Description of modules for the Master's course 2011/12

The English version is for general information only and not legally relevant.

Mast INS IN	**Introduction to Neurosciences**	C	15 CP

Series of lectures on selected topics in neurosciences I (WS)
Content: Cellular, molecular and physiological background to the function of nerve and glia cells. Mechanisms of signal transduction. Plasticity, learning, memory, sensory systems, motor control, nervous system function, basis of cognition, development of the nervous system, rhythmic control of nerve function and anatomy of the human brain.

Series of lectures on selected topics in neurosciences II (SS)
The lectures go into more detail about specific aspects of experimental neurology, pathology and diagnostics, including non-invasive analyses of the human brain, degenerative diseases of the nervous system and medical psychology.

Seminars relating to the lectures in selected topics in neurosciences I and II
The students will assess research papers relevant to the lectures

Introductory sessions
Introducing neurobiology research in Frankfurt. Presenting the Master's programme.

Colloquium
Participating in 7 neurobiology oriented colloquia at the institute

Weekend seminar
Presenting and discussing research projects within the Master's programme

Competence: The students gain broad interdisciplinary background knowledge about neurosciences and their possible applications. They learn about neuroscientific research concepts and should be in the position to link together various specific areas and paradigms in neurosciences. They will be able to critically assess scientific research papers in the form of an oral presentation.

Requirements for participating: None

Special note: Lectures and seminar presentations in English

Suitable for other courses: Master's course Faculty15

Times offered: Module covers the first two semesters of the course and starts in the winter semester

Conformation of module completion: Proof of participation in all units, whereby participation in one of the two seminars relating to the lecture series includes a seminar talk.

Cumulative module exams: One written exam (45 minutes long) per set of lectures (each at the end of a semester).

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Lectures on selected topics in neurosciences 1	**L**	**2**	3			
Seminars on selected topics in neurosciences 1	**S**	**1**	2			
Lectures on selected topics in neurosciences 2	**L**	**2**		3		
Seminars on selected topics in neurosciences 2	**S**	**1**		2		
Introductory session	**L/S**	**2**	2			
Colloquium	**Co**	**1**	1	1		
Weekend seminar	**S**	**1**	1			

Mast INS MN	**Methods in Neurosciences**	C 15 CP

Content: The module is a practical on “Introduction to scientific research techniques”. The aim is to teach the students as much as possible about the most important experimental techniques recommended for the specialised topics of their Master’s degree so that their thesis work can be completed successfully in the time available.

Competence: After completing the module, the students will be familiar with the basic techniques that apply directly to a Master’s project in their chosen topic. They will be able to efficiently find information about methods from publications and the Internet and evaluate the feasibility of carrying out experimental protocols. They will be competent in criticizing methods and assessing artefacts.

Requirements for participating: Successful completion of the module “Introduction to Neurosciences” as well as at least 3 out of the 4 elective modules

Special note: …

Suitable for other courses: No

Times offered: As of the third semester of the Master’s course (winter semester)

Conformation of module completion: Non-graded Conformation of participation in the form of a written practical protocol

Module completion exam: None

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Practical: Introduction to scientific research techniques	**P**	**15**			15	

Mast INS CC	**Current Concepts in Neurosciences**	C 16 CP

Content: The module includes a practical project and a seminar that aims to provide the students with the most important theoretical background for developing a research concept in one neurobiological topic. After working on recent scientific papers, they should identify critical unanswered questions as well as develop research strategies to solve them.

Competence: After completing the module, the students will be familiar with developing scientific research concepts as well as how to incorporate these into grant applications. The students will develop critical skills to assess the relevance and validity of different or even contradictory theories and research concepts.

Requirements for participating: Successful completion of the module “Introduction to Neurosciences” as well as at least 3 out of the 4 elective modules

Special note: …

Suitable for other courses: No

Times offered: As of third semester of the Master’s course (winter semester)

Conformation of module completion: 2 non-graded performance assessments, one for written research concepts and one for giving a talk in a seminar

Module completion exam: None

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Project work on developing a research concept	**Pr**	**15**			15	
Weekend seminar	**S**	**1**			1	

Mast INS MA	**Master's Thesis**	C	30 CP

Content: As part of the Master's degree a student uses scientific methods to work intensively and in detail on a particular question for a period of 6 months. The work can be experimental, empirical or analytic. The results must be written up in a Master's thesis in the style of a scientific paper. The quality of the work will be assessed based on the written thesis by the supervisor and a second referee.

Competence / learning and qualification aims:

- Ability to work intensively and in detail on a scientific question
- Producing a written work in the style of a scientific publication
- Practical application of modern research methods

Timing and duration of the module: The timing is open, the duration is 6 months

Requirements for participation: At least 75 CP as well as completion of the modules Mast INS and MN.

Special note: The Master's degree is usually supervised by a university professor who regularly organises compulsory or elective units in Master's courses.

Suitable for other courses: No

Conformation of completion (proof of participation or performance): None

Module completion exam: Written in the form of a Master's thesis (the grades will carry double the weight of the grades in all other modules).

Requirement for gaining credit points for the module: Passing the module exam.

			Semester/CP			
Unit	**Type**	**SWH**	**1**	**2**	**3**	**4**
Master's thesis	**MA**					30

Specialised Modules

All specialised modules are optional modules and each contributes 11 CP to the degree course. The distribution of practicals, seminars and individual lectures within a specialized module varies between the subject; similarly equating SWH to CP varies since there are different conversion factors in the various subject areas. The four required optional modules must be chosen from at least two different theme areas (see list of elective modules).

Specialized module theme area A: Basic Neurosciences

Mast INS A-1	**Cellular and Molecular Basis of Signal Transfer in the Nervous System**	O 15 CP

Content: The practical focuses on basic techniques used in cellular and molecular neurobiology. The students work on their own project with supervision, and present the results in the form of a seminar talk. In another seminar talk they assess an original piece of research from the field of cellular and molecular neurobiology. They learn how to present scientific work through writing up an appropriate result protocol. The main topics are: protein biochemistry methods to study nerve function, including sub-cellular fractionation, the basics of working with neuronal cell culture, cell transfection, and cytology of cultured cells and tissue sections from the brain, as well as working with digital images.

Competence: Familiarity with isolating neuronal cell organelles, independently characterising organelle proteins, sterile work and cultivation and transfection of cells, independently using a fluorescence microscope and computer-aided evaluation of lab data and image data, familiarity with anesthetising lab animals, independently working on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Lectures and protocols in English

Suitable for other courses: Master's course Faculty15

Times offered: Twice per year in the winter and summer semester, each in the first half; 4 weeks of whole day block practicals as well as 4 hours per week of seminars.

Conformation of module completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on current publications.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Cellular and molecular basis of signal transfer in the nervous system	**P, S**	**11**	11			

Mast INS A-2	**Auditory Neuroscience**	O 11 CP

Content: The practical teaches basic electrophysiological conductance techniques and bio-acoustic measuring techniques to investigate the auditory system in laboratory mammals and insects *in vivo*. The students work on their own projects with supervision, and present their results in the form of a seminar talk. In a further seminar talk they present an original piece of research from the field of auditory neurobiology. They learn how to present scientific work through writing up an appropriate result protocol. The main topics are: physiological properties of nerves in the midbrain and cortex, investigating active sensory amplification mechanisms in the inner ear, psychoacoustic analyses in humans, use of computer/software in evaluating data and generating stimuli.

Competence: Familiarity with carrying out electrophysiological experiments, measuring otoacoustic emissions, familiarity with anesthetising and surgical procedures in animal experiments, application of neuroanatomical techniques, learning how to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: Master's course Faculty15

Times offered: Twice per year in the winter and summer semester, each in the first half; 4 weeks of block practicals with seminars.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Auditory neuroscience	**P, S**	**11**	11			

Mast INS A-3	**Molecular Control of Neuronal Differentiation**	O 11 CP

Content: The practical addresses molecular biological, cell biological and immunohistological techniques for analysing neuronal differentiation. The students work on projects related to current research in the group and participate in the group's journal club and progress report seminars. In two seminar talks they present the thematic background to their project and their results. They learn how to present scientific work through writing up an appropriate result protocol.

Competence: Familiarity with carrying out molecular biological cell biological and immunohistological experiments, working on scientific questions.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: Master's course Faculty15

Times offered: Once a year in the winter semester, second half; 4-6 weeks of block practicals.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Molecular control of neuronal differentiation	**P, S**	**11**	11			

Mast INS A-4	**Functional Anatomy of the Retina**	O 11 CP

Content: The practical introduces histological techniques for visualising and documenting neuronal structures (fixation, dissection, immunostaining, microscopy, micro-photography) and as an example a glimpse into the neuronal switching circuits that determine the function of the mammalian retina.
The students work on their own projects under supervision and present their results in the form of a seminar talk. In an additional seminar talk they assess an original piece of research from the field of visual neurobiology. They learn how to present scientific work through writing up an appropriate result protocol.

Competence: Familiarity with carrying out immunocytochemical staining, using microscopes, working on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: Master's course Faculty15

Times offered: Once a year in the winter semester, first half; 4-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Functional anatomy of the retina	**P, S**	**11**	11			

Mast INS A-5	**Clock Mechanisms in Mammalian Neurons and Neuroendocrine Cells**	O 11 CP

Content: The practical presents the basics of generating endogenous circadian rhythms in mammalian neurons. Here, the students analyze the cellular and molecular elements for chronobiological behaviour, working under supervision, and write up the results. Then the results obtained are presented in the form of a seminar talk. In a further seminar talk they present original research from the area of chrononeurobiology. The following techniques will be introduced: immunohistochemistry, protein gel electrophoresis, RNA extraction, RT-PCR, densitometry.

Competence: Basic knowledge about cell and molecular biology, basic skills in neuroanatomy of the mammalian brain, basics in chronobiological systems biology, learning to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: Master's course Faculty15

Times offered: Once a year in the summer semester, first half; 4-week block practical.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Clock mechanisms in mammalian neurons and neuroendocrine cells	**P, S**	**11**		**11**		

Mast INS A-6	**Cellular and Molecular Biology of the Circadian System**	O 11 CP

Content: The practical provides a look into the basic circadian system in mammals. The students also work on their own projects under supervision. The results are recorded in the form of a protocol and presented as a seminar talk. In a further seminar talk the participants present a recent research paper from the area of circadian rhythms. The following molecular biology and cell biology techniques will be used: PCR, cloning, handling cell cultures, transfection of cell lines, *in situ* hybridisation, immunohistochemistry, Western blotting.

Competence: Familiarity with basic molecular biology and cell biology. Learning to work on scientific questions based on relevant publications. Writing up scientific work in the form of a written practical protocol.

Requirements for participating: None

Special note: Protocols and seminar talks in English

Suitable for other courses: Master's course Faculty15

Times offered: Once a year in the second half of the summer semester; 4-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Cellular and molecular biology of the circadian system	**P, S**	**11**		**11**		

Mast INS A-7	**Neurobiology of the nematode *Caenorhabditis elegans***	O 11 CP

Content: This practical focuses on basic methods for investigating the nervous system of *Caenorhabditis elegans*. As well as more general molecular biology methods, this involves genetic methods (crosses, genotyping) as well as simple behaviour assays without and with the effect of specific agonists for ligand mediated ion channels (nicotinic acetylcholine receptors, GABA receptors) that are used for general characterization of the function of neuromuscular synapses. In addition, cell biology methods for expression analysis of transgenes (GTP-fusion proteins) or endogenous proteins (using specific antibodies) in relation to the genetic background are part of the lab's standard repertoire. More specialised methods that are used are exogenous stimulation of neurons in *C. elegans* by light, transmitted by the transgene expressed, photo-activated cation channel rhodopsin-2, as well as electrophysiological conductance from *C. elegans* muscle cells (the latter only as a demonstration, since the method is too complicated to learn in 6 weeks).

The students work on a current research project under the supervision of a PhD student and present the results in the form of a seminar talk. They learn how to present scientific work through writing up their result protocol.

Competence: Familiarity with standard methods to analyse an invertebrate nervous system, genetic methods for making crosses, cell biology methods, molecular biology methods, learning to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Protocol and seminar talk

Suitable for other courses: Master's course Faculty15, Master's in Biochemistry

Times offered: 4-6 weeks in the lab, full-time

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Neurobiology of the nematode *Caenorhabditis elegans*	**P, S**	**11**	11			

Mast INS A-8	**Neuropharmacology**	WP 11 CP

Content: This module teaches principles and methods of neuropharmacology. Our lab works with animal models of neurodegenerative disease such as stroke and dementia of the Alzheimer type. We use in vitro- as well as in vivo-methods, with a focus on microdialysis which allows access to the extracellular fluid. In demonstrations and experiments, students will be trained to manufacture probes for microdialysis studies and will carry out measurements of neurotransmitters (e.g. acetylcholine, glutamate) and energy metabolites (glucose, lactate). Major topics will include investigations of the central cholinergic system and of the energy metabolism in the brain under ischemic conditions.
The students will write protocols for their own work and will analyze their data both graphically and statistically in a way that would permit publication; thus, the students will learn basics of scientific work. The individual projects will be presented as seminar talks at the end of the module. In a further seminar talk, they will present an original piece of research (publication) from the field of neuropharmacology.

Competence: Familiarity with biological and analytical experiments, basic knowledge in animal experimentation. Theory and practice of microdialysis, analysis of neurotransmitters and metabolites with chromatographic (HPLC) and enzymatic procedures. Addressing scientific questions with the help of relevant literature.

Requirements for participating: None

Special note: At least one talk and report in English.

Suitable for other courses: Master's and PhD courses at Goethe University.

Times offered: Twice per year in the winter and summer semester, always in the second half of the semester. Duration: 4 consecutive weeks.

Conformation of completion: Written protocols with data analysis, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific studies.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Neuropharmacology	**P, S**	**11**	11			

Mast INS A-9	**Cellular Neurophysiology of Dopaminergic Neurons**	O 11 CP

Content: The practical covers basic electrophysiological single cell techniques (patch-clamp recordings & extracellular electrodes) of the dopaminergic midbrain system of mice *in vivo* and *in vitro*. The students work on their own projects under supervision and present their results in the form of a seminar talk. In a further seminar talk they present an original piece of research from the field of basal ganglia neurophysiology and pathophysiology (e.g. Parkinsos's disease, schizophrenia, drug addiction). The main focuses are measuring and evaluating neuronal activity (current-clamp) and measuring (voltage-clamp) as well as biophysical and pharmacological characterisation of this neuronal activity mediated by synaptic and post-synaptic mechanisms (e.g. ion channels) with various configurations of the patch-clamp technique. This also includes using statistical evaluation methods. The students learn about the associated stochastic background and how to use the relevant software, which involves interdisciplinary cooperation with the BSc/MSc courses in mathematics.

Competence: Familiarity with carrying out electrophysiological experiments, measuring and analysing electrical activity of dopaminergic neurons *in vivo* and *in vitro*, using and evaluating the patch-clamp technique to characterise biophysical and pharmacological properties of synaptic and post-synaptic ion channels. Combination of the patch-clamp technique with neuroanatomical and immunohistological analyses. Basic computer modelling of neuronal activity. Stochastic description and statistical analysis of the recorded time sequence data. Understanding the molecular pathophysiological correlation between important diseases of the dopaminergic system and their corresponding mouse models.

Requirements for participating: None

Special note: Talks and protocol in English

Suitable for other courses: No

Times offered: Once a year in the summer semester, first half; 4-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Cellular neurophysiology of dopaminergic neurons	**P, S**	**11**		**11**		

Mast INS A-10	**Neurophysiology and Behaviour**	O 11 CP

Content: The practical investigates the neurophysiological basis of behaviour control. The students work on their own project on a theme defined together beforehand. The techniques that are taught include: cell physiology (patch-clamp conductance, intracellular conductance, calcium imaging, cell culture); neuroanatomy (staining methods, brain preparation, confocal laser microscopy, fluorescence microscopy); behavioural experiments (behaviour pharmacology, extracellular conductance, learning and memory, social behaviour). Insects (honey bees, drosophila) are used as model organisms. The principle areas are: how ion channels and transmitter receptors work, neuromodulation, learning behaviour, olfactory memory formation, and social behaviour of bees.

The students present their results in the form of a seminar talk and poster. In a further seminar talk they learn how to critically assess analytic physiological and behavioural research papers. These presentations are held in English and the students receive comprehensive feedback about the content and style of the presentation. They become familiar with writing a scientific publication by producing a protocol in the form of a paper.

After the individual experimental steps have been explained, the students mostly work independently, from planning to carrying out, writing up and evaluating the research data.

Competence: Planning, carrying out and evaluating neurobiology experiments, measuring ion flow; observing and quantifying behaviour; neuroanatomical methods. How to approach scientific questions, working with publications. Preparing scientific papers and presentations.

Requirements for participating: None

Special note: Talks, protocol and poster in English

Suitable for other courses: Master's degree Faculty15

Times offered: Twice a year in the winter and summer semester, each in the first half; 4-week block practical with seminars

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Neurophysiology and Behaviour	**P, S**	**11**	11			

Mast INS A-11	**Developmental Neurobiology**	O 11 CP

Content: The practical course offers basic theoretical and experimental knowledge in the area of developmental neurobiology. Principal areas of research are the development and plasticity of the synapse as well as migration of neurons during cortex development. The students take part in ongoing experiments in the laboratory to elucidate the molecular mechanisms of these processes. Their work includes: basic mouse genetics techniques and the handling of a mouse colony, processing of brain tissue for *in situ* hybridisation and immunohistochemisty, isolation of primary hippocampal and cortical neurons from mice, transfection of primary neurons, immunofluorescence microscopy, confocal microscopy, Biochemical techniques including protein gel electrophoresis, Western blotting and immunoprecipitation.

The results of the practical course are presented by every student in the form of a written protocol and a talk at the end of the course. The students also take part in the weekly lab meetings where they learn about the ongoing research of all the members of the group. In a Journal Club every student presents a recent publication in the field of their own projects.

Competence: Students learn the basic techniques for studying cellular and molecular neurobiology (as detailed above). By the end of the course they have been in direct contact with mice and learn how to handle a mouse colony. The students are in an international environment and learn how to write and communicate their results in English.

Requirements for participating: None

Special note: Communication, talks and protocol in English

Suitable for other courses: Master's degree Faculty15, also useful for the course "Cell Biology"

Times offered: Once a year in summer semester

Conformation of completion: Written practical protocol, and 2 talks

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Developmental neurobiology	**P, S**	**11**		**11**		

Mast INS A-12	**„The Neuro-Vascular Interface“**	O 11 CP

Content: The practical course offers basic theoretical and experimental knowledge in the area of the brain vasculature in developmental and pathological neurobiology. Principal areas of research are the development and maintenance of the blood-brain barrier (BBB), and its relevance for neuronal function. The students take part on ongoing experiments in the laboratory to elucidate the molecular mechanisms of BBB formation. Their work may include: basic mouse genetics techniques and the handling of transgenic mice (various reporter mouse strains for the Wnt pathway as well as conditional/inducible gain- and loss-of-functions strains), processing of brain tissue for in situ hybridization and immunohistochemisty, isolation of primary cortical microvessels from mice, transfection and infection techniques, immunofluorescence, confocal and live-cell microscopy, biochemical techniques including protein gel electrophoresis, Western blot and immunoprecipitation.

The results of the practical course are presented by every student on the form of a written protocol and a talk at the end of the course. The students also take part on the weekly lab meetings where they learn about the ongoing research of all the members of the group. In a Journal Club every student presents a recent publication on the field of their own projects.

Competence: Students learn the basic techniques to study cellular and molecular Neurobiology (as detailed above). By the end of the course they have been in direct contact with mice and/or cells in vitro and they learn how to appropriately handle mouse tissue and cells for experiments. The students are in an international environment and learn how to write and communicate their results in English.

Requirements for participating: none

Special information: Communication, presentations and protocol in english

Suitable for other courses: Master programs FB15 , especially for focus „*Cell Biology*“

Times offered: Once a year, first half of the summer semester, 4-weeks block practical

Confirmation of completion: Written practical protocol, 1 seminar talk on the results of one’s own experiments, 1 seminar talk on recent scientific papers (journal club)

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWS**	**Semester/CP**			
			1	**2**	**3**	**4**
The Neuro-Vascular Interface	**P,S**	**11**		11		

Mast INS A-13	**„Olfactory Processing – Behavioural Testing and *in vivo* Imaging “**	O 11 CP

Content: The practical course and seminars provide an interdisciplinary overview of sensory processing in the mouse olfactory system. Behavioral experiments include training of mice in an automated operant conditioning paradigm. Wildtyp and genetically modified mice will be tested. Physiological experiments include *in vivo* optical imaging using intrinsic signals in combination with odor stimulation as well as *in vivo* optical imaging using calcium sensitive fluorescent dyes and genetically encoded activity indicators such as synaptopHluorin. Students will analyze their recorded data using existing and newly generated scripts and functions in the Matlab programming environment. Aims and objectives are to understand and use various state of the art technique for measuring neuronal population activity in sensory systems.

During the seminars the used experimental techniques will be discussed in conjunction with different models of neuronal processing in sensory systems. The relevance of the *in vivo* experimental approaches for the understanding of sensory information processing will be examined using recent research papers.

Skills: Basic behavioral analysis, basics of optical *in vivo* measurements; anesthesia and surgical preparation; *in vivo* microscopy, strategies to approach scientific questions based on literature research and relevant publications.

Requirements for participating: Basic understanding of Matlab and/or C++ would be heplful

Special information: Presentations and protocol in English

Suitable for other courses:

Times offered: Once a year; second half of the summer semester; 6-week block practical.

Requested items for completion: Written protocol; one presentation of own experimental results; one presentation covering recent and relevant scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWS**	**Semester/CP**			
			1	**2**	**3**	**4**
Olfactory Processing – Behavioural Testing and in vivo Imaging	**P,S**	**11**		11		

Mast INS A-14	**Embryonic and Adult Neurogenesis**	O	11 CP

Content: Topic of this practical course are principles of neurogenesis in vertebrates, with special focus on cell intrinsic mechanisms governing cell fate specification and differentiation of adult and embryonic stem- and progenitor cells in the brain.

The students work on their own projects with supervision and present their results in the form of a seminar talk. In addition, one original publication from recent literature relevant to his/her research project will be presented and discussed. The results obtained during the course will be recorded in a written results protocol either in the form of a short research paper or of a short grant application in order to allow the students to gain first practical experience in these two important forms of scientific writing.

Competence: The practical course teaches basic techniques in cellular and molecular developmental neuroscience. Model organisms used are mice and chick embryos. Emphasis will be placed on retroviral gene transfer *in vivo* and *in vitro*; working with cell lines and primary cell cultures (embryonic and adult neural stem and progenitor cells); biochemical techniques (sub cellular fractionation, protein purification); immunohistochemistry, in situ hybridization; working with transgenic animals.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: Master's course Faculty15

Times offered: Once a year in the first half of the summer semester; 4 weeks of block practicals with seminars.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Embryonic and adult neurogenesis	**P, S**	**11**		11		

New Module probably as from winter term 2012/13 – to be approved by the medical department

Mast INS A-15	**Electrophysiology of the hippocampus during spatial navigation**	O 11 CP

Content: This practical will introduce students to the techniques used to examine neural activity in freely behaving animals. Students will record neural activity extracellularly from the hippocampus of mice performing a spatial working memory task and analyze the neural data in relation to the animal's behavior. Students will learn how to train animals to perform a behavioral task, how to perform extracellular recordings in freely behaving animals; how to extract the spiking of individual neurons as well as local field potentials from the neural data; and how to analyze these signals in relation to each other and the animals' behavior. Students will present the data they have collected and analyzed at the end of the practical. In addition, they are required to present one recent paper that is relevant to the work in a journal club.

Competence: Behavioral training; basic knowledge of techniques used to record and analyze neural activity from freely behaving animals; ability to generate scientific hypotheses based on previous literature and design experiments to test them.

Requirements for participating: None

Useful previous knowledge:

Special note: Talks and reports in English

Suitable for other courses:

Times offered: Once a year, during the winter semester, 4 weeks of block practicals with seminars.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Electrophysiology of the hippocampus during spatial navigation	**P, S**	**11**	**11**			

Specialised module theme area 2: Clinical Neurosciences

Mast INS B-1	**Ageing and Neurodegeneration**	O	11 CP

Content: The practical course introduces basic analysis techniques for mouse models of the neurodegenerative diseases Parkinson's and ataxia. The students are trained in objective methods to measure motor and behaviour patterns (Offenfeld, Rotarod, etc.), statistical evaluation for progression analyses (ANOVA, Regression, etc.) as well as molecular genetic mutation tests (tail biopsy, DNA extraction, quantitative PCR) and analysing the expression profile of mutated tissue. They work on current projects under supervision, report on up to date science in a Journal Club, and present the experimental results in the form of a seminar talk. They learn how to present scientific work through writing up a result protocol.

Competence: Basic knowledge about designing and carrying out motor-behaviour analyses in rodents as well as statistical evaluation. Learning methods in cell biology (fibroblasts/cell culture, transfection), molecular genetics/biology (quantitative PCR, Western blots), histological methods, learning to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Talks and protocol in English

Suitable for other courses: No

Times offered: Twice a year, in the second half of the summer or winter semester; 4-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Aging and neurodegeneration	**P, S**	**11**	11			

Mast INS B-2	**Physiology and Pharmacology of Pain**	O 11 CP

Content: The practical focuses on basic methods for investigating the mechanisms of how pain arises and particularly the pharmacology of this in various human, animal and cell culture models. Under supervision the students perform and document the experiments themselves in small groups. At the end of the practical the results are presented and discussed in a seminar talk. Current topics in pain research are presented and discussed in a Journal Club accompanying the practical, where each student prepares a talk on an recent research paper.

Competence: Familiarity with human pain models, observing the behaviour of experimental animals and presenting various pain models, preparing tissue for immunohistochemistry and Western blots, setting up neuronal cell culture, introduction to calcium imaging, measuring primary sensory neurons and pharmacological effects, learning about *in vitro* cell culture models for investigating the pharmacology of inflammation mechanisms, measuring inflammation mediators in a cell culture model, preparing scientific papers, preparing one's own results in the form of a talk and written protocol.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: No

Times offered: Once a year in the winter semester, first half; 4-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Physiology and pharmacology of pain	**P, S**	**11**	11			

Mast INS B-3	**Human Neuroanatomy and Neurohistology**	O 11 CP

Content: The module provides basic knowledge in human neuroanatomy and neurohistology and comprises lectures and a practical.

The topics addressed in the lectures are: meninges, blood vessels supplying the brain, development of the central nervous system, parts of the brain, building blocks of the nervous system, spinal cord with brachial and lumbosacral plexus, ascending and descending nerve tracts, rhombencephalon and mesencephalon, brain nerves, vestibular organs, cerebellum, diencephalons and neuroendocrine system, eyes and optical nerve, auditory tract, olfactory system, limbic system and neocortex.

The four-day practical concentrates on macroscopic anatomy of the brain and spinal cord, meninges, blood vessel supply, analysis of brain sections, and thin slice anatomy with imaging procedures; also working on microscopic anatomy of the spinal cord, cortex and cerebellum in terms of cyto-architecture, immunocytochemistry and Golgi silver staining. There is also a brief introduction to the neuropathology of neurodegenerative diseases (Parkinson's, Alzheimer's).

Competence: Knowledge about macro and micro-anatomy of the human brain; learning about the morphological background to understanding imaging procedures and structurally oriented neurobiology research methods, propaedeutic to neuropathology

Requirements for participating: None

Special note: None

Suitable for other courses: Master's degree Faculty15

Times offered: Once a year in the winter semester, second half

Conformation of completion: Regular attendance required

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Human neuroanatomy and neurohistology	**P, L**	**11**	11			

Mast INS B-4	**Plasticity in Hippocampus – Morphology, Physiology, and Clinical Relevance**	O 11 CP

Content: The practical and seminars provide an interdisciplinary overview of the plasticity of the hippocampus. Physiological experiments include conductance of electrical potential *in vivo* in hippocampal sections and section cultures, as well as how they are affected by electrical stimuli and pharmaceuticals. The aim is to learn the various standard techniques for analysing hippocampal plasticity and comparing how they are applied in research. Anatomical experiments demonstrate analyses of changes in cellular morphology following central nervous system damage, or neuronal over-stimulation.

The accompanying seminars compare the experimental models used for neurological diseases. The relevance of animal experimental models for understanding human diseases are discussed using examples from recent research papers.

Competence: Basic electrophysiological and anatomic techniques; preparing tissue slices and organ-specific slice cultures; confocal microscopy; learning how to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: Molecular medicine

Times offered: 4 times per year, first and second half of winter and summer semester; 4-week block practical.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Plasticity in hippocampus – morphology, physiology, and clinical relevance	**P, S**	**11**		**11**		

Mast INS B-5	**Motor Cortex Neurophysiology**	O 11 CP

Content: The practical teaches basic stimulation techniques (transcranial magnetic stimulation) for non-invasive and painless neurological analyses of the human corticospinal tract and motor cortex. The students learn about stimulation methods to determine the excitability of stimulatory and inhibitory networks in the motor cortex, and to characterise connections between the pre-motor region and the primary motor cortex. They work on current projects under supervision and present their results in the form of a seminar talk. They learn how to produce a scientific paper by writing a results protocol. In another seminar talk they present and critically assess a recent research paper on the theme of excitability / plasticity in the motor cortex.

Competence: Basic knowledge about designing and carrying out clinical neurophysiological experiments in humans, learning about physiolological methods (transcranial magnetic stimulation (TMS), MR-navigated TMS, electromyography), learning how to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: No

Times offered: Once a year in the summer semester, second half; 4-week block practical.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers).

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Motor cortex neurophysiology	**P, S**	**11**		**11**		

Mast INS B-6	Brain Damage and Neuroprotection	O 11 CP

Content: The practical involves experiments using the following methods: cultivating neuronal cells (primary cells and neuronal cell lines), inducing ischemia *in vivo* in rats, *in vitro* hypoxia/ischemia, application of further stress stimuli *in vitro*, assessing neuronal cell death and neuroprotection by cytokines and pharmaceuticals *in vitro* and *in vivo*, detecting proteins and other compounds in the cell using fluorescence and laser scanning microscopy, transcriptional stress responses in neurons as well as transfection techniques and live cell imaging.

Competence: Familiarity with cell culture techniques and molecular biological techniques in experimental neurosciences, knowledge about anesthetising and surgical approaches in animal experiments, learning how to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Practical / lab hospital block, talks and reports in English

Suitable for other courses: No

Times offered: Once a year in the summer semester, second half; 3-4-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers).

Module completion exam: Written exam (45 minutes)

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Brain Damage and neuroprotection	**P, S**	**11**		**11**		

Mast INS B-7	**Clinical Paediatric Neurology**	O 11 CP

Content: The practical investigates neurological questions in children. The main themes are developmental neurobiology in the first year of life, applied neurophysiology in children, neuropaedriatric medicine including epilepsy syndromes and neurotraumatology. The students take part in relevant investigations, write up an experimental protocol and present their results in the form of a seminar talk. They give an additional seminar talk on recent original research papers.

Competence: Familiarity with standard methods in clinical neuropaediatry, acquiring experience in handling patients as well as classifying typical clinical symptoms, learning how to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: 2-4 weeks of practicals and hospital work

Suitable for other courses: No

Times offered: Once a year in the winter semester, second half

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Clinical paediatric neurology	**P, S**	**11**	11			

Mast INS B-8	**Clinical Neuroimaging**	O 11 CP

Content: The practical provides an introduction to basic image analysis, image interpretation and acquiring data by examining the CNS (cerebral and spinal) with neuroradiological imaging procedures. The following procedures are used: molecular resonance tomography (MRT) of the head and spinal column, computer tomography (CT) of the skull and spinal column, digital cerebral and spinal subtraction angiography (DSA) as well as an introduction to basic neuroradiological intervention measures.

In addition, the practical presents the theoretical / physical background to individual analysis procedures in neuroradiology focussing on nuclear resonance tomography. This will deal with the physical basis of MRT / image composites, sequences and sequence parameters of MRT, diffusion and perfusion weighted MRT imaging, tractography (fibre tracking), functional MRT (fMRT), nuclear resonance spectroscopy analysis (MR spectroscopy).

The students compile a written protocol on the investigations carried out and present this along with the theoretical background in the form of a seminar talk.

Competence: Familiarity with neuroanatomy (cerebral/spinal) as well as the skull and spinal column; basic knowledge about relevant neurological diseases. Learning about indications for neuroradiological examination, acquiring and interpreting images as well as assigning them to typical individual clinical pictures.

Requirements for participating: None

Special note: None

Suitable for other courses: No

Times offered: In both halves of the winter and summer semester; each with a 6-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the methods covered and their practical / theoretic background.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Clinical neuroimaging	**P, S**	**11**	11			

Mast INS B-9	**Clinical Auditory Neuroscience**	O 11 CP

Content: The practical teaches most important basics of objective and subjective audiometric measurement techniques to assess hearing disorders. Pure tone and speech audiometry as well as clinical application of otoacoustic emissions, impedance measurements of the eardrum, and different methods of auditory brainstem response recording (BERA, CERA, ASSR, MMN) shall be demonstrated. The fitting of implantable hearing aids and cochlear implants will be shown in different patients. Intra-operative assessment of neuro-physiological auditory responses will be also part of the practical.

The students work on their own projects with supervision, and present their results in the form of a seminar talk. In a further seminar talk they present an original piece of research from the field of neuro-physiological stimulation/recording of auditory responses. They learn how to present scientific work through writing up an appropriate result protocol. The main topics are: psychoacoustic measurements of auditory perception with electrical stimulation by means of cochlear implants, investigation of different recording techniques to assess frequency specific responses of the auditory system, use of computer/software in evaluating data and generating stimuli.

Competence: Familiarity with carrying out psycho-acoustical experiments, measuring auditory brainstem responses, basics of audiometry, learning how to work on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Talks and reports in English

Suitable for other courses: Master's course Faculty15

Times offered: Twice per year, in the first half of the winter and summer semester; 4 weeks of block practicals with seminars.

Conformation of completion: Written practical protocol, one seminar talk on the results of one's own experiments, one seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Clinical Auditory neuroscience	**P, S**	**11**	11			

Specialised module theme area 3: Cognitive and computational neuroscience

Mast INS C-1	**Modern Non-Invasive Methods in Human Cognition Research**	O	11 CP

Content: The practical focuses on non-invasive techniques for measuring brain activity in humans that have significantly influenced recent cognition research. This includes functional magnetic resonance tomography (fMRT), EEG, including stimulation correlated potentials (SCP), and magnetic encephalography (MEG). Following a theoretical introduction to the basics of each method, the students carry out their own experiments on central cognitive functions such as perception, attention, working memory and speech. They should be made aware of the advantages and disadvantages of each method and learn the main steps in evaluating the results. The project topics should be related to current projects in the participating research groups in cognitive neurology and the Institute for Medical Psychology who are responsible for supervising the students. The results should be presented in the form of a seminar talk. A protocol should be written up in the style of a scientific paper. In an additional seminar talk the students should present and critically assess recent published research on a related theme.

Competence: Basic knowledge about the design and carrying out of cognitive experiments in humans, learning about relevant physiological methods (fMRT, EEG, MEG), learning about working on scientific questions based on relevant publications.

Requirements for participating: None

Special note: Protocols and seminar talks in English

Suitable for other courses: No

Times offered: Once a year in the summer semester, first half; 4-week block practical

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers.

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Modern non-invasive methods in human cognition research	**P, S**	**11**		**11**		

Mast INS C-2	**Cognitive Development across the Life-Span**	O 11 CP

Content: A: The module provides an introduction to numerous psychological methods, test procedures and techniques for measuring cognitive abilities in people from different age groups (infants, young children, school children, young adults, older people). These will be taught using examples of on-going experiments, available archived material as well as recent data and video material. One part of the course will address simultaneous psychological and fMRT measurements. With reference to early development stages of cognitive function, FIAS modelling adapted development steps will be carried out together with groups using connectionistic models.

Content B: Knowledge about the origin and changes in the cognitive system over the lifespan taking into account various development phases (normal versus atypical development); knowledge about experimental design and methods; acquiring information on human development at different levels (behaviour, brain activation, modelling) and linking these.

Competence: Familiarity with developmental psychology and the range of methods. Correlating psychological, behaviour-based measurements and imaging procedures; acquiring basic knowledge about modelling early cognitive development.

Requirements for participating: None

Special note: None

Suitable for other courses: BSc (diploma) and/or Master's in psychology (extra experience with research orientated practical and seminar)

Times offered: Practicals in the research unit Developmental Psychology are offered continuously, with space for ca. 2-3 practical students in the various projects following arrangement with the leader of the research unit. Seminars are held during the time of lectures.

Conformation of completion: A talk (possibly poster presentation) as well as written practical protocol

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Cognitive development across the life-span	**P, S**	**11**		**11**		

Mast INS C-3	**Modelling and Simulation**	O 11 CP

Content: This module is a combination of two modules, offered in the Master Program Informatics at Faculty 12 (Computer Science and Mathematics). The practical course “Modelling and Simulation I” (Master Program Informatics: M-SIM-PR) deals with the simulation of specific problems in science and technology. After an introduction to the basic simulation tools, participants process specific simulation tasks. The results are presented at the end of the course in the form of oral presentations that are graded.
The seminar (Master Program Informatics: M-NEURO-S) is concerned with the modelling of signal processing in neurons. Original papers are reviewed.

Competence: Familiarity with simulation tools (practical course), Competence in physical/mathematical approaches to problems in neurosimulation (seminar).

Requirements for participating: None

Helpful previous knowledge: Module M-SIM1 (Master Program Informatics), skills in programming (C**), basic lectures in mathematics, basic lectures in informatics

Special note: Teaching language usually is German

Suitable for other courses: Master course Faculty 12

Times offered: Practical course: twice per year, throughout the winter semester and throughout the summer semester; Seminar: once a year, throughout the winter semester

Confirmation of completion: see module completion exam

Module completion exam: Graded evaluation of the practical work and the corresponding oralpresentation in the practical course, and accepted draft and talk in the seminar

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Modelling and simulation	**P, S**	**11**	11			

Mast INS C-4	**Virtual Hippocampus – Introduction to Computational Neuroscience**	O 11 CP

Content: The practical and seminars provide an overview of computational and mathematical modeling of neural systems specifically focusing on modeling neurons and networks of the hippocampus. The course is an entry to the theoretical methods and approaches used to model the brain at different levels, ranging from synapses and dendrites to neurons and neural circuits. The aim is to learn standard techniques for building, managing, and using models that are closely linked to experimental data, especially those that involve hippocampal cells with complex anatomical and biophysical properties. Computational (in silico) experiments include large-scale network simulations in biophysically realistic and data-driven models of the hippocampus as well as single-cell simulations in morphologically reconstructed hippocampal neurons.

In the accompanying seminars, the relevance of computational models for understanding the function of the brain is discussed using examples from recent research papers.

Competence: basic cable and network modeling techniques; learning how to use NEURON (software for for empirically-based simulations of neurons and networks of neurons, http://www.neuron.yale.edu/neuron/); learning how to work on scientific questions based on relevant publications.

Requirements for participating: background in the physical sciences, mathematics or computer programming would be helpful but not necessary

Special note: Talks and reports in English

Suitable for other courses: Master's Program Computational Science

Times offered: Twice a year; first half of the winter semester; second half of the summer semester; 4-week block practical.

Confirmation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments, 1 seminar talk on recent scientific papers (journal club).

Module completion exam: Practical exam: solving a computational problem

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Virtual Hippocampus – Introduction to Computational Neuroscience	**P, S**	**11**	**11**			

Mast INS C-5	**“Studying Human Cognition with Magnetoencephalography”**	O 11 CP

Content: Core techniques of non-invasive human electrophysiology using a perceptual closure paradigm.

Students will create their own stimuli (Mooney faces) from photographs. In doing this, student's will learn the difference between feature based perceptual processes and knowledge based perceptual processes.The created stimuli will be tested in psychophysical measurements (accuracy, reaction times, D', A'). After selection of optimal stimuli, we will proceed with MEG measurements using these stimuli. Students will have the opportunity to operate the MEG systems themselves. Students will learn how to analyse the recorded MEG data using the open source software package Fieldtrip (http://fieldtrip.fcdonders.nl/) and will have the opportunity to compare results to previous in-house studies using similar content.

Competence: Knowledge on MEG signal generation and fundamental analysis techniques (event related fields, analysis of oscillatory activity), creating an experimental protocol using the software package „Presentation“, performing MEG measurements according to the Glasgow standards. Criticall evaluation of the student's own results and comparison to the literature will be a central part of of the Final protocol. Presentation of results in a scientific talk.

Requirements for participating: None

Special note: Protocol in English. There is the opportunity to get training in scientific writing once a week in the 'writer's club' of the MEG laboratory.

Suitable for other courses:

Times offered: Once per year, in the second half of the winter semester; 4 weeks of block practicals with seminars. (whole day, one afternoon off for working as an assistant, if desired)

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one’s own experiments

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Studying Human Cognition with Magnetoencephalography	**P, S**	**11**	11			

New Module as from summer term 2012

Mast INS C-7	**"Cognitive Neuroscience – Higher Cognitive Functions"**	O 11 CP

Contents: This practical course gives an overview of our research of the neural bases of higher cognitive functions, in the context of current projects in the areas of working memory, language processing, motion imagery and executive control functions. There may also be the opportunity to participate in developmental studies investigating neuro-cognitive development in primary school age. Depending on currently ongoing projects, the students can participate in neurocognitive studies (using techniques such as fNIRS, fMRI, EEG, or behavioral measurements) or in the area of signal processing of neurophysiological data. Aim of the practical course is to learn about the theoretical background of the projects, as well as data acquisition, data analysis, and interpretation of results. Students are encouraged to work independently.

Students are expected to write a protocal documenting their work in the lab. In an ongoing seminar, recent studies form the cognitive neuroscience literature are discussed and students will have the opprtunity to give a talk.

Competence: Cognitive and neurocognitive models, methods of experimental psychology, basics of acquisition and analysis of neurocognitive data. Learning how to work on scientific questions based on relevant publications.

Requirements for participating: none; basics in matlab or other programming language would be helpful

Special note:protocol and seminarwork in English; talk possibly in English

Suitable for other courses:

Times offered: once per year: second half of summer term, 4 weeks of block practicals with seminars.

Conformation of completion: Written practical protocol, 1 seminar talk on the results of one's own experiments or 1 seminar talk on recent scientific papers, 1 review on a relevant topic

Module completion exam: graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Cognitive Neuroscience – Higher Cognitive Functions	**P,S**	**11**		11		

New Module probably as from winter term 2012/13 – to be approved by the medical department

Mast INS C-8	**Cognitive and sensorimotor aspects of speech**	O 11 CP

Content: This module gives students the opportunity to study executive functions in the human brain using speech and language as object under investigation. This topic was chosen because it allows analysis of network dynamics underlying lateralization of brain function. We currently perform research on the mechanisms that underlie information processing in large scale networks and their contribution to lateralization. This involves studies in healthy participants and patient groups using magnetoencephalography and functional nuclear magnetic resonance imaging as well as electrocorticography in awake brain surgery patients. We thus have the possibility to study specific aspects of these functional networks at the appropriate resolution. Students will learn some of the aforementioned techniques and will deepen their knowledge on human-specific brain functions.
Students will acquire behavioural and functional imaging data and learn how to analyze them. The corresponding literature will be presented and discussed in the biweekly seminar. Besides these competences, students will learn to plan, perform and analyze studies on cognition and/or speech.
To assure high teaching quality, we can only accept 2-3 students at a time.

Competence: Acquisition and analysis of human functional imaging and behavioural data (patients and/or healthy controls). Learning how to work on scientific questions based on relevant publications.

Requirements for participating: None

Useful previous knowledge: Matlab

Special note: Talks and reports in English

Suitable for other courses: No

Times offered: Once a year; during the summer term; three days per week.

Conformation of completion: Written protocol, 1 seminar presentation on the results of one's own experiments, 1 seminar presentation on recent scientific papers.

Module completion exam: Graded protocol

Name of unit	**Form**	**SWH**	**Semester/CP**			
			1	**2**	**3**	**4**
Cognitive and sensorimotor aspects of speech	**P, S**	**11**		**11**		

Example of a course timetable

Semester	Unit	CP	Time required / when
1	Introductory unit (module: Introduction to Neurosciences)	0,5	1 week at semester start
	Lectures on selected topics in neurosciences I with seminars (module: Introduction to Neurosciences)	8	5 SWH
	Colloquium (1st or 2nd semester) (module: Introduction to Neuroscience)	0.5	0.5 SWH
	Weekend seminar (module: Introduction to Neurosciences, Current Concepts in Neurosciences)	1	1 SWH
	Elective module. 1	11	1st semester half
	Elective module 2	11	2nd semester half
2	Lectures on selected topics in neurosciences II with seminars (module: Introduction to Neurosciences)	5	3 SWH
	Colloquium (module: Introduction to Neuroscience)		See 1. semester
	Elective module 3	11	1st semester half
	Elective module 4	11	2nd semester half
3	Project work (module: Current Concepts in Neurosciences)	16	16 SWH, 6 weeks
	Module: Methods in Neurosciences	15	15 SWH, 6 weeks
4	Master's project	30	6 months
Total		120	

Compulsory module "Introduction to Neurosciences" (15 CP) in 1st and 2nd sem. covers
Introductory sessions (1 week); Lecture series 1 + 2 with seminars (WS & SS);
Colloquium; weekend seminar
Compulsory module "Current Concepts in Neurosciences" in 3rd semester (15 CP) covers
Project work; weekend seminar
Compulsory module "Methods in Neurosciences" in 3rd semester (15 CP) is a practical