Modules for Neuroscience

Background Modules

neu110 - Development and Evolution

Version of 1. Decision from 06.08.2015. / Version 1

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<td>• Master Neuroscience &gt; Background Modules</td>
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<td>Contact person</td>
<td>module responsibility</td>
</tr>
<tr>
<td></td>
<td>» Ulrike Sienknecht</td>
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<tr>
<td></td>
<td>» Alle hier genannten</td>
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<tr>
<td></td>
<td>» Hans Gerd Nothwang</td>
</tr>
<tr>
<td></td>
<td>» Christine Köppl</td>
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Prerequisites


Module contents Lectures on the fundamentals and concepts of developmental biology, and introduction to the development of the auditory system, including evolutionary aspects. Parallel seminars matching the topics of the lectures.

Recommended reading Gilbert S.F., Development, Macmillan Publishers Ltd;

Links

Language of instruction English

Duration (semesters) 1 semester

Module frequency jährlich

Module capacity unlimited

General information Course in the first half of the semester

Modullevel MM (Mastermodul)

Modulart Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

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Total attendance time of module 84
neu120 - Lab Exercises in Development and Evolution

Version of 1. Decision from 14.09.2015 / Version 1

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Contact person
- module responsibility
  - Ulrike Sienknecht
- authorized examiners
  - Alle hier genannten
  - Hans Gerd Nothwang

Prerequisites
- required previous credits

Skills to be acquired in this module
- Neurosci. knowlg. Expt. methods
- Independent research + Scient. literature + Social skills
- ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics
- Fundamentals and concepts of developmental and evolutionary biology

Module contents
- Lab exercises in comparative developmental biology on mouse and chicken embryos. Methods: in-ovo live observation; developmental stage discrimination and description, tissue preparation for histology, sectioning, staining, and microscopy

Recommended reading
- Gilbert S.F., Development, Macmillan Publishers Ltd

Links

Language of instruction
- English

Duration (semesters)
- 1 semester

Module frequency
- jährlich

Module capacity
- unlimited

General information
- Course in the first half of the semester

Modullevel
- MM (Mastermodul)

Modulart
- Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

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Course type
- SWS

Exercises
- 4

Seminar
- 0

Total attendance time of module
- 56
neu170 - Molecular Genetics and Cell Biology

Version of 1. Decision from 24.01.2017 / Version 1

Module label: Molecular Genetics and Cell Biology

Module code: neu170

Credit points: 15.0 KP

Workload: 450

Used in study courses:
- Master Neuroscience > Background Modules

Contact person:
- module responsibility
  - John Neidhardt
- authorized examiners
  - Alle hier genannten
- Module counseling
  - Karl-Wilhelm Koch
  - Kathrin Thedieck

Prerequisites:
- Neurosci. knowlg. + Expt. methods
- Independent research + Scient. literature + Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. Data present./disc.
- Scientific English Ethics

Skills to be acquired in this module:
- Genetic basis of diseases, inheritance patterns of diseases and gene therapeutic approaches
- Cell nucleus and genomic DNA, Nucleic acid structure and function
- Signaling and Cancer
- Gene expression
- RNA Processing
- Translation
- structures of proteins and protein functions
- Membranes and membran proteins
- Energie metabolism in the cell
- sequencing techniques and knowledge of several other selected lab techniques
- Basic knowledge of how to perform research projects.

Module contents:

Subjects of the lecture and seminar:
- Storing and processing of genetic information
- mutation analysis
- genetic high throughput techniques
- structure and function of proteins/membranes, cytoskeleton, meta-bolic signaling, molecular basis of neurodegenerative diseases.

Exercises: Learning current methods of human genetics, cellular and molecular neurobiology; introduction to cell cultivation techniques.

- DNA extraction and agarose gel analysis
- Sanger sequencing and sequence analysis
- PCR-based techniques
- bioinformatic analysis of high throughput data
- cell culture
- gene therapy of dominant diseases

Recommended reading:
- Several selected scientific papers for the seminar (selection may vary)
- Textbooks of Molecular Cell Biology; Alberts, Molecular biology of the cell

Links:

Language of instruction: English

Duration (semesters): 1 semester

Module frequency: jährlich

Module capacity: unlimited

General information:
Course in the first half of the semester
Version of 1. Decision from 24.01.2017. / Version 1

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### Type of program

### Previous knowledge

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<td>Presentation(s) within the frame of the seminar.</td>
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<td>Regular active participation is required for the module to be passed.</td>
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### Course type

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### Total attendance time of module

| Total attendance time of module | 140 |
neu190 - Biochemical concepts in signal transduction

Module label: Biochemical concepts in signal transduction
Module code: neu190
Credit points: 15.0 KP
Workload: 450

Used in study courses:
- Master Neuroscience > Background Modules

Contact person:
- Module responsibility: Karl-Wilhelm Koch
- Authorized examiners: Alle hier genannten
- Module counseling: Alexander Scholten

Prerequisites:
- Neurosci. knowlg. Expt. methods Independent research + Scient. literature + Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

Skills to be acquired in this module:
- know fundamental principles of molecular mechanisms of signal processing in cells
- know the properties and functional roles of proteins involved in signaling pathways
- have a basic understanding of structure-function relationships of receptor molecules (e.g. G-protein-coupled receptors) and their down-stream targets
- know the main hypotheses and their experimental confirmation in selected signal transduction pathways
- are able to discuss and present current concepts and knowledge of cellular signaling
- learn by selected experiments, how to study experimentally protein function in signaling
- are able to assess experimentally prepared data sets and have a good command of how to present them scientifically
- have a basic knowledge how to plan and perform a sequential set of experiments in molecular life sciences
- have a basic knowledge how to operate and use scientific equipment like spectrophotometer, fluorescence spectrophotometer, clean benches in cell culture and chromatographic systems (HPLC)

Module contents:
Lecture on the molecular fundamentals of cellular signal processes

Lecture topics:
- Introduction to the concept of signal transduction
- G protein-coupled receptors
- G proteins and effector molecules
- Biochemical properties of secondary messenger molecules
- Down-stream targets of secondary messengers and physiological responses
- Calcium and signaling networks
- Nitric Oxide and nitric oxide synthases
- Tyrosine-Kinase-receptors
- Signaling cascades of monomeric G proteins
- Molecular regulation of the cell cycle
- Biochemical aspects of sensory cells, their receptors and signaling pathways

Seminar:
Signal transduction
Students prepare presentations and discussions on current reviews written by leading experts in the fields; topics include: structural basis of G-protein coupled receptors, G proteins, adenylate cyclases, cyclic nucleotide research, calcium signaling, signal transduction in vision, ion channel function, nitric oxide synthase function.

Exercises:
Students perform experiments on cellular signal transduction and enzymology; they learn to express proteins in heterologous cell systems; they learn how to purify proteins and characterize them in subsequent assay systems.

Recommended reading:
Current reviews on topics of signal transduction as preparation for the presentation in the Seminar; list of reviews will be adjusted every year; Textbooks of cell biology and biochemistry. Alberts et al., Molecular Biology of the Cell, 5th edition or later; Stryer, Biochemistry, 7th edition or later; these textbooks are updated almost every 3 or 4 years.
Current literature on topics of signal transduction (as announced in the preparatory meeting).

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<tr>
<td>Language of instruction</td>
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<tr>
<td>Module capacity</td>
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<td>Regular active participation and seminar presentation(s) are required to pass the module.</td>
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**neu210 - Neurosensory Science and Behaviour - Part A**

Version of 1. Decision from 24.01.2017. / Version 1

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<td>Used in study courses</td>
<td>• Master Neuroscience &gt; Background Modules</td>
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**Contact person**

- module responsibility
- Georg Martin Klump
- authorized examiners
- Alle hier genannten
- Module counseling
- Ulrike Langemann
- Jannis Hildebrandt
- Henrik Mouritsen

**Prerequisites**

- Neurosci. knowlg. + Expt. methods + Independent research + Scient. literature + Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

Upon successful completion of this course, students

- know the fundamentals of behavioural ecology and neuroethology
- are able to present and critically assess scientific data and approaches

**Module contents**

The lecture “Neuroethology” provides an introduction to the mechanisms underlying the behaviour of animals. Subjects are, e.g., the mechanisms of perception, control of movement patterns, mechanisms of learning, orientation and navigation.

The lecture “Behavioural ecology” provides an introduction to topics such as predator-prey interactions, optimal food utilization, spatial and temporal distribution of animals, social relations and group formation, mating systems and reproductive strategies, sexual selection, investment of parents in offspring, and communication.

In the seminar “Current issues of Ethology”, current original literature relating to behavioural biology is reported and discussed.

**Recommended reading**


**Links**

- Language of instruction: English
- Duration (semesters): 1 semester
- Module frequency: jährlich
- Module capacity: unlimited

**General information**

Course in the second half of the semester

Regular active participation is required to pass the module.

**Modullevel**

MM (Mastermodul)

**Modulart**

Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

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**Course type**

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56
28
Module label: Neurosensory Science and Behaviour - Part B

Module code: neu220

Credit points: 6.0 KP

Workload: 180

Used in study courses: Master Neuroscience > Background Modules

Contact person:
- Module responsibility: Christiane Margarete Thiel
- Authorized examiners: Carsten Gießing
- Module counselling: Alle hier genannten

Prerequisites:
- Neurosci. knowlg. + Expt. methods
- Independent research + Scient. literature
- Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English
- Ethics

Upon successful completion of this course, students:
- know the fundamentals of neurotransmission
- know the basic neural mechanisms underlying attention, learning, emotion, language and executive functions
- understand the relationship between disturbances in neurotransmitter systems, cognitive functions and psychiatric disease
- know the principles of drug treatment for psychiatric disorders
- have in-depth knowledge in selected areas of these topics
- are able to understand, explain and critically assess neuroscientific approaches in animals and humans
- are able to understand and critically assess published work in the area of cognitive neuroscience

Module contents:
The lecture "Introduction to Cognitive Neuroscience" gives a short introduction into neuroanatomy and cognitive neuroscience methods and then covers different cognitive functions.

Lecture topics:
- History of cognitive neuroscience
- Methods of cognitive neuroscience
- Attention
- Learning
- Emotion
- Language
- Executive functions

The supervised exercise either deepens that knowledge by exercises or discussions of recent papers/talks on the respective topic covered during that week.

The lecture "Psychopharmacology" illustrates the connection between neurotransmitters and behaviour and its links to psychiatric disease. The lecture contains several interactive parts to consolidate and critically evaluate the acquired knowledge.

Lecture topics:
- Introduction to Terms and Definitions in Drug Research
- Dopaminergic and Noradrenergic System
- Cholinergic and Serotonergic System
- GABAergic and Glutamatergic System
- Addiction
- Depression
- Schizophrenia
- Anxiety
- Alzheimer's Disease

Recommended reading:

Links:
- Language of instruction: English
- Duration (semesters): 1 semester
- Module frequency: jährlich
- Module capacity: unlimited
- General information: Course in the second half of the semester
- Regular active participation is required to pass the module.
Version of 1. Decision from 15.08.2016. / Version 1

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<th>Modullevel</th>
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| Total attendance time of module | 56 |


neu240 - Computational Neuroscience - Introduction

Version of 1. Decision from 15.08.2016. / Version 1

Module label
Computational Neuroscience - Introduction

Module code
neu240

Credit points
9.0 KP

Workload
270

Used in study courses
• Master Neuroscience > Background Modules

Contact person
module responsibility
  • Jutta Kretzberg

authorized examiners
  • Alle hier genannten

Module counseling
  • Martin Greschner
  • Jannis Hildebrandt

Prerequisites
attendance in pre-meeting

Skills to be acquired in this module
Neurosci. knowlg. Expt. methods Independent research + Scient. literature + Social skills
Interdiscipl. knowlg. ++ Maths/Stats/Progr. + Data present./disc. ++ Scientific English Ethics
Upon successful completion of this course, students
have acquired good programming skills (in Matlab)
are able to implement and apply algorithms
have learned to handle scientific data independently
have acquired theoretical and practical knowledge of advanced data analysis techniques
know about computational model approaches on different levels of abstraction
know how to perform model simulations for single cells and small neuronal networks
can interpret simulation results in a neuroscientific context

Module contents
This course consists of four weeks with different topics, which are introduced in lectures,
discussed in depth using selected literature in the seminar and consolidated in computer-based
hands-on exercises (in Matlab). Portfolio tasks, mainly interpretation of programming results are
given every day.
Week 1: Background and Matlab preparation week
practice of programming principles (functions, scripts, if, loops, structures, cell arrays)
revision of neuroscience backgrounds (neuron, membrane, spike)
Week 2: Spike train analysis
response tuning, spike triggered average, receptive fields, linear-nonlinear model, spike
correlation, linear reconstruction, classification
Week 3: Neuron models
Conductance-based single cell models using differential equations (passive membrane
equation, integrate and fire, Hodgkin Huxley, alpha synapses)
Week 4: Network models
small networks (lateral inhibition, central pattern generator)
larger networks (Integrate and fire networks, rate models, inhibition-excitation balance, learning)

Recommended reading
Dayan / Abbott: Theoretical Neuroscience: Computational and Mathematical Modeling of Neural Systems. MIT
Press (More text books will be suggested prior to the course).
Scripts for each course day will be provided prior to / during the course
Copies of scientific articles for the seminar will be provided prior to the course

Links

Language of instruction
English

Duration (semesters)
1 semester

Module frequency
jährlich

Module capacity
unlimited

General information
Course in the first half of the semester

Modullevel
MM (Mastermodul)

Modulart
Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination
examination periods
Type of examination

Final exam of module
during the course
Portfolio, consisting of daily short tests, programming exercises and short reports

Course type
SWS
Offer rhythm
Workload attendance in hours
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neu241 - Computational Neuroscience - Introduction

Version of 1. Decision from 08.07.2017. / Version 1

Module label
- Computational Neuroscience - Introduction

Module code
- neu241

Credit points
- 12.0 KP

Workload
- 360

Used in study courses
- Master Neuroscience > Background Modules

Contact person

Prerequisites

Skills to be acquired in this module

Module contents

Recommended reading

Links

Language of instruction
- German

Duration (semesters)
- 1 semester

Module frequency
- jährlich

Module capacity
- unlimited

Modulelevel
- ---

Modulart
- je nach Studiengang Pflicht oder Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination

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Course type

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Total attendance time of module
- 0
### neu250 - Computational Neuroscience - Statistical Learning

**Version of 1. Decision from 15.08.2016. / Version 1**

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**Contact person**

- module responsibility
  - Jutta Kretzberg
  - Authorized examiners
  - Alle hier genannten
  - Module counseling
  - Jochem Rieger
  - Jörn Anemüller

**Prerequisites**

- Attendance in pre-meeting

**Skills to be acquired in this module**

- Upon successful completion of this course, students have refined their programming skills (in Matlab) in order to efficiently analyze large-scale experimental data
- are able to implement a processing chain of prefiltering, statistical analysis and results visualization
- have acquired an understanding of the theoretical underpinnings of the most common statistical analysis methods
- have practised using existing toolbox functions for complex analysis tasks
- know how to implement new analysis algorithms in software from a given mathematical formulation
- can interpret analysis results in a neuroscientific context
- have applied these techniques to both single channel and multi-channel neurophysiological data

**Module contents**

- Data preprocessing, e.g., artifact detection and rejection, filtering, z-scoring, epoching
- Data handling for high-volume data in Matlab
- Introduction to relevant analysis toolbox software
- Theory of multi-dimensional statistical analysis approaches, such as multi-dimensional linear regression, principal component analysis, independent component analysis, logistic regression, gradient-based optimization
- Practical implementation from mathematical formulation to software code, debugging and unit testing
- Postprocessing and results visualization
- Consolidation during hands-on computer-based exercises (in Matlab)
- Introduction to selected specialized analysis approaches during the seminar

**Recommended reading**

- More textbooks will be suggested prior to the course.
- Scientific articles: Copies of scientific articles for the seminar will be provided prior to the course

**Links**

- Language of instruction: English
- Duration (semesters): 1 semester
- Module frequency: Jährlich
- Module capacity: Unlimited
- General information:
  - Course in the first half of the semester
  - Students without Matlab experience should take the optional Matlab course (1 week) of Computational Neuroscience - Introduction
- Modullevel: MM (Mastermodul)
- Modulfar: Wahlpflicht

**Lern-Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

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<th>Type of examination</th>
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**Total attendance time of module** 56
# neu270 - Neurocognition & Psychophysics

Version of 1. Decision from 24.01.2017 / Version 1

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<td>- Master Neuroscience &gt; Background Modules</td>
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<td>module responsibility</td>
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<td>- Georg Martin Klump</td>
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<td>- Alle hier genannten</td>
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<td></td>
<td>- Christiane Margarete Thiel</td>
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<td>- Ulrike Langemann</td>
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<td>- Carsten Gießing</td>
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## Prerequisites

Skills to be acquired in this module
- Neurosci. knowlg. Expt. methods + Independent research + Scient. literature + Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English
- Ethics

The aim of the module is the study of different aspects of psychophysics or neurocognition. Students participate in ongoing projects and gain a first insight into topical research.

### Module contents

Students have the choice of two basic streams:
- Stream 1: “Neurocognition” comprises (i) an exercise “Introduction to MATLAB” [2 SWS], (ii) a lecture “Functional MRI data analysis” [2 SWS], and (iii) a practical course [5 SWS] and a seminar “Experiments on Neurocognition” [1 SWS] including aspects of planning, performance and analysis of functional neuro-imaging studies using MATLAB based software.
- Stream 2 "Psychophysics of Hearing" comprises (i) exercise “Introduction to MATLAB”, (ii) lecture and seminar “The sense of hearing”, and (iii) a laboratory project in which psychoacoustical experiments into the function of the auditory system are performed.

### Recommended reading

### Links

Language of instruction | English
Duration (semesters)    | 1 semester
Module frequency         | jährlich
Module capacity          | unlimited

### General information

Course in the second half of the semester
Regular active participation is required to pass the module

### Modullevel

MM (Mastermodul)

### Modular

Wahlpflicht

### Lern- /Lehrform / Type of program

**Vorkenntnisse / Previous knowledge**

### Examination

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**neu280 - Research Techniques in Neuroscience**

**Version of 1. Decision from 08.07.2017. / Version 1**

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**Lern-/Lehrform / Type of program**

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neu290 - Biophysics of Sensory Reception

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# neu305 - Essentials of fMRI Data Analysis with SPM and FSL

Version of 1. Decision from 08.07.2017. / Version 1

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**Contact person**

**Prerequisites**

**Skills to be acquired in this module**

**Module contents**

**Recommended reading**

**Links**

**Language of instruction** German

**Duration (semesters)** 1 semester

**Module frequency**

**Module capacity** unlimited

**Modullevel** ---

**Modulart** je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

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neu320 - Introduction to Neurophysics

Version of 1. Decision from 08.07.2017. / Version 1

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Total attendance time of module 0

21 / 49
Research Modules

neu410 - Auditory Neuroscience

Version of 1. Decision from 03.01.2017. / Version 1

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Used in study courses
- Master Neuroscience > Research Modules

Contact person
- module responsibility
  - Christine Köppl
- authorized examiners
  - Alle hier genannten
- Module counseling
  - Georg Martin Klump
  - Jannis Hildebrandt

Prerequisites

Skills to be acquired in this module
- + Neurosci. knowlg. Expt. methods Independent research Scient. literature + Social skills
- + Interdiscipl. knowlg. Maths/Stats/Progr. Data present./disc. + Scientific English + Ethics

Introduction to independent, experimental research in auditory sensory physiology. May serve as preparation for a Master thesis.

Upon successful completion of this course, students
- have profound knowledge on auditory sensory processing, including cochlear transduction mechanisms, central auditory processing and auditory psychophysiology
- have basic knowledge of the large range of techniques used in auditory research
- are able to read and critically report to others on an original research paper in auditory neuroscience
- have in-depth knowledge on a specific research question in auditory neuroscience
- are able to discuss current hypotheses and controversies regarding their research question
- are able to perform experiments addressing their research topic and can describe the principles and the pros and cons of the experimental technique used
- are able to critically evaluate and discuss experimental results

Module contents

One week introductory block course "Fundamentals of Auditory Physiology", comprised of a lecture series and matching seminar that emphasizes discussion.

Topics:
- Hair cells: structure, transduction mechanism, receptor potential, synaptic transmission
- Basilar papilla / cochlea: structure, micromechanics, amplification; otoacoustic emissions
- Auditory nerve: phase locking, rate coding. Excitation patterns
- Ascending auditory pathways: wiring, principles of excitation/inhibition, examples of cellular/molecular specialisations
- Sound localisation in birds and mammals
- Central auditory processing: imaging techniques, auditory streams, cortex, primates
- Relation between psychophysics and neurophysiology

The introductory course is followed by 6 weeks of small-group laboratory-based projects, participating in the supervisor's ongoing research. This includes experimental work, data analysis, literature study, participation in the group seminar and in a poster presentation of concurrent Research Modules.

There are three options for the lab projects:
- Option 1: Cochlea and auditory brainstem (Köppl)
- Option 2: Auditory cortex (Hildebrandt)
- Option 3: Central auditory mechanisms (Klump)

Recommended reading

About 20 selected original papers (selection varies)

Links

Language of instruction
- English

Duration (semesters)
- 1 semester

Module frequency
- jährlich

Module capacity
- unlimited

General information

Introductory block course will be held in the first week of winter term, lab component is flexible and subject to individual arrangement. Participation in a joint poster presentation of concurrent research modules is required to pass the module.
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### Lern-/Lehrform / Type of program

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### Vorkenntnisse / Previous knowledge

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**Total attendance time of module**: 140 hours
### Module: Visual Neuroscience (neu440)

**Version of:** 03.01.2017 / Version 1

**Module label:** Visual Neuroscience  
**Module code:** neu440  
**Credit points:** 15.0 KP  
**Workload:** 450

**Used in study courses:**  
- Master Neuroscience > Research Modules

**Contact person**

- Ulrike Janssen-Bienhold  
- Karin Dedek  
- Martin Greschner

**Module responsibilities**

**Contact:**

- Ulrike Janssen-Bienhold  
- Karin Dedek  
- Martin Greschner

**Prerequisites**

- Attendance in pre-meeting, priority is given to students who attended neu140 BM Neurophysiology and/or neu150 BM Neuroanatomy

**Skills to be acquired in this module**

- Neurosci. knowl.  
- Expt. methods  
- Independent research  
- Scient. literature  
- Independent research  
- Social skills  
- Interdiscipl. knowl.  
- + Maths/Stats/Progr.  
- Data present./disc.  
- Scientific English  
- Ethics  
- + During the module, the students acquire advanced theoretical knowledge of the molecular and cellular characteristics of retinal circuits and physiology.  
- + Students learn to plan and perform a research project independently (includes: literature research and usage of data banks (PUBMED, Gene Bank, Expasy etc.)  
- + Students are introduced to scientific writing / have to write a scientific report.  
- + Students acquire advanced skills in data analysis (including statistics, computational neuroscience, image analysis)  
- + The module can serve the purpose of preparing for a Master's thesis.

**Module contents**

1. Independent performance of an individual research project in small groups. Dates are individually arranged with the respective supervisor. Available project topics will be presented in the pre-meeting. Methods include:

   - Option 1: Molecular Neuroscience  
   - Option 2: Neuroanatomy  
   - Option 3: Neurophysiology

2. Participation in the "Journal club" seminar, including presentation of the project and the results obtained.

**Recommended reading**

- [http://webvision.med.utah.edu/](http://webvision.med.utah.edu/) (H. Holb et al., 2016) The organization of the retina and visual system
- 20 to 30 selected original papers on vision research (depending on individual project)

**Links**

**Language of instruction:** English  
**Duration (semesters):** 1 semester  
**Module frequency:** halbjährlich  
**Module capacity:** unlimited  
**General information**

- Regular active participation and presentation(s) within the scope of the seminar are required to pass the module. Furthermore, participation in a joint poster presentation of concurrent research modules is required to pass the module.

**Module level:** MM (Mastermodul)  
**Modalart:** Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

- *Flexible, after individual project*
- *Internship report*  
- *Offer rhythm*  
- *Workload attendance in hours*

**Course type**

<table>
<thead>
<tr>
<th>Type</th>
<th>SWS</th>
<th>Offer rhythm</th>
<th>Workload attendance in hours</th>
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<tbody>
<tr>
<td>Seminar</td>
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<tr>
<td>Practical</td>
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</table>

**Total attendance time of module:** 140
neu470 - Molecular Sensory Neuroscience

Module label: Molecular Sensory Neuroscience
Module code: neu470
Credit points: 15.0 KP
Workload: 450

Used in study courses:
- Master Neuroscience > Research Modules

Contact person:
- module responsibility
  - Karl-Wilhelm Koch
- authorized examiners
  - Alle hier genannten

Module contents:
- Theory and practice of topics related to issues in molecular sensory neuroscience;
- independent treatment of an individual project; acquiring an advanced theoretical knowledge in selected fields of the molecular biology of the cell (points of emphasis: genetics, biochemistry, cell biology; topics depending on working groups).
- There are several options for the lab projects, in the broad categories of:
  1. Protein function in neurosensory signaling (Koch)
  2. Neurosensory genetics (Nothwang)
  3. Metabolic signalling networks (Thedieck)
  4. Human genetics: mutation identification, pathogenic processes and therapy development (Neidhardt)

Prerequisites:
- + Neurosci. knowlg. Expt. methods Independent research Scient. literature + Social skills
- + Interdiscipl. knowlg. Maths/Stats/Progr. Data present./disc. + Scientific English + Ethics
- For students putting emphasis on cell biological, molecular biological, genetic, biochemical and/or neurobiological fields. The module can serve the purpose of preparing for a Master's thesis.
- Upon successful completion of this course, students have an advanced knowledge in molecular cell biology
- have acquired methodological and experimental skills in molecular cell biology
- have an advanced knowledge of how to perform research projects
- have advanced skills in presenting and discussing scientific data they have obtained, analysed and put in a wider framework of a current scientific topic.

Recommended reading:
- Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year.
- Textbooks of Cell Biology, Biochemistry, Genetics:
  - Alberts et al. Molecular Biology of the Cell (5th Edition or later); Stryer Biochemistry (7th Edition or later); Lehninger Biochemistry (4th Edition or later). These textbooks are updated almost every 3 or 4 years.

Links:
- Languages of instruction: German, English
- Duration (semesters): 1 semester
- Module frequency: halbjährlich
- Module capacity: unlimited
- General information: Time is flexible and subject to individual arrangement. An accepted internship report and participation in a joint poster presentation of concurrent research modules are required to pass the module.
- Modullevel: MM (Mastermodul)
- Modulart: Wahlpflicht

Lern-/Lehrform / Type of program:

Vorkenntnisse / Previous knowledge:

Examination:

- examination periods
- Type of examination: oral exam of 30 min. in Cell Biology, Genetics or

Final exam of module:
- as agreed; usually within 2 months of the conclusion
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<td>Biochemistry, depending on the chosen option</td>
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<td>Participation in seminar, Signed project report</td>
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<th>SWS</th>
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<tr>
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**Total attendance time of module** 140
**neu510 - Computation in Sensory Systems**

Version of 1. Decision from **03.01.2017** / Version **1**

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<tr>
<td>Workload</td>
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<td>Used in study courses</td>
<td>Master Neuroscience &gt; Research Modules</td>
</tr>
<tr>
<td>Contact person</td>
<td></td>
</tr>
<tr>
<td>module responsibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Jutta Kretzberg</td>
</tr>
<tr>
<td>authorized examiners</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alle hier genannten</td>
</tr>
<tr>
<td>Module counseling</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Martin Greschner</td>
</tr>
<tr>
<td></td>
<td>Jannis Hildebrandt</td>
</tr>
<tr>
<td></td>
<td>Jochem Rieger</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>attendance in pre-meeting, priority is given to students who attended BM Computational Neuroscience</td>
</tr>
<tr>
<td>Students perform individual research projects to learn:</td>
<td>• planning, performing and analyzing experiments and / or simulations • working with scientific background literature on the specific context of the project • oral presentation and discussion of backgrounds and results in the lab seminar • write a scientific report • prepare and present a scientific poster</td>
</tr>
<tr>
<td>Module contents</td>
<td>Students can choose between five options (explained in more detail during the pre-meeting): 1. invertebrate somatosensory system (Kretzberg) 2. vertebrate visual system (Greschner) 3. vertebrate auditory system (Hildebrandt) 4. human perception-action cycle (Rieger) 5. advanced analysis of physiological data (Anemüller) In options 1-4, depending on the student’s interests and background, projects can be focussed on • experiments (neurophysiology / behavior) • simulation • data analysis or • combinations of these approaches In all systems, project can be focussed on experiments (neurophysiology / behavior), simulation, data analysis or combinations of these approaches.</td>
</tr>
<tr>
<td>Recommended reading</td>
<td>Will be given to the students depending on the project</td>
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<td>English</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 semester</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
<td>unlimited</td>
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<tr>
<td>General information</td>
<td>The timing of individual projects can be discussed with the supervisor. Projects can also be scheduled during semester breaks, part-time options (lasting more than 7 weeks) are available. • priority for admission to the module is given to students who passed computational neuroscience background modules (neu240 / neu250) • Participation in a joint poster presentation of concurrent research modules is highly recommended.</td>
</tr>
<tr>
<td>Modullevel</td>
<td>MM (Mastermodul)</td>
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<tr>
<td>Modulart</td>
<td>Wahlpflicht</td>
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<table>
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<tr>
<td>Modul level</td>
</tr>
<tr>
<td>Type of program</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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<th>Examination</th>
<th>examination periods</th>
<th>Type of examination</th>
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<tr>
<td>Final exam of module</td>
<td>flexible, 6 weeks after individual project</td>
<td>Internship report</td>
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<table>
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<tr>
<th>Course type</th>
<th>SWS</th>
<th>Offer rhythm</th>
<th>Workload attendance in hours</th>
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**Total attendance time of module**: 140 hours
neu540 - Neural Basis of Perception

Version of 1. Decision from 03.01.2017. / Version 1

<table>
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<th>Module label</th>
<th>Neural Basis of Perception</th>
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<tr>
<td>Module code</td>
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<td>Credit points</td>
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<td>Workload</td>
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<td>Used in study courses</td>
<td>Master Neuroscience &gt; Research Modules</td>
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</table>

Contact person

- module responsibility
  - Jutta Kretzberg
- authorized examiners
  - Alle hier genannten

Module counseling

- Georg Martin Klump
- Henrik Mouritsen
- Michael Winklhofer

Prerequisites

attendance in pre-meeting, priority is given to students who attended at least one of the background modules listed as "recommended in combination with"

Skills to be acquired in this module

- Neurosci. knowlg.
- Expt. methods
- Independent research
- Scient. literature
- Independent research
- Social skills
- Interdiscipl. knowlg.
- Math/Stats/Progr.
- Data present./disc.
- Scient. English
- Ethics

Students perform individual research projects to learn:

- planning, performing and analyzing experiments and / or simulations
- working with scientific background literature on the specific context of the project
- oral presentation and discussion of backgrounds and results in the lab seminar
- write a scientific report
- prepare and present a scientific poster

Module can serve as preparation for a Master's thesis.

Module contents

Introductory lecture and seminar (either blocked or parallel to lab work) plus 6 weeks of small-group lab projects, participating in the supervisor's ongoing research, and in the respective group seminar. There are four options for the lab projects:

Option 1: Navigation mechanisms in nocturnal bird migration (Mouritsen) comprises (i) lecture "Bird migration", (ii) participation in group seminar, and (iii) a laboratory project "Navigation mechanisms in nocturnal bird migration" (flexible timing); including participation in investigations of navigation mechanisms in migratory birds (project focussing on behavioural biology, molecular biology or neuroanatomy).

Option 2: Invertebrate somatosensory system (Kretzberg), includes participation in group seminar, journal club and laboratory project (all flexible timing).

Option 3: Central auditory mechanisms (Klump), includes introductory block course "Fundamentals of Auditory Physiology" (one week at start of winter semester) , participation in group seminar and a laboratory project (flexible timing).

Option 4: Magnetic field perception (Winklhofer), includes participation in group seminar, journal club and laboratory project (all flexible timing, at some times additional topics are available in the group, e.g. visual behaviour of mice).

Recommended reading


Links

- Language of instruction: English
- Duration (semesters): 1 semester
- Module frequency: jährlich
- Module capacity: unlimited

General information

Please note that different options have mandatory course components at different times.

Priority for admission is given to students who attended at least one of the background modules listed as
Participation in a joint poster presentation of concurrent research modules is highly recommended.

<table>
<thead>
<tr>
<th>Module level</th>
<th>MM (Mastermodul)</th>
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</thead>
<tbody>
<tr>
<td>Modulart</td>
<td>Wahlpflicht</td>
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<td>Lern-/Lehrform / Type of program</td>
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<tr>
<td>Previous knowledge</td>
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<td>Examination examination periods</td>
<td>Type of examination</td>
</tr>
<tr>
<td>Final exam of module within 2 months after completion of experimental work</td>
<td>Internship report</td>
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<tr>
<td>Course type</td>
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<tr>
<td>Lecture</td>
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<td>Seminar</td>
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<td>Practical</td>
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<tr>
<td>Total attendance time of module</td>
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### neu570 - Development and Evolution of the Auditory System

**Module label**
Development and Evolution of the Auditory System

**Module code**
neu570

**Credit points**
15.0 KP

**Workload**
450

**Used in study courses**
- Master Neuroscience > Research Modules

**Contact person**
- module responsibility
  - Ulrike Sienknecht
- authorized examiners
  - Alle hier genannten
- Module counseling
  - Hans Gerd Nothwang
  - Christine Köppl
  - Hubert Löwenheim

**Prerequisites**

**Skills to be acquired in this module**
- Neurosci. knowlg. Expt. methods Independent research Scient. literature
- Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. Data present./disc.
- Scientific English
- Ethics

**Module contents**
Two-week introductory course into current research questions and techniques of the field; followed by 5 weeks of small-group lab projects, participating in the supervisor’s ongoing research, and in the group seminar. There are several options for the lab projects, in the broad categories of:
1. Molecular development and evolution of the peripheral auditory system (Sienknecht)
2. Molecular development and evolution of the central auditory system (Nothwang)
3. Comparative studies of the peripheral or central auditory system (Köppl)
4. Regenerative medicine of the auditory system (Löwenheim, Müller)

**Recommended reading**
Springer Handbook of Auditory Research (SHAR); Sanes et al. eds. Development of the Nervous System, Academic Press; and research papers (original papers and reviews)

**Links**

**Language of instruction**
English

**Duration (semesters)**
1 semester

**Module frequency**
jährlich

**Module capacity**
unlimited

**General information**
Course in the second half of the semester usually in winter term; lab component is flexible and subject to individual arrangement. Participation in a joint poster presentation of concurrent research modules is required to pass the module.

**Modullevel**
MM (Mastermodul)

**Modulart**
Wahlpflicht

**Vorkenntnisse / Previous knowledge**

**Examination**
- examination periods
- Type of examination

**Final exam of module**
- within 2 months after completion of experimental work
  - Portfolio: 60% presentation, 40% internship report (paper or poster format)

**Course type**
- SWS
  - Offer rhythm
  - Workload attendance in hours

| Lecture | 1 | 14 |
| Seminar | 1 | 14 |
| Exercises | 9 | WinSem | 126 |

**Total attendance time of module**
154
neu610 - External Research Project

Version of 1. Decision from 24.01.2017 / Version 1

Module label  | External Research Project
Module code   | neu610
Credit points | 15.0 KP
Workload      | 450

Used in study courses
- Master Neuroscience > Research Modules

Contact person
- module responsibility
  - Christine Köppl
- authorized examiners
  - Christine Köppl

Prerequisites
- project and supervisor(s) need to be approved by the exam board prior to the start of lab work

Skills to be acquired in this module
- + Neurosci. knowlg. Expt. methods Independent research Scient. literature + Social skills
- + Interdiscipl. knowlg. Maths/Stats/Progr. Data present./disc. + Scientific English Ethics

Students are introduced to independent research in a specific area of neuroscience by a scientifically working group outside of the regular Neuroscience faculty at the University of Oldenburg (usually a university, research institute, clinics or scientifically working company in Germany or abroad)

Students perform individual research projects to learn:
- planning and organization of a research project in a group outside of University of Oldenburg
- formulate a scientific hypothesis
- planning, performing and analyzing experiments and / or simulations
- working with scientific background literature on the specific context of the project
- oral presentation and discussion of backgrounds and results in the lab seminar
- write a scientific report in publication format
- prepare and present a scientific poster

Module contents
The External Research Module is carried out under the guidance and supervision of an experienced researcher who is not part of the regular Neuroscience faculty at the University of Oldenburg.
It comprises approximately 7 (minimum 5) weeks of experimental or theoretical work, individually or in small groups, and, usually, participation in a regular group seminar during that time.
After completion of the lab work, students will continue to be advised during the writing phase of the project report by the external supervisor and / or by a local Neuroscience faculty member.

Recommended reading
- Provided by external and / or local supervisor, depending on the project

Links

Language of instruction  | English
Duration (semesters)     | 1 semester
Module frequency          | halbjährlich
Module capacity           | unlimited

General information
- all members of the regular Neuroscience faculty at the University of Oldenburg can act as local supervisor, students should contact appropriate supervisors individually
- prior to project start, external and local supervisors must fill the learning agreement form
- the supervisor at the host institution is invited to submit a short written statement of assessment, final grading is done by the local supervisor
- participation in a joint poster presentation of concurrent research modules is highly recommended.

Modullevel  | MM (Mastermodul)
Modulart     | Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge
<table>
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<tr>
<th>Examination</th>
<th>examination periods</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>within 2 months after conclusion of lab work</td>
<td>internship report</td>
</tr>
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Skills Modules

**neu710 - Neuroscientific Data Analysis in Matlab**

Version of 1. Decision from 24.01.2017 / Version 1

<table>
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<td><strong>Credit points</strong></td>
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**Used in study courses**
- Master Neuroscience > Skills Modules

**Contact person**
- module responsibility
  - Jannis Hildebrandt
- authorized examiners
  - Jannis Hildebrandt

**Prerequisites**

**Skills to be acquired in this module**
- Neurosci. knowlg.
- Expt. methods
- Independent research
- Scient. literature
- Social skills
- Interdiscipl. knowlg.
- Maths/Stats/Progr.
- Data present./disc.
- Scientific English
- Ethics

Students should learn and practice basic programming concepts and apply them to neuroscientific data. Goal of the course is that students can write programs in Matlab to analyze their own data.

**Module contents**
The course is going to introduce the students both to the programming environment Matlab and its application in neuroscience data analysis. We will start with some general programming concepts and then quickly move on to hands-on examples of neuroscientific data. This includes - but is not limited to - the analysis of electrophysiological data, spike train analysis, image processing, statistical analysis and visualization. The students are encouraged to bring examples of data from experiments they have been involved in or are planning to do.

**Recommended reading**
Will be available in Stud.IP

**Language of instruction**
English

**Duration (semesters)**
1 semester

**Module frequency**
jährlich

**Module capacity**
unlimited

**Modullevel**
MM (Mastermodul)

**Modulart**
Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

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<th>Type of examination</th>
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<td>after the course</td>
<td>practical exercise</td>
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<th><strong>Offer rhythm</strong></th>
<th><strong>Workload attendance in hours</strong></th>
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<tr>
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**Total attendance time of module**
56
neu720 -

Version of 1. Decision from 01.10.2015. / Version 1

Module label

Module code neu720

Credit points 6.0 KP

Workload 180

Used in study courses

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Frühere Module
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Frühere Module
- Fach-Bachelor Biologie > Frühere Module
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > Frühere Module
- Fach-Bachelor Chemie > Frühere Module mehr...
- Fach-Bachelor Comparative and European Law > Frühere Module
- Fach-Bachelor Engineering Physics > Frühere Module
- Fach-Bachelor Informatik > Frühere Module
- Fach-Bachelor Interkulturelle Bildung und Beratung > Frühere Module
- Fach-Bachelor Mathematik > Frühere Module
- Fach-Bachelor Nachhaltigkeitsökonomik > Frühere Module
- Fach-Bachelor Pädagogik > Frühere Module
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Frühere Module
- Fach-Bachelor Physik > Frühere Module
- Fach-Bachelor Physik, Technik und Medizin > Frühere Module
- Fach-Bachelor Sozialwissenschaften > Frühere Module
- Fach-Bachelor Wirtschaftsinformatik > Frühere Module
- Fach-Bachelor Wirtschaftswissenschaften > Frühere Module
- Master Neuroscience > Skills Modules
- Zwei-Fächer-Bachelor Anglistik > Frühere Module
- Zwei-Fächer-Bachelor Biologie > Frühere Module
- Zwei-Fächer-Bachelor Chemie > Frühere Module
- Zwei-Fächer-Bachelor Elementarmathematik > Frühere Module
- Zwei-Fächer-Bachelor Ev. Theologie und Religionspädagogik > Frühere Module
- Zwei-Fächer-Bachelor Gender Studies > Frühere Module
- Zwei-Fächer-Bachelor Germanistik > Frühere Module
- Zwei-Fächer-Bachelor Geschichte > Frühere Module
- Zwei-Fächer-Bachelor Informatik > Frühere Module
- Zwei-Fächer-Bachelor Interdisziplinäre Sachbildung > Frühere Module
- Zwei-Fächer-Bachelor Kunst und Medien > Frühere Module
- Zwei-Fächer-Bachelor Materielle Kultur: Textil > Frühere Module
- Zwei-Fächer-Bachelor Mathematik > Frühere Module
- Zwei-Fächer-Bachelor Musik > Frühere Module
- Zwei-Fächer-Bachelor Niederlandistik > Frühere Module
- Zwei-Fächer-Bachelor Ökonomische Bildung > Frühere Module
- Zwei-Fächer-Bachelor Pädagogik > Frühere Module
- Zwei-Fächer-Bachelor Philosophie / Werte u. Normen > Frühere Module
- Zwei-Fächer-Bachelor Physik > Frühere Module
- Zwei-Fächer-Bachelor Politik-Wirtschaft > Frühere Module
- Zwei-Fächer-Bachelor Slavistik > Frühere Module
- Zwei-Fächer-Bachelor Sonderpädagogik > Frühere Module
- Zwei-Fächer-Bachelor Sozialwissenschaften > Frühere Module
- Zwei-Fächer-Bachelor Sportwissenschaft > Frühere Module
- Zwei-Fächer-Bachelor Technik > Frühere Module
- Zwei-Fächer-Bachelor Wirtschaftswissenschaften > Frühere Module

Contact person

module responsibility

○ Fabian Sobotka

authorized examiners

○ Fabian Sobotka

Prerequisites

Skills to be acquired in this module


- students learn the use of the software R in application scenarios
- students learn to actively "speak" the programming language R
- students practice statistical data analysis with R
## Module contents

The lecture gives an intuitive introduction into the use of the statistics software R. We start by introducing the basic handling of R and the syntax of its programming language. We use these to obtain the first statistical analyses from R. The next important step is to create informative graphics to represent the statistical results. Finally, we look into programming concepts that allow for more complex statistical analyses.

## Recommended reading

- Uwe Ligges - Programmieren mit R
- R Core Team - R: A language and environment for statistical computing
- Simon N. Wood - Generalized Additive Models: An Introduction with R

## Links

- **Language of instruction**: English
- **Duration (semesters)**: 1 semester
- **Module frequency**: jährlich
- **Module capacity**: unlimited
- **Modullevel**: MM (Mastermodul)
- **Modulart**: Wahlpflicht

## Learning/Teaching Form / Type of program

- **Previous knowledge**
- **Examination**
  - **Final exam of module**: after the course
  - **Type of examination**: practical exercise

## Examination periods / Type of examination

<table>
<thead>
<tr>
<th>Course type</th>
<th>SWS</th>
<th>Offer rhythm</th>
<th>Workload attendance in hours</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Exercises</td>
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</tbody>
</table>

## Total attendance time of module

56
neu730 -

Version of 1. Decision from 24.01.2017. / Version 1

Module label

Module code neu730
Credit points 6.0 KP
Workload 180

Used in study courses

- Fach-Bachelor Betriebswirtschaftslehre für Leistungssportlerinnen und Leistungssportler > Frühere Module
- Fach-Bachelor Betriebswirtschaftslehre mit juristischem Schwerpunkt > Frühere Module
- Fach-Bachelor Biologie > Frühere Module
- Fach-Bachelor Business Administration in mittelständischen Unternehmen > Frühere Module
- Fach-Bachelor Chemie > Frühere Module mehr...
- Fach-Bachelor Comparative and European Law > Frühere Module
- Fach-Bachelor Engineering Physics > Frühere Module
- Fach-Bachelor Informatik > Frühere Module
- Fach-Bachelor Interkulturelle Bildung und Beratung > Frühere Module
- Fach-Bachelor Mathematik > Frühere Module
- Fach-Bachelor Nachhaltigkeitsökonomik > Frühere Module
- Fach-Bachelor Pädagogik > Frühere Module
- Fach-Bachelor Pädagogisches Handeln in der Migrationsgesellschaft > Frühere Module
- Fach-Bachelor Physik > Frühere Module
- Fach-Bachelor Physik, Technik und Medizin > Frühere Module
- Fach-Bachelor Sozialwissenschaften > Frühere Module
- Fach-Bachelor Wirtschaftsmanagement > Frühere Module
- Fach-Bachelor Wirtschaftswissenschaften > Frühere Module
- Master Neuroscience > Skills Modules
- Zwei-Fächer-Bachelor Anglistik > Frühere Module
- Zwei-Fächer-Bachelor Biologie > Frühere Module
- Zwei-Fächer-Bachelor Chemie > Frühere Module
- Zwei-Fächer-Bachelor Elementarmathematik > Frühere Module
- Zwei-Fächer-Bachelor Ev. Theologie und Religionspädagogik > Frühere Module
- Zwei-Fächer-Bachelor Gender Studies > Frühere Module
- Zwei-Fächer-Bachelor Germanistik > Frühere Module
- Zwei-Fächer-Bachelor Geschichte > Frühere Module
- Zwei-Fächer-Bachelor Informatik > Frühere Module
- Zwei-Fächer-Bachelor Interdisziplinäre Sachbildung > Frühere Module
- Zwei-Fächer-Bachelor Kunst und Medien > Frühere Module
- Zwei-Fächer-Bachelor Materielle Kultur: Textil > Frühere Module
- Zwei-Fächer-Bachelor Mathematik > Frühere Module
- Zwei-Fächer-Bachelor Musik > Frühere Module
- Zwei-Fächer-Bachelor Niederländisch > Frühere Module
- Zwei-Fächer-Bachelor Ökonomische Bildung > Frühere Module
- Zwei-Fächer-Bachelor Pädagogik > Frühere Module
- Zwei-Fächer-Bachelor Philosophie / Werte u. Normen > Frühere Module
- Zwei-Fächer-Bachelor Physik > Frühere Module
- Zwei-Fächer-Bachelor Politik-Wirtschaft > Frühere Module
- Zwei-Fächer-Bachelor Slavistik > Frühere Module
- Zwei-Fächer-Bachelor Sozialpädagogik > Frühere Module
- Zwei-Fächer-Bachelor Sozialwissenschaften > Frühere Module
- Zwei-Fächer-Bachelor Sportwissenschaft > Frühere Module
- Zwei-Fächer-Bachelor Technik > Frühere Module
- Zwei-Fächer-Bachelor Wirtschaftswissenschaften > Frühere Module

Contact person

module responsibility

- Christine Köppl

authorized examiners

- Alle hier genannten

Module counseling

- Ulrike Sienknecht

Prerequisites

Skills to be acquired in this module

Basic knowledge of non-biological aspects of professional life (e.g., law, management, languages)
Ability to communicate scientific concepts, both orally and in writing
Ability to work in a team
Acquiring an in-depth knowledge of subject-specific concepts and facts
Introduction to non-university workplaces
Knowledge of safety and environmental concerns in bioscientific workplaces

**Module contents**
Introduction to the legal framework and the application procedures for experimental work with animals, humans and genetically modified organisms.
Critical and evidence-based evaluation of the pros and cons of bioscientific questions of public interest, e.g., the use of genetically modified organisms in food production.
Critical definition and discussion of ethical conflicts in biological research, e.g., stem cell research or data manipulation.
Problem-based, independent research of the scientific background by a team of students is an integral part of this module.

**Recommended reading**
Current law and interpretative commentaries, e.g., by the German Research Council (DFG) or the German Ethics Panel.
Introductory papers aimed at lay persons, e.g. from “The Scientist” or widely respected newspapers.
Problem-based, independent search for relevant scientific literature is an integral part of this module.

**Links**
Languages of instruction: German, English

**Duration (semesters)**
1 semester

**Module frequency**
jährlich

**Module capacity**
unlimited

**Modullevel**
PB (Professionalisierungsbereich)

**Modulart**
Ergänzung/Professionalisierung

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
<thead>
<tr>
<th>Examination</th>
<th>examination periods</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>innerhalb weniger Wochen nach Ende der SS-Vorlesungszeit</td>
<td>Hausarbeit (100%) (max. 10 Seiten) Um sich für die Prüfung zu qualifizieren, ist die regelmäßige Teilnahme während des Semesters (max. 3 Fehltermine) erforderlich. Durch aktive Beteiligung während des Semesters kann eine Leistung erzielt werden, die sich als Bonus mit der Prüfung verrechnet. Eine aktive Beteiligung besteht in regelmässigen Wortbeiträgen zu den Gruppendiskussionen, die über die selbst gehaltenen Referate hinausgehen. Durch den Bonus verbessert sich die Prüfungsnote um eine Stufe (0,3 bzw. 0,4). Diese Leistung ist freiwillig, auch ohne einen Bonus kann die Prüfung mit 1,0 bestanden werden. Ein Bonus führt nicht dazu, dass eine nicht bestandene Prüfung bestanden ist.</td>
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**Course type**

<table>
<thead>
<tr>
<th>Course type</th>
<th>SWS</th>
<th>Offer rhythm</th>
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<td>28</td>
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</table>

**Total attendance time of module**
56
neu750 - Laboratory Animal Science

Version of 1. Decision from 24.01.2017 / Version 1

Module label Laboratory Animal Science
Module code neu750
Credit points 6.0 KP
Workload 180

Used in study courses
- Master Neuroscience > Skills Modules

Contact person

module responsibility
- Christine Köppl

authorized examiners
- Alle hier genannten

Module counseling
- Ulrike Langemann
- Georg Martin Klump
- Arne Nolte
- Gabriele Gerlach

Prerequisites

Skills to be acquired in this module
- Neurosci. knowlg. Expt. methods + Independent research + Scient. literature Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. Data present./disc. + Scientific English Ethics

Upon successful completion of this course, students

- know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language
- understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint
- have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents and birds)
- are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation
- have practical skills in handling small rodents and birds
- have profound knowledge of anaesthesia, analgesia and basic principles of surgery
- have practised invasive procedures and euthanasia

NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments“ and EU directive D „Persons killing animals“ for rodents, birds and fish. We aim to obtain accreditation by the Federation of European Laboratory Animal Science Associations (FeLaSa) by mid-2017.

Module contents

Background knowledge on:
- Legislation, ethics and the 3Rs
- Scientific integrity
- Data collection
- Basic biology of rodents, birds and fish
- Husbandry, and nutrition of rodents, birds and fish
- Animal Welfare
- Health monitoring
- Pain and distress
- Euthanasia

Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every partipant:

- Handling and external examination of mouse, gerbil, zebra finch, chicken, zebra fish
- Administration of substances, blood sampling
- Euthanasia and dissection
- Transcardial perfusion
- Anaesthesia and surgery

Recommended reading

"LAS interactive" internet-based learning platform

Links
**Version of 1. Decision from 24.01.2017. / Version 1**

<table>
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<tr>
<th>Language of instruction</th>
<th>English</th>
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<td>Module capacity</td>
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**General information**
Course in the semester break
In addition to the exam, completion of an assignment is required to pass the module.
GV-SOLAS accreditation aimed for in 2016, FELASA in 2017

**Modullevel**
MM (Mastermodul)

**Modulart**
Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

<table>
<thead>
<tr>
<th>Examination</th>
<th>examination periods</th>
<th>Type of examination</th>
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<td>within 2 months of completing the course</td>
<td>Written exam of 90 min.</td>
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**Course type**

| Lecture | 2 | 28 |
| Exercises | 3 | 42 |

**Total attendance time of module** 70
neu751 - Laboratory Animal Science

Version of 1. Decision from 08.07.2017. / Version 1

<table>
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<td>Skills to be acquired in this module</td>
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<tr>
<td>Module contents</td>
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<td>Recommended reading</td>
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<td>Links</td>
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<tr>
<td>Language of instruction</td>
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<td>Duration (semesters)</td>
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<td>Module capacity</td>
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<tr>
<td>Module level</td>
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<td>Modulart</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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<table>
<thead>
<tr>
<th>Lern-/Lehrform / Type of program</th>
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</thead>
<tbody>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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**neu760 - Scientific English**

**Version of 1. Decision from 15.08.2016. / Version 1**

<table>
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<th>Module label</th>
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<td>Credit points</td>
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<tr>
<td>Used in study courses</td>
<td>Master Neuroscience &gt; Skills Modules</td>
</tr>
</tbody>
</table>

**Contact person**

- module responsibility
  - Jannis Hildebrandt
- authorized examiners
  - Jannis Hildebrandt

**Prerequisites**

non-native speakers

**Skills to be acquired in this module**


Upon completion of this course, students

- have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience
- are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation
- are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone)
- are able to recognize and avoid common errors of non-native speakers.

**Module contents**

Lectures cover

- characteristics of the different forms of scientific presentations
- sentence structure using the passive voice
- scientific vocabulary and terminology as contrasted to common speech
- appropriate language for communication with scientific editors and referees

Students read neuroscience texts of an advanced level and practice explaining and presenting these in both written and oral form. They also practice different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone). Emphasis is placed on individual problems in pronunciation and language use errors.

**Recommended reading**

http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf

**Language of instruction**

English

**Duration (semesters)**

1 semester

**Module frequency**

jährlich

**Module capacity**

unlimited

**General information**

Usually held in the break before summer term

Additional teachers in the module: outsourced to STELS-OL (Scientific and Technical English Language Service, Oldenburg); native English speaker with in-depth neuroscience knowledge

**Modullevel**

Abschlussmodul (Abschlussmodul)

**Modulart**

Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

examination periods

**Type of examination**


<table>
<thead>
<tr>
<th>Examination</th>
<th>examination periods</th>
<th>Type of examination</th>
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<tbody>
<tr>
<td>Final exam of module</td>
<td>within 2 months of completing the course</td>
<td>Portfolio: 50% presentation, 50% assignment; bonus for active participation</td>
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<table>
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**Total attendance time of module**: 56
neu770 - Basics of Statistical Data Analysis

Version of 1. Decision from 24.01.2017 / Version 1

Module label  Basics of Statistical Data Analysis
Module code  neu770
Credit points  6.0 KP
Workload  180

Used in study courses
- Fach-Bachelor Physik, Technik und Medizin > Aufbaumodule
- Master Neuroscience > Skills Modules

Contact person
module responsibility
  - Fabian Sobotka
authorized examiners
  - Fabian Sobotka

Prerequisites
Skills to be acquired in this module
- Social skills
- Interdiscipl. knowl.
- +Maths/Stats/Progr.
- + Scientific English

Upon successful completion of this course, students
- have basic statistical competencies for understanding data
- understand the main statistical methods and their practical use through application
- can evaluate statistical methods regarding the qualities and their limits

Module contents
- populations and samples; exploratory data analysis through describing statistics
- elementary probabilities and random variables
- important discrete and continuous distributions
- estimating parameters through the method of maximum likelihood
- confidence intervals and classical significance testing
- pairs of random variables; distribution and dependence
- classical regression analysis
- basic use of the software R to apply those methods

Recommended reading
Will be available in Stud.IP

Links
Language of instruction  English
Duration (semesters)  1 semester
Module frequency  jährlich
Module capacity  unlimited
Modullevel  MM (Mastermodul)
Modulart  Wahlpflicht

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

Examination  examination periods
Type of examination

Final exam of module  after the course
written exam

Course type  SWS
Offer rhythm  Workload attendance in hours
Lecture  2  28
Seminar  2  28

Total attendance time of module  56
**neu780 - Introduction to Data Analysis with Python**

**Module label**: Introduction to Data Analysis with Python  
**Module code**: neu780  
**Credit points**: 6.0 KP  
**Workload**: 180

- **Used in study courses**:
  - Master Neuroscience > Skills Modules

**Contact person**  
**Prerequisites**

**Skills to be acquired in this module**

**Module contents**

**Recommended reading**

**Links**

**Languages of instruction**: German, English  
**Duration (semesters)**: 1 semester  
**Module frequency**: unlimited  
**Modullevel**: BC (Basicscurriculum / Base curriculum)  
**Modulart**: Wahlpflicht / Elective

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

**Final exam of module**

<table>
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<th>SWS</th>
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<th>Workload attendance in hours</th>
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<tr>
<td>Exercises</td>
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<td>SumSem and WinSem</td>
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</tbody>
</table>

**Total attendance time of module**: 56
# neu790 - Communicating Neuroscience

**Version of 1. Decision from 08.07.2017. / Version 1**

<table>
<thead>
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<th><strong>Module label</strong></th>
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</table>

**Prerequisites**

**Skills to be acquired in this module**

**Module contents**

**Recommended reading**

**Links**

**Language of instruction**

German

**Duration (semesters)**

1 semester

**Module frequency**

unlimited

**Module level**

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**Modular**

je nach Studiengang Pflicht oder Wahlpflicht

**Lern-/Lehrform / Type of program**

**Vorkenntnisse / Previous knowledge**

**Examination**

<table>
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<tbody>
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<td>Final exam of module</td>
<td>PF</td>
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</table>

**Course type**

Seminar

**SWS**

0

**Workload attendance**

0
neu800 - Introduction to Matlab

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<table>
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<td>Module contents</td>
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<tr>
<td>Recommended reading</td>
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<td>Links</td>
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<tr>
<td>Language of instruction</td>
<td>German</td>
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<td>Duration (semesters)</td>
<td>1 semester</td>
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<tr>
<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<td>Modullevel</td>
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<tr>
<td>Modulart</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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| Language of instruction | German |
| Duration (semesters)    | 1 semester |
| Module frequency        |          |
| Module capacity         | unlimited |
| Modullevel              | ---      |
| Modulart                | je nach Studiengang Pflicht oder Wahlpflicht |

Lern-/Lehrform / Type of program

Vorkenntnisse / Previous knowledge

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<th>Type of examination</th>
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Total attendance time of module

0