparing two independent samples (e.g. parallel groups or between-subject design) and for comparing two dependent samples (e.g. crossover or within-subject design) on a quantitative dependent variable (outcome). Subsequently, this is extended to a) correlation between two quantitative variables, b) the comparison of two groups on a binary outcome, and c) two-way factorial designs (BS*BS, WS*WS, BS*WS). The opposite effects of a covariate on the sample size needed in randomized and nonrandomized studies are also explained and practiced. Finally, the data analysis and sample size calculation are covered for some popular nested designs, specifically cluster randomized trials and multicenter/multisite trials. Sample size calculations will be done with GPower and possibly some free software for nested designs, and with pencil-and-paper assignments.

Theme 2, Period 4, offered in PSY4163 & PSY4165

Course lecturer: Nick Broers

Structural equation modeling: Structural equation modeling (SEM) is an advanced multivariate method that is gaining importance in psychology but still requires special software (such as Lisrel, EQS, AMOS or Mplus). SEM is introduced in two units, starting with causal modelling and mediation analysis in cross-sectional research and then extending to longitudinal research and latent variables (factors). Special attention is given to identifying models, model equivalence, global and local goodness of fit indices, parsimony, model modification and cross- validation. Some concepts from matrix algebra are needed for SEM, and these will be briefly discussed without going into technical detail.

Theme 3, Period 5, offered in PSY4164 & PSY4165

Course Lecturer: Jan Schepers

Resampling methods in statistics: Many modern statistical analyses make use of resampling methods in applications where theoretical statistics cannot readily provide answers for making statistical inferences from the data at hand. This elective provides an introduction to three important resampling methods, bootstrapping, permutation testing and cross- validation, for obtaining measures of accuracy for parameters of a model or for studying model fit. The methods will be practiced using the software R.

Course objectives

Students are able to choose the correct formula for computing the sample size for basic and often used research designs, and to compute the sample size with that formula (Theme 1)

Students are able to understand path analysis, structural equation modeling, confirmatory factor analysis, structural models with latent variables, creating and testing SEM models (Theme 2)

Students are able to understand bootstrap sampling, permutation testing, cross-validation, bias, bootstrap confidence interval, bootstrap standard error, prediction error (Theme 3)

Prerequisites

All electives: good understanding of basic and intermediate statistics, including factorial ANOVA and multiple regression

Good working knowledge of R for theme 3: basic programming skills such as for-loops, logical operators, vectors

PSY4163
Period 4
3 Feb 2025
4 Apr 2025
Print course description
ECTS credits:
2.0
Instruction language:
English
Coordinator:

- J. Schepers

Teaching methods:
Lecture(s), Skills, Assignment(s)
Assessment methods:
Attendance, Written exam
Keywords:
sample size, power, structural equation modeling, LISREL, bootstrapping, permutation test, cross-validation
Faculty of Psychology and Neuroscience

Applied Statistics II: B

Full course description

Theme 1, Period 4, offered in PSY4163 & PSY4164

Course lecturer: Gerard van Breukelen

Sample size calculation and nested designs: This course provides an introduction to sample size/power calculation for elementary and often encountered research designs in psychology and neuroscience. First, sample size calculation is explained and practiced for comparing two independent samples (e.g. parallel groups or between-subject design) and for comparing two dependent samples (e.g. crossover or within-subject design) on a quantitative dependent variable (outcome). Subsequently, this is extended to a) correlation between two quantitative variables, b) the comparison of two groups on a binary outcome, and c) two-way factorial designs (BS*BS, WS*WS, BS*WS). The opposite effects of a covariate on the sample size needed in randomized and nonrandomized studies are also explained and practiced. Finally, the data analysis and sample size calculation are covered for some popular nested designs, specifically cluster randomized trials and multicenter/multisite trials. Sample size calculations will be done with GPower and possibly some free software for nested designs, and with pencil-and-paper assignments.

Theme 2, Period 4, offered in PSY4163 & PSY4165

Course lecturer: Nick Broers

Structural equation modeling: Structural equation modeling (SEM) is an advanced multivariate method that is gaining importance in psychology but still requires special software (such as Lisrel, EQS, AMOS or Mplus). SEM is introduced in two units, starting with causal modelling and mediation analysis in cross-sectional research and then extending to longitudinal research and latent variables (factors). Special attention is given to identifying models, model equivalence, global and local goodness of fit indices, parsimony, model modification and cross- validation. Some concepts from matrix algebra are needed for SEM, and these will be briefly discussed without going into technical detail.

Theme 3, Period 5, offered in PSY4164 & PSY4165

Course Lecturer: Jan Schepers

Resampling methods in statistics: Many modern statistical analyses make use of resampling methods in applications where theoretical statistics cannot readily provide answers for making statistical inferences from the data at hand. This elective provides an introduction to three important resampling methods, bootstrapping, permutation testing and cross- validation, for obtaining measures of accuracy for parameters of a model or for studying model fit. The methods will be practiced using the software R.

Course objectives

Students are able to choose the correct formula for computing the sample size for basic and often used research designs, and to compute the sample size with that formula (Theme 1)

Students are able to understand path analysis, structural equation modeling, confirmatory factor analysis, structural models with latent variables, creating and testing SEM models (Theme 2)

Students are able to understand bootstrap sampling, permutation testing, cross-validation, bias, bootstrap confidence interval, bootstrap standard error, prediction error (Theme 3)

Prerequisites

All electives: good understanding of basic and intermediate statistics, including factorial ANOVA and multiple regression

Good working knowledge of R for theme 3: basic programming skills such as for-loops, logical operators, vectors

PSY4164
Period 4
3 Feb 2025

4 Apr 2025
[Print course description]
ECTS credits:
2.0
Instruction language:
English
Coordinator:

- [J. Schepers]

Teaching methods:
Lecture(s), Skills, Assignment(s)
Assessment methods:
Attendance, Written exam, Assignment
Keywords:
sample size, power, structural equation modeling, LISREL, bootstrapping, permutation test, cross-validation
Faculty of Psychology and Neuroscience

Applied Statistics II: C

Full course description

Theme 1, Period 4, offered in PSY4163 & PSY4164

Course lecturer: Gerard van Breukelen

Sample size calculation and nested designs: This course provides an introduction to sample size/power calculation for elementary and often encountered research designs in psychology and neuroscience. First, sample size calculation is explained and practiced for comparing two independent samples (e.g. parallel groups or between-subject design) and for comparing two dependent samples (e.g. crossover or within-subject design) on a quantitative dependent variable (outcome). Subsequently, this is extended to a) correlation between two quantitative variables, b) the comparison of two groups on a binary outcome, and c) two-way factorial designs (BS*BS, WS*WS, BS*WS). The opposite effects of a covariate on the sample size needed in randomized and nonrandomized studies are also explained and practiced. Finally, the data analysis and sample size calculation are covered for some popular nested designs, specifically cluster randomized trials and multicenter/multisite trials. Sample size calculations will be done with GPower and possibly some free software for nested designs, and with pencil-and-paper assignments.

Theme 2, Period 4, offered in PSY4163 & PSY4165

Course lecturer: Nick Broers

Structural equation modeling: Structural equation modeling (SEM) is an advanced multivariate method that is gaining importance in psychology but still requires special software (such as Lisrel, EQS, AMOS or Mplus). SEM is introduced in two units, starting with causal modelling and mediation analysis in cross-sectional research and then extending to longitudinal research and latent variables (factors). Special attention is given to identifying models, model equivalence, global and local goodness of fit indices, parsimony, model modification and cross- validation. Some concepts from matrix algebra are needed for SEM, and these will be briefly discussed without going into technical detail.

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

Theme 3, Period 5, offered in PSY4164 & PSY4165

Course Lecturer: Jan Schepers

Resampling methods in statistics: Many modern statistical analyses make use of resampling methods in applications where theoretical statistics cannot readily provide answers for making statistical inferences from the data at hand. This elective provides an introduction to three important resampling methods, bootstrapping, permutation testing and cross- validation, for obtaining measures of accuracy for parameters of a model or for studying model fit. The methods will be practiced using the software R.

Course objectives

Students are able to choose the correct formula for computing the sample size for basic and often used research designs, and to compute the sample size with that formula (Theme 1)

Students are able to understand path analysis, structural equation modeling, confirmatory factor analysis, structural models with latent variables, creating and testing SEM models (Theme 2)

Students are able to understand bootstrap sampling, permutation testing, cross-validation, bias, bootstrap confidence interval, bootstrap standard error, prediction error (Theme 3)

Prerequisites

All electives: good understanding of basic and intermediate statistics, including factorial ANOVA and multiple regression

Good working knowledge of R for theme 3: basic programming skills such as for-loops, logical operators, vectors

PSY4165
Period 4
3 Feb 2025
4 Apr 2025
Print course description
ECTS credits:
2.0
Instruction language:
English
Coordinator:

- J. Schepers

Teaching methods:
Lecture(s), Skills, Assignment(s)
Assessment methods:
Attendance, Written exam, Assignment
Keywords:
sample size, power, structural equation modeling, LISREL, bootstrapping, permutation test, cross-validation
Second year courses

Research Master Specialisation Cognitive Neuroscience Year 2

Faculty of Psychology and Neuroscience

Programming in Matlab Advanced Course

Full course description

This course deals with advanced topics in Matlab programming. In particular, it will focus on how to implement efficient and re-usable programs for neuroimaging applications. Students will learn how to put the principles of efficient programming, such as debugging and profiling, into practice. Advanced topics in graphics and user interfaces will also be discussed.

Course objectives

Knowledge of: Debugging, efficient programming, graphical objects, graphical user interfaces.

Prerequisites

PSY4224 Programming in Matlab Basic Course.

Recommended reading

Material provided by the coordinator.

PSY5223
Period 1
2 Sep 2024
25 Oct 2024
Print course description
ECTS credits:
1.0
Instruction language:
English
Coordinator:

- G. Valente

Teaching methods:
Assignment(s), Lecture(s), Skills, Work in subgroups
Assessment methods:
Attendance, Take home exam
Keywords:
Efficient programming, debugging, graphical user interfaces.
Faculty of Psychology and Neuroscience

The Brain's Engram: Memorising Experiences and Experiencing Memory

Full course description

The brain is able to retain a myriad of perceptual experiences in the memory for shorter and longer durations of time. Memory formation requires the selection of relevant items in working memory, and the consolidation of the experience into a lasting neural representation. At the same time, memory retrieval appears to involve the reactivation of the neural processes of memory formation. In this course, students will discuss the neuroscience of working memory and episodic memory, and in how far these types of memory rely on similar neural mechanisms and brain networks. The role of prefrontal cortex as well as the hippocampal complex in memory formation and retrieval will be discussed in detail. The literature comprises cutting-edge empirical research papers from various neuroscience disciplines, including cognitive neuroimaging, neurophysiological recording, pharmacological manipulation and neurobiological fields.

Course objectives

Knowledge of: neuroscience of memory formation, consolidation and retrieval; Hippocampal anatomy and function; neurophysiology of memory; neuroscience methods; brain activity and connectivity; fleshing out cutting-edge empirical research papers

PSY5213
Period 1
2 Sep 2024
25 Oct 2024
Print course description
ECTS credits:
4.0
Instruction language:
English
Coordinator:

- V.G. van de Ven

Teaching methods:
Lecture(s), PBL, Paper(s)
Assessment methods:
Attendance, Written exam
Keywords:
working memory, episodic memory, hippocampus, prefrontal cortex, neurophysiology, LTP, consolidation, reactivation, neuroscience.
Faculty of Psychology and Neuroscience

Signal Analysis

Full course description

Traditional and advanced statistics provide essential knowledge and tools for the correct formulation of scientific inferences and for summarising a research work. Nonetheless, modern techniques in neuroscience research have strongly increased the amount of information that can be extracted from experimental data and analysed, especially on account of the improved spatial and temporal resolution of the acquisition methods. Most of the new information can be recovered by including in the statistical modelling the 'signal' structure of the data, generally due to the physical dimensions of data, time and space. This Signal Analysis course introduces the practical implementation of the traditional and latest research approaches to time and space signal analysis in the context of neuroscience research.

The course focuses on time series analysis from one- and multi-dimensional data. The basics of discrete time and space signal acquisition and modelling are presented and discussed in their practical neuroscience applications. The course has the objective to provide the participants with an operational understanding of the classical signal analysis techniques like preprocessing, analysis in the frequency, time and amplitude domains, Fourier series, Fourier Transform and FFT, spectral analysis, linear system theory and implementation of filters in time and frequency domains. Practical demonstrations from real world data reinforce concepts introduced in the lectures. MATLAB implementation of these techniques is also addressed throughout the meetings.

Course objectives

Students are able to understand:

statistical modeling, stationary signals, sampling theorem and frequency, harmonics, Fourier Series, Fourier Transform, Discrete Fourier Transform, linear systems, filters.

Recommended reading

W. van Drongelen. Signal processing for neuroscientists: An Introduction to the analysis of physiological signals. Academic Press.(selected chapters);

S. W. Smith. The Scientist and Engineer's Guide to Digital Signal Processing. California Technical Pub (selected chapters).

PSY5231
Period 1
2 Sep 2024
25 Oct 2024
Print course description
ECTS credits:
2.0
Instruction language:
English
Coordinator:

- G. Valente

Teaching methods:
Assignment(s), Lecture(s)
Assessment methods:
Attendance, Assignment
Keywords:

Frequency representation, Linear systems, filters
Faculty of Psychology and Neuroscience

Research Grant Writing Course

Full course description

Research is expensive. Finding appropriate funding sources and writing a convincing application is therefore a core comptenency of scientists. In this course, students will apply what they have learned during the Research Grant Writing Workshop (PSY4114) by going through a full grant proposal writing and review process. Students will work together (groups of 4-6 students) to write a joint research proposal as group on their selected topic, including an original research hypothesis, design, methods, motivation and valorization. Students are encouraged to think across boundaries of different scientific fields. A mentor (senior researcher) will guide students during this writing process. The students will write their proposal in 3 steps, and they will receive feedback from their mentor and peers along the way. The resulting grant proposals will be reviewed by two assessors and presented during a symposium by way of a group-based oral presentation.

Course objectives

Students are able to:

• review literature;

• formulate a research hypothesis;

• design a innovative research study;

• write a competitive grant proposal;

• present and illustrate a grant proposal at a symposium.

Prerequisites

This course is a continuation of the Research Grant Writing Workshop (PSY4112).

PSY5112
Period 1
2 Sep 2024
25 Oct 2024
Print course description
ECTS credits:
3.0
Instruction language:
English
Coordinators:

- S. Köhler
- R.L.H. Handels

Teaching methods:
Work in subgroups, Skills, Paper(s)
Assessment methods:
Attendance, Final paper, Presentation
Keywords:
grant proposal, Interdisciplinary, hypothesis, design, methods, research symposium
Internships

Research Internship

Faculty of Psychology and Neuroscience

Research Internship Graded

Full course description

The second part of the second year of the research master's programme is devoted to conducting a research internship. As a result of the many international research contacts that faculty members have established, a substantial number of students will conduct their research internship abroad. Students start their internship with the writing of a research proposal. Students finish the master's programme by writing a thesis based on their internship research project.

The internship can be completed at Maastricht University or at external research institutes. In all cases, a student's research proposal and master's thesis will be evaluated by two assessors. At least one of these assessors must be a member of the Faculty of Psychology and Neuroscience (FPN), the Faculty of Health, Medicine and Life Sciences (FHML), or the School of Business and Economics (SBE). Both assessors must hold a PhD degree.

A detailed guide on research internships and the master's thesis can be found on AskPsy > Curriculum > Internships.

Each specialisation has its own internship coordinator:

- RM Cognitive Neuroscience: to be announced

Lars Hausfeld, Cognitive Neuroscience (FPN),

Phone: (0) 43 38 84521, 55 Oxfordlaan, Room S.1.018

Email: lars.hausfeld@maastrichtuniversity.nl

- RM Fundamental Neuroscience:

Pilar Martínez, Psychiatry and Neuropsychology (FHML),

Phone: (0)43 38 81042, 40 Universiteitssingel, Room 2.574,

Email: p.martinez@maastrichtuniversity.nl

- RM Neuropsychology:

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience
Michael Schwartze, Neuropsychology and Psychopharmacology (FPN),

Phone (043) 38 82802, 40 Universiteitssingel, Room A2.765,

Email: michael.schwartze@maastrichtuniversity.nl

For the clinical part:

Ieke Winkens, Neuropsychology and Psychopharmacology (FPN),

Phone (043) 38 84512, 40 Universiteitssingel, Room A2.761,

Email: fpn-np-internship@maastrichtuniversity.nl

- RM Clinical Psychology:
Nicole Geschwind, Clinical Psychological Science (FPN),

Phone (043) 38 81487, 40 Universiteitssingel, Room 2.767,

Email: nicole.geschwind@maastrichtuniversity.nl

- RM Drug Development and Neurohealth:

Jacco Briedé, Toxicogenomics,

Phone (043)3881094, 50 Universiteitssingel, Room 4.114,

Email: j.briede@maastrichtuniversity.nl

Course objectives

Students are able to understand and apply:

conducting a (supervised) empirical research project and summarising the research and findings in the form of a master's thesis.

Prerequisites

The research internship cannot be started until:

- at least 60 credits have been attained during the programme;
- the above mentioned 60 credits must include the courses Advanced Statistics I and II.

PSY5120
Year
28 Oct 2024
31 Aug 2025
Print course description
ECTS credits:
10.0
Instruction language:
English

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

Coordinator:

- G.C. Kraag

Teaching methods:
Assignment(s), Paper(s), Research, Skills
Assessment methods:
Attendance, Final paper, Observation, Participation
Keywords:
Internship, Research, master's thesis
Faculty of Psychology and Neuroscience

Research Internship Ungraded

Full course description

The second part of the second year of the research master's programme is devoted to conducting a research internship. As a result of the many international research contacts that faculty members have established, a substantial number of students will conduct their research internship abroad. Students start their internship with the writing of a research proposal. Students finish the master's programme by writing a thesis based on their internship research project.

The internship can be completed at Maastricht University or at external research institutes. In all cases, a student's research proposal and master's thesis will be evaluated by two assessors. At least one of these assessors must be a member of the Faculty of Psychology and Neuroscience (FPN), the Faculty of Health, Medicine and Life Sciences (FHML), or the School of Business and Economics (SBE). Both assessors must hold a PhD degree.

A detailed guide on research internships and the master's thesis can be found on AskPsy > Curriculum > Internships.

Each specialisation has its own internship coordinator:

- RM Cognitive Neuroscience: to be announced

Lars Hausfeld, Cognitive Neuroscience (FPN),

Phone: (0) 43 38 84521, 55 Oxfordlaan, Room S.1.018

Email: lars.hausfeld@maastrichtuniversity.nl

- RM Fundamental Neuroscience:

Pilar Martínez, Psychiatry and Neuropsychology (FHML),

Phone: (0)43 38 81042, 40 Universiteitssingel, Room 2.574,

Email: p.martinez@maastrichtuniversity.nl

- RM Neuropsychology:

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience
Michael Schwartze, Neuropsychology and Psychopharmacology (FPN),

Phone (043) 38 82802, 40 Universiteitssingel, Room A2.765,

Email: michael.schwartze@maastrichtuniversity.nl

For the clinical part:

Ieke Winkens, Neuropsychology and Psychopharmacology (FPN),

Phone (043) 38 84512, 40 Universiteitssingel, Room A2.761,

Email: fpn-np-internship@maastrichtuniversity.nl

- RM Clinical Psychology:
Nicole Geschwind, Clinical Psychological Science (FPN),

Phone (043) 38 81487, 40 Universiteitssingel, Room 2.767,

Email: nicole.geschwind@maastrichtuniversity.nl

- RM Drug Development and Neurohealth:

Jacco Briedé, Toxicogenomics,

Phone (043)3881094, 50 Universiteitssingel, Room 4.114,

Email: j.briede@maastrichtuniversity.nl

Course objectives

Students are able to understand and apply:

conducting a (supervised) empirical research project and summarising the research and findings in the form of a master's thesis.

Prerequisites

The research internship cannot be started until:

- at least 60 credits have been attained during the programme;
- the above mentioned 60 credits must include the courses Advanced Statistics I and II.

PSY5121
Year
28 Oct 2024
31 Aug 2025
Print course description
ECTS credits:
25.0
Instruction language:
English

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

Coordinator:

- G.C. Kraag

Teaching methods:
Assignment(s), Paper(s), Research, Skills
Assessment methods:
Attendance, Final paper, Observation, Participation
Keywords:
Internship, Research, master's thesis
Faculty of Psychology and Neuroscience

Research Proposal

Full course description

The second part of the second year of the research master's programme is devoted to conducting a research internship. As a result of the many international research contacts that faculty members have established, a substantial number of students will conduct their research internship abroad. Students start their internship with the writing of a research proposal. Students finish the master's programme by writing a thesis based on their internship research project.

The internship can be completed at Maastricht University or at external research institutes. In all cases, a student's research proposal and master's thesis will be evaluated by two assessors. At least one of these assessors must be a member of the Faculty of Psychology and Neuroscience (FPN), the Faculty of Health, Medicine and Life Sciences (FHML), or the School of Business and Economics (SBE). Both assessors must hold a PhD degree.

A detailed guide on research internships and the master's thesis can be found on AskPsy > Curriculum > Internships.

Each specialisation has its own internship coordinator:

- RM Cognitive Neuroscience: to be announced

Lars Hausfeld, Cognitive Neuroscience (FPN),

Phone: (0) 43 38 84521, 55 Oxfordlaan, Room S.1.018

Email: lars.hausfeld@maastrichtuniversity.nl

- RM Fundamental Neuroscience:

Pilar Martínez, Psychiatry and Neuropsychology (FHML),

Phone: (0)43 38 81042, 40 Universiteitssingel, Room 2.574,

Email: p.martinez@maastrichtuniversity.nl

- RM Neuropsychology:

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience
Michael Schwartze, Neuropsychology and Psychopharmacology (FPN),

Phone (043) 38 82802, 40 Universiteitssingel, Room A2.765,

Email: michael.schwartze@maastrichtuniversity.nl

For the clinical part:

Ieke Winkens, Neuropsychology and Psychopharmacology (FPN),

Phone (043) 38 84512, 40 Universiteitssingel, Room A2.761,

Email: fpn-np-internship@maastrichtuniversity.nl

- RM Clinical Psychology:
Nicole Geschwind, Clinical Psychological Science (FPN),

Phone (043) 38 81487, 40 Universiteitssingel, Room 2.767,

Email: nicole.geschwind@maastrichtuniversity.nl

- RM Drug Development and Neurohealth:

Jacco Briedé, Toxicogenomics,

Phone (043)3881094, 50 Universiteitssingel, Room 4.114,

Email: j.briede@maastrichtuniversity.nl

Course objectives

Students are able to understand and apply:

conducting a (supervised) empirical research project and summarising the research and findings in the form of a master's thesis.

Prerequisites

The research internship cannot be started until:

- at least 60 credits have been attained during the programme;
- the above mentioned 60 credits must include the courses Advanced Statistics I and II.

PSY5107
Year
28 Oct 2024
31 Aug 2025
Print course description
ECTS credits:
1.0
Instruction language:
English

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

Coordinator:

- G.C. Kraag

Teaching methods:
Assignment(s), Paper(s), Research, Skills
Assessment methods:
Attendance, Final paper, Observation, Participation
Keywords:
Internship, research, master’s thesis
Thesis

Master's Thesis

Faculty of Psychology and Neuroscience

Master’s Thesis

Full course description

The second part of the second year of the research master’s programme is devoted to conducting a research internship. As a result of the many international research contacts that faculty members have established, a substantial number of students will conduct their research internship abroad. Students start their internship with the writing of a research proposal. Students finish the master’s programme by writing a thesis based on their internship research project.

The internship can be completed at Maastricht University or at external research institutes. In all cases, a student’s research proposal and master’s thesis will be evaluated by two assessors. At least one of these assessors must be a member of the Faculty of Psychology and Neuroscience (FPN), the Faculty of Health, Medicine and Life Sciences (FHML), or the School of Business and Economics (SBE). Both assessors must hold a PhD degree.

A detailed guide on research internships and the master’s thesis can be found on AskPsy > Curriculum > Internships.

Each specialisation has its own internship coordinator:

- RM Cognitive Neuroscience: to be announced

Lars Hausfeld, Cognitive Neuroscience (FPN),

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- RM Fundamental Neuroscience:

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Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience
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- RM Neuropsychology:

Michael Schwartze, Neuropsychology and Psychopharmacology (FPN),

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For the clinical part:

Ieke Winkens, Neuropsychology and Psychopharmacology (FPN),

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- RM Clinical Psychology:
Nicole Geschwind, Clinical Psychological Science (FPN),

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- RM Drug Development and Neurohealth:

Jacco Briedé, Toxicogenomics,

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Email: j.briede@maastrichtuniversity.nl

Course objectives

Students are able to understand and apply:

conducting a (supervised) empirical research project and summarising the research and findings in the form of a master's thesis.

Prerequisites

The research internship cannot be started until:

- at least 60 credits have been attained during the programme;
- the above mentioned 60 credits must include the courses Advanced Statistics I and II.

PSY5103
Year
28 Oct 2024
31 Aug 2025
Print course description
ECTS credits:

Research Master Cognitive and Clinical Neuroscience Specialisation Cognitive Neuroscience

14.0
Instruction language:
English
Coordinator:

- G.C. Kraag

Teaching methods:
Assignment(s), Paper(s), Research, Skills
Assessment methods:
Attendance, Final paper, Observation, Participation
Keywords:
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