Module name: Clinical Neurobiology

**Identification number**
03-TN-NB

**Credits**
10

**Workload**
300 h

**Frequency of occurrence**
Winter term

**Duration**
1 semester

<table>
<thead>
<tr>
<th>1</th>
<th>Type of lessons</th>
<th>Contact times**</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Lecture (L)</td>
<td>a) 28 h b) 26 h</td>
<td>246 h (Preparing and reworking matters of L; Preparing oral presentations)</td>
<td>a) 25 students</td>
</tr>
<tr>
<td></td>
<td>b) Seminar (S)</td>
<td></td>
<td></td>
<td>b) 6-7 students / supervising tutor</td>
</tr>
</tbody>
</table>

**Learning outcomes**
Students who successfully completed this module will have acquired insights into current theoretical concepts in neurobiology. The students will examine clinical aspects of neurobiology with a focus on the molecular, cellular and physiological mechanisms. Additionally, they will have learned how to evaluate and present data in oral form. Furthermore, the students will learn to critically read scientific publications in the field of neurobiology and will be taught in the ability to extract relevant information from the original literature.

**Skills & Methods**
critical reading, evaluation and presentation of original literature, establishing of a deep understanding of theoretical aspects in neurobiology by extracting results, the underlying experiments, and the modern interpretation from scientific work.

**Contents Main topics:**
- Lecture: Students will get a theoretical introduction into the neurobiology and clinical neurobiology. 
  Topics are: Introduction to Neuron and Glia, Ion channels and Membrane Potential
- Ion Channelopathies Synapses, Transmitter release, NMJ, Myasthenia gravis, Cerebellum, Basal Ganglia, Ataxia and Mtorus Parkinson
- The literature seminar bases on fundamental literature of lecture-relevant topics to document the experiments underlying our present knowledge in neurobiology.

**Teaching methods**
Lectures; Seminar

**Requirements for participation**
Bachelor; enrollment in the Master’s program “Translational Neurosciences”

**Additionally:** basic knowledge in physics, anatomy and physiology, biology

**Type of examinations**
Exam prerequisites: Regular and active participation
Exams: lecture - written exam (90 min, accounts for 60 % of the module note), seminar - oral presentations of publications in neurobiology (20 min + discussion, accounts for 40 % of the total module mark). Each participant will present two basic literature manuscripts.

**Requisites for the allocation of credits**
Total module mark at least “adequate” (see examination regulations for details)

**Compatibility with other Curricula**
Obligatory module in the Master’s degree program “Translational Neuroscience”

**Significance of the mark for the overall grade**
The Master's degree course: 15 % of the overall grade

**Module coordinator and Participating faculty**
Module coordinator: Prof. Dr. M. Sendtner, phone 201-44001, Sendtner_M@klinik.ukw.de
Participating faculty: Prof. Dr. M. Sendtner, PD Dr. R.Blum, PD Dr. S. Jablonka, Prof. Dr. C. Villmann

**Additional information**
Neurosciences - Focus of research: Neurobiology

**Literature:** Textbook - Kandel ER, Schwarz JH: Principles of Neural Science, Elsevier; original publications

**General time schedule:** Week 1-13. Lectures and preparation for oral presentation of a publication in neurobiology; Week 1-13 (Wed.): Lectures, seminar

*All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).
Module Name: Biopsychology

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-BPSY</td>
<td>300 h</td>
<td>10</td>
<td>summer term</td>
<td>1 semester</td>
</tr>
</tbody>
</table>

Type of lessons
1. Lecture (L)
2. Seminar (S)

Contact times**
1. 26 h
2. 26 h

Self-study times
- Preparing and reworking matters of L and S; preparing oral presentations
- 248 h

Intended group size
1. 25
2. 25 (supervising tutor)

Learning outcomes
Students who have successfully completed the module will have acquired insights into current theories, models and concepts from biopsychological approaches to basic psychological functions. Specifically, students will:
- Show knowledge and understanding of the structures and functions of the human nervous system (including the brain) that are relevant to the study of psychological processes and functions as well as to the understanding of psychological disorders
- Demonstrate key intellectual skills by critically evaluating the role of physiology in human behaviour, emotion, and cognition
- Compare and contrast the contributions made by the different approaches and research methods that are used in Biological Psychology
- Critically read scientific publications in the field of Biological Psychology
- Demonstrate writing and reading skills to present and interpret material with evidence of the use of relevant literature
- Demonstrate the ability to communicate critically and to engage in critical thinking.

Skills & Methods
- Basic biopsychological theories and models for psychological disorders
- Emotion and Motivation
- Learning and Memory
- Attention and Orientation
- Perception
- Cognitive Processes
- Action Control
- Basic biopsychological theories and models for psychological disorders

Contents Main topics:
Biopsychological theories and models of basic psychological functions
- Emotion and Motivation
- Learning and Memory
- Attention and Orientation
- Perception
- Cognitive Processes
- Action Control

Basic biopsychological theories and models for psychological disorders

Requirements for participation
Bachelor; enrollment in Master Program Translational Neuroscience
Additionally: Basic knowledge in Neuroanatomy and Neurophysiology

Teaching methods
Lecture, seminar

Type of examinations
Exam prerequisites: Regular and active participation

Exams:
1. Written exam (120 min; accounts for 60% of the total module grade)
2. Oral presentation (20 min + discussion; accounts for 40% of the total module grade)

Requisites for the allocation of credits: Total module grade mark at least “adequate” (see examination regulations for details)

Exams:
1. Written exam (120 min; accounts for 60% of the total module grade)
2. Oral presentation (20 min + discussion; accounts for 40% of the total module grade)

Requisites for the allocation of credits: Total module grade mark at least “adequate” (see examination regulations for details)

Compatibility with other Curricula
Obligative module in the Master’s degree program "Translational Neuroscience"

Significance of the mark for the overall grade
15% of the overall grade

Module coordinator and Participating faculty
Module Coordinator:
Prof. Dr. Paul Pauli, phone +49 931 31 82842, email pauli@psychologie.uni-wuerzburg.de
pauli@psychologie.uni-wuerzburg.de

Participating faculty: Prof. Dr. Paul Pauli, Professor for Experimental Clinical Psychology; N.N.

Additional information
Neurosciences – Focus of Research: Biopsychology
All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).

General time schedule: Week 1-13 Lectures, Seminars; Week 14-17: Exams

# Modulkatalog M.Sc. (Translational Neuroscience)

## Neurology and Neurosurgery: Neurologic diseases and their neuroscientific background

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration</th>
</tr>
</thead>
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<tr>
<td>03-TN-NN</td>
<td>300 h</td>
<td>10</td>
<td>summer term</td>
<td>1 semester</td>
</tr>
</tbody>
</table>

**Type of lessons**
- a) Lecture (L)
- b) Seminar (S)

**Contact times***
- a) 28 h
- b) 26 h

**Self-study times**
- 246 h (Preparing and reworking matters of L; preparing oral presentations)

**Intended group size**
- a) 25 students
- b) 25 students

### Learning outcomes
Students who successfully completed this module will have acquired insights into current the molecular and systems pathophysiology of diseases prevalent in neurology and neurosurgery. They will understand basic mechanisms of disease in the motor and sensory system and of higher functions. They will understand about brain trauma and brain tumor biology. They know about animal models for neurological and neurosurgical diseases and will be introduced into behavioral, neurophysiological, morphological and molecular biological analysis methods. They will have learnt how to ask the appropriate in bed-to-bench research and how to devise study plans. They will learn how to critically read scientific publications and how to extract the data the bring them forward in their own project. In addition, they will have learnt how to record and analyze data and how to present them in oral and written form.

### Skills & Methods
Methods include animal models, behavioral analysis, cell culture, histology, imaging techniques, behavioural analysis, cell and molecular biology, electrophysiological recording techniques.

### Contents Main topics:
- "Pathophysiology of movement disorders";
- "Structure, function, and molecular function of the basal ganglia" - Motor behavioral tests in models for Parkinson's disease; functional and morphological analysis of basal ganglia
- Neuroimmunology: Pathophysiology of multiple sclerosis.
- Current neurobiology of stroke, stroke models and their analysis
- Pathophysiology of brain trauma "Experimental brain trauma models and their analysis"
- Antibody-associated CNS-diseases "In-vitro analysis of auto-antibody function"
- Clinical neurophysiology: basic and practical aspects "Experimental neurophysiology in disease models"
- Genetically caused neurologic disorders: Ataxias and dysonias
- Brain tumour immunology, tumour cell invasion and cell cycle regulation

**Model animals:**
- rattus norvegicus, mus musculus, primary neuronal cultures

### Teaching methods
Lectures; Seminar; Hands-on lab work

### Requirements for participation
Bachelor; enrollment in the Master’s program "Translational Neurosciences"

### Type of examinations
Exam prerequisites: Regular and active participation
Exams: lecture - written exam (90 min, accounts for 40 % of the module note), seminar - oral presentations of publications in clinical neurosciences (20 min + discussion), accounts for 20 % of the total module mark), practical course - written lab report (10-15 pages, accounts for 40 % of the total module mark)

### Requisites for the allocation of credits
Total module mark at least “adequate” (see examination regulations for details)

### Compatibility with other Curricula
Obligative module in the Master’s degree program "Translational Neuroscience"

### Significance of the mark for the overall grade
In the Master’s degree course: 15 % of the overall grade

### Module coordinator and Participating faculty
uni-wuerzburg.de

**Participating faculty:** Neurology
- Prof. Dr. J. Volkmann, PD Dr. C. IP, PD Dr. S. Klebe, Prof. Dr. C. Kleinschnitz, Prof. Dr. C. Sommer, Prof. Dr. G. Stoll
- Neurosurgery
- Prof. Dr. Ernestus, Prof. Dr. A.-L. Sirén, Prof. Dr. C. Matthies, Dr. M. Löhr, Dr. C. Hagemann, Dr. T. Westermaier

### Additional information
- Neurosciences - Focus of research: Neurology, Neurosurgery

### General time schedule
- Week 1-13, Lectures and preparation for oral presentation of a publication in neurobiology; Week 1-13 (Wed.): Lectures; seminar; Week 4 (Mon.-Fri.): Practical course

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*All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).*
Module name: Psychiatric Neurosciences

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-PSYT</td>
<td>300 h</td>
<td>10</td>
<td>summer term</td>
<td>1 semester</td>
</tr>
</tbody>
</table>

1. Type of lessons
   - a) Lecture (L)
   - b) Seminar (S)

2. Contact times***
   - 2 h per week
   - 13x2_28 h
   - 2 h pro Woche
   - 28 h

3. Self-study times
   - 230 h (Preparing and reworking matters of L; Preparing oral presentations and/or writing an essay)

4. Intended group size
   - a) 30 students
   - b) 5-10 students / supervising tutor

Learning outcomes
Students who successfully completed this module will have gained an overview of the characteristics of diverse psychiatric disorders. They will have acquired insights into the neurobiological basis of the etiopathogenesis of these disorders (e.g. which neurotransmitter systems and brain regions are involved); how they are treated in addition to current concepts and experimental approaches studying these psychiatric disorders. They will have learned (at least theoretically) how molecular biology methods, e.g. genotyping or gene expression analysis, or various methods studying the neuronal plasticity in the brain are used to reveal neurobiological correlates of certain psychiatric disorders and/or the efficacy of pharmacotherapy. Furthermore, the students will learn to critically read scientific publications in the field of neurobiology/neuropsychiatry.

Skills & Methods
The methodological approaches include molecular biological methods such as various genotyping techniques, gene expression techniques (including methods studying epigenetic modifications), imaging techniques including immunohistochemistry and neuronal reconstructions) knowledge about behavioural tests and their ability to picture various behavioral traits; human brain imaging techniques.

Contents Main topics:
- Basic knowledge about the characteristics of various psychiatric disorders, the proposed neurobiological basis (e.g. gene by environment interaction) as well as the treatment options: - Anxiety disorders, - depression (uni-polar and bi-polar), - schizophrenia, - dementia (Alzheimer’s disease), - Parkinson’s disease
- Brain regions and neurotransmitter systems involved in neuronal networks involved in experiencing anxiety and fear, attentional networks, learning and memory, and their importance for emotionality in humans.
- Analysis of gene variants and their association with various psychiatric disorders and behavioral traits; Animal models for psychiatric disorders
- Gene by environment interaction; neuroadaptive mechanisms as a result of stress exposure during different periods of lifetime; resilience, epistatic load hypothesis, mis match hypothesis
- anatomical, cellular/neuronal plasticity at selected brain regions, e.g. hippocampus and amygdala;
- human brain imaging...

Requirements for participation
Bachelor; enrollment in the Master’s program “Translational Neurosciences” Neurosciences
Additionally: basic knowledge in physics, neuroanatomy and neurophysiology

Type of examinations
Exam prerequisites: Regular and active participation
Exams: written exam (90 min, accounts for 40 % of the module note), Oral presentation of a publication in neurobiology (20 min + discussion, accounts for 20 % of the total module mark), written lab report (10- 15 pages, accounts for 40 % of the total module mark)
Requisites for the allocation of credits
Total module mark at least “adequate” (see examination regulations for details)

Compatibility with other Curricula
Obligative module in the Master’s degree program "Translational Neuroscience"

Significance of the mark for the overall grade
In the Master’s degree course: 15 % of the overall grade

Module coordinator and Participating faculty
Module coordinator:
Participating faculty: Prof. Deckert, Prof. Romanos, Prof. Lesch, Prof. Domschke, PD Dr. Grünblatt, PD Dr. Herman, Prof. Gerlach, PD Dr. Schmitt, Dr. Neufang,

Additional information
Neurosciences - Focus of research: Neuropsychiatry
Literature: Kandel ER, Schwarz JH: Principles of Neural Science, Elsevier

General time schedule:
Week 1-13, Lectures; Week 1-13 Seminar including preparation for oral presentation of a publication in neuropsychiatry;
# Cellular Neurobiology

**Module name: Cellular Neurobiology**

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration*</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-CN</td>
<td>150 h</td>
<td>5</td>
<td>summer term</td>
<td>1 semester</td>
</tr>
</tbody>
</table>

**Type of lessons**

<table>
<thead>
<tr>
<th>Contact times**</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Lectures (L)</td>
<td>6 h</td>
<td>10 students</td>
</tr>
<tr>
<td>b) Practice/Lab(P)</td>
<td>36 h</td>
<td>10 students / supervising tutor</td>
</tr>
</tbody>
</table>

**Learning outcomes**

Students who successfully completed this module will have acquired insights into current experimental approaches in neurobiology. They will be introduced to preparations and recording techniques to study the function and pathomechanisms of neural models systems. The students will examine clinical aspects of neurobiology with a focus on the molecular, cellular and physiological mechanisms. Additionally, they will have learned how to document their own data that were collected during lab courses. Furthermore, the students will learn to critically reflect their data in the context of the experimental methods used.

**Skills & Methods**

Modern neurobiological methods include ultrastructural analysis, immunohistochemistry, microscopy and imaging techniques, behavioural analysis, cell and molecular biology, electrophysiological recording techniques, primary cultures of neural cells, digital documentation of image material.

**Contents Main topics:**

- Structure, function, and molecular functional components of the peripheral nerves of the nervous system including its neuronal and non-neuronal cells as well as the neuromuscular endplate (model system mouse).
- Motor behavioral tests in mouse models for motoneuron diseases; functional and morphological analysis of motoneurons and motor endplates.
- Neural stem cells: characteristics, approaches for therapeutic strategies.
- Anatomical, cellular/neuronal plasticity at selected brain structures, e.g. hippocampus and cerebellum (mouse model).
- Immunohistochemistry/immunofluorescence in hippocampal/cerebellar slices, confocal microscopy.
- Primary neuron preparations of dorsal root ganglia and hippocampal neurons, mouse perfusion.
- CLabs/Neuron to simulate various electrophysiological conditions, whole cell patch clamp recordings to determine ion channel properties.

**Model animals:**

mus musculus, primary neuronal cultures.

**Teaching methods**

Lectures; intensive hands-on lab work.

**Requirements for participation**

Bachelor; enrollment in the Master’s program “Translational Neuroscience”

Additionally: basic knowledge in physics, anatomy and physiology, biology.

**Type of examinations**

Exam prerequisites: Regular and active participation

Exams: practical course – written lab report (15 pages, accounts for 100% of the total module mark)

Requisites for the allocation of credits: Total module mark at least “adequate” (see examination regulations for details).

**Compatibility with other Curricula**

Obligatory module in the Master’s degree program “Translational Neuroscience”

**Significance of the mark for the overall grade**

In the Master’s degree course: 7 % of the overall grade.

**Module coordinator and Participating faculty**

Module coordinator: Prof. Dr. M. Sendtner, phone 201-44001, Sendtner_M@klinik.ukw.de

Participating faculty: Prof. Dr. M. Sendtner, PD Dr. R. Blum, PD Dr. S. Jablonka, Prof. Dr. C. Villmann

**Additional information**

Neurosciences - Focus of research: Neurobiology


**General time schedule**: one week (Mo. Fr.), preparation of the report.

# All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).
Modulkatalog M.Sc. (Translational Neuroscience)

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-DI</td>
<td>150 h</td>
<td>5</td>
<td>summer term</td>
<td>1 week (Block)</td>
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</table>

<table>
<thead>
<tr>
<th>Type of lessons</th>
<th>Contact times***</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures (L) + Practice (P)</td>
<td>a) 6 h; b) 36 h</td>
<td>108 h (reworking matters of the Lecture and Practice, exam preparation)</td>
<td>a) 10 students</td>
</tr>
</tbody>
</table>

**Learning outcomes**
Students who successfully completed this module will have acquired insights into the basics of fMRI data analysis, preprocessing of functional and anatomical MR data. Behavioral data during an attentional paradigm will be analyzed and implemented into the statistical analysis of brain activation patterns from patients with and without ADHD.

**Skills & Methods**
processing of functional and structural MR-data, application of fMRI within the study of ADHD

<table>
<thead>
<tr>
<th>Contents Main topics:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>*Basics of fMRI signal (BOLD response)</td>
<td></td>
</tr>
<tr>
<td>*Preprocessing of fMRI data and the definition of single subject models</td>
<td></td>
</tr>
<tr>
<td>* The analysis of behavioral data of the experimental paradigm, and its implementation into first level analyses</td>
<td></td>
</tr>
<tr>
<td>* Group (second level) analyses of fMRI data, ANOVA Models, multiple regression models</td>
<td></td>
</tr>
</tbody>
</table>

**Teaching methods**
Lectures, intensive training in the analysis of fMRI data

**Requirements for participation**
Bachelor; enrollment in the Master’s program “Translational Neurosciences”
Additionally: basic knowledge of functional brain anatomy

**Type of examinations**
Exam prerequisites: Regular and active participation
Exams: a written exam (Friday afternoon)
Requisites for the allocation of credits
Total module mark at least “adequate” (see examination regulations for details)

**Compatibility with other Curricula**
Obligative module in the Master’s degree program “Translational Neuroscience”

**Significance of the mark for the overall grade**
In the Master’s degree course: 7 % of the overall grade

**Module coordinator and Participating faculty**
Module coordinator: Dr. S. Neufang, Neufang_S@ukw.de
Participating faculty: Dr. S. Neufang

**Additional information**
Neurosciences - Focus of research: Developmental Changes

**General time schedule:** one week (Mo. - Fr.), 8.00-17.00

# All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).
# Experimental Psychiatry

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
<th>Type of lessons</th>
<th>Contact times***</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-EP</td>
<td>winter term</td>
<td>1 semester</td>
<td>a) Seminar (S)</td>
<td>a) 6 h; b) 36 h</td>
<td>108 h (Preparing and reworking matters of P; Writing lab report and essay)</td>
<td>a) 10 students b) 5-10 students / supervising tutor</td>
</tr>
</tbody>
</table>

## Learning outcomes

Students who successfully completed this module will have acquired insights into current concepts and experimental approaches in Psychiatry and especially in the neurobiological basis of the etiopathogenesis and the treatment of psychiatric disorders. They will be trained in molecular biology methods, e.g. genotyping, gene expression analysis, and in various methods studying structural neuronal plasticity of the brain. Additionally, they will have learned how to evaluate and present data in oral and written form that were collected during the lab course. Furthermore, the students will learn to critically read scientific publications in the field of neurobiology/neuropsychiatry.

## Skills & Methods

The methodological approaches include molecular biology methods such as various genotyping techniques, gene expression techniques (including methods studying epigenetic modifications), imaging techniques including immunohistochemistry and neuronal reconstructions) knowledge about behavioural tests and their ability to picture various behavioral traits; human brain imaging techniques (Hermann)

## Contents Main topics:

- Brain regions and neurotransmitter systems involved in neuronal networks involved in experiencing anxiety and fear, attentional networks, learning and memory, and their importance for emotionality in humans.
- Analysis of gene variants and their association with various psychiatric disorders and behavioral traits; Animal models for psychiatric disorders
- Gene x environment interaction; neuroadaptive mechanisms as a result of stress exposure during different periods of lifetime; resilience, epistatic load hypothesis, mismatch hypothesis
- anatomical, cellular/neuronal plasticity at selected brain regions, e.g. hippocampus and amygdala; Adult neurogenesis; immunohistochemistry/immunofluorescence using forebrain slices; neuronal reconstructions using the Neurolucida software
- human brain imaging...

Model animals: mus musculus

## Teaching methods

Seminar; Intensive hands-on lab work

## Requirements for participation

Bachelor; enrollment in the Master’s degree program "Translational Neurosciences"

Additionally: basic knowledge in physics, neuroanatomy and neurophysiology

## Type of examinations

Exam prerequisites: Regular and active participation

Exams: practical course - written lab report (15 pages, accounts for 100 % of the total module mark)

Requisites for the allocation of credits

Total module mark at least "adequate" (see examination regulations for details)

## Compatibility with other Curricula

Obligative module in the Master’s degree program "Translational Neuroscience"

## Significance of the mark for the overall grade

In the Master’s degree course: 7 % of the overall grade

## Module coordinator and Participating faculty

Module coordinator: Prof. Deckert, Prof. Lesch, PD Dr. Herrman, PD Dr. Schmitt, Dr. Rivero, Dr. Waider

Participating faculty:

## Additional information

Neurosciences - Focus of research: Neuropsychiatry

Literature: Literature: Kandel ER, Schwarz JH: Principles of Neural Science, Elsevier

## General time schedule:

one week (Mo. Fr.), preparation of the report
Module name: Functional neuroimaging

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-FI</td>
<td>150 h</td>
<td>5</td>
<td>winter term</td>
<td>1 semester</td>
</tr>
</tbody>
</table>

1. Type of lessons
   a) Lectures (L)
   b) Practice/Lab(P)

2. Contact times***
   a) 12 h
   b) 30 h

3. Self-study times
   108 h (Preparing and reworking matters of P; Writing lab report and essay)

4. Intended group size
   a) 10 students
   b) 10 students / supervising tutor

Learning outcomes
Students who successfully completed this module will have acquired insights into current experimental approaches in neurobiology. They will be introduced in preparations and recording techniques to study the function and pathomechanisms of neural models systems. The students will examine clinical aspects of neurobiology with a focus on the molecular, cellular and physiological mechanisms. Additionally, they will have learned how to document their own data that were collected during lab courses. Furthermore, the students will learn to critically reflect their data in the context of the experimental methods used.

Skills & Methods
Established and innovative molecular imaging technologies including preclinical and clinical magnetic resonance imaging, single photon emission computed tomography, positron emission tomography, and hybrid imaging

Contents Main topics:
- target identification for functional and molecular neuroimaging
- basic concepts of radiochemistry, radiolabelling of surrogate markers for PET and SPECT
- basic concepts of magnetic resonance imaging
- basic concepts of positron emission tomography, single photon emission computed tomography and hybrid devices (PET/CT, SPECT/CT)
- anatomic and functional structures of the brain in small animals
- anatomic and functional structures in humans and patients with neurodegenerative disorders and dementia
- multimodality multiparametric imaging of brain tumors using MR, PET and SPECT

Model animals:
* mus musculus, primary neuronal cultures

Teaching methods
Lectures; Intensive hands-on lab work

Requirements for participation
Bachelor; enrollment in the Master’s program “Translational Neurosciences” Neurosciences
Additionally: basic knowledge in physics, anatomy and physiology, biology

Type of examinations
Exam prerequisites: Regular and active participation
Exams: practical course - written lab report (15 pages, accounts for 100 % of the total module mark)
Requisites for the allocation of credits
Total module mark at least “adequate” (see examination regulations for details)

Compatibility with other Curricula
Obligative module in the Master’s degree program “Translational Neuroscience”

Significance of the mark for the overall grade
In the Master’s degree course: 7 % of the overall grade

Module coordinator and Participating faculty
Module coordinator: Prof. Dr. A.K. Buck, phone 201-35000, buck_a@ukw.de
Participating faculty: Prof. Dr. A.K. Buck, Prof. Dr. T. Higuchi, Prof. Dr. S. Samnick, Prof. Dr. M. Lassmann

Additional information
Neurosciences - Focus of research: Neuroimaging

General time schedule: one week (Mo. Fr.), preparation of the report

# All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).
<table>
<thead>
<tr>
<th>Module name: Ion channels - structure, physiology, and disease</th>
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<tbody>
<tr>
<td><strong>Identification number</strong></td>
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<tr>
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<tr>
<td><strong>Type of lessons</strong></td>
</tr>
<tr>
<td>1</td>
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<tr>
<td></td>
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</table>

**Learning outcomes**
Students who successfully completed this module will have acquired distinct knowledge on various families of ion channels and their importance for brain physiology. The student will have learned in a bottom up approach to put the molecular findings into the context of pathomechanisms in various kinds of channelopathies. They will be trained in recording techniques to study ion channel properties on transfected/injected cell lines/oocytes as well as primary murine neurons. Additionally, they will have trained to critically read, reflect, and present scientific reports in the field of channel physiology.

**Skills & Methods**
The physiological approaches include patch clamp recordings and two electrode-voltage clamp recordings in various cell systems.

**Contents Main topics:**
- physiological properties of membranes
- structure-function relationships of ligand-gated and voltage-gated ion channels
- regulation and pharmacology of ion channels
- anatomical expression profiles, developmental regulation, evolution of ion channels
- sensory systems, ion channelopathies
- cLabs/Neuron to simulate various electrophysiological conditions, whole cell patch clamp recordings to determine ion channel properties

**Model animals:**
Xenopus oocytes; cell lines; primary neuronal cultures from mouse brain

**Teaching methods**
Lectures; Seminars; Intensive hands-on lab work

**Requirements for participation**
Bachelor; enrollment in the Master's program "Translational Neurosciences"; passed module: neurobiology in the Master's program Translational Neuroscience; 
Additionally: basic knowledge in physics, physiology

**Type of examinations**
Exams: Oral presentation of a publication on ion channels (20 min + discussion, accounts for 80 % of the total module mark); lab report (accounts for 20 % of the total module mark)
Requisites for the allocation of credits
Total module mark at least "adequate" (see examination regulations for details)

**Compatibility with other Curricula**
Obligative module in the Master’s degree program "Translational Neuroscience"

**Significance of the mark for the overall grade**
In the Master's degree course: 7 % of the overall grade

**Module coordinator and Participating faculty**
Module coordinator: Prof. Dr. C. Villmann, phone 201-44035, villmann_C@klinik.uni-wuerzburg.de
Participating faculty: Prof. Dr. E. Wischmeyer PD Dr. F. Döring

**Additional information**
Neurosciences - Focus of research: Neurophysiology

**General time schedule:**
Week 1-13: Lectures and preparation for oral presentation of a publication in neurobiology; Week 1-5: Lectures, week: 6-9 seminar; Week 10-12: Practical course
# Modulkatalog M.Sc. (Translational Neuroscience)

## Module name: Neuroinflammation

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
<th>Modulname: Neuroinflammation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification number</td>
<td>03-TN-NI</td>
<td>36 h</td>
<td>5</td>
<td>1 semester</td>
<td>Identification number</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of lessons</th>
<th>Contact times***</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Lecture (L)</td>
<td>8 x 2 h</td>
<td>20 h (Preparing and reworking matters)</td>
<td>a) 10 students</td>
</tr>
</tbody>
</table>

## Learning outcomes

Students who successfully completed this module will have acquired solid insights into basic and disease-relevant aspects of neuroimmunology and neuroinflammation.

## Skills & Methods

### Contents Main topics:
- Introduction into neural cells and structures relevant for neuroinflammation (glial cells, myelin, myelin molecules, synapses, nodes of Ranvier)
- Components of the innate immune system I: macrophages and microglial cells
- Components of the innate immune system II: dendritic cells, NK cells, granulocytes; antigen presentation; lymphatic organs
- Components of the adaptive immune system: lymphocytes and antigen recognition
- The phenomenon of tolerance and autoimmunity
- Experimental models for neuroinflammation (EAE, Cuprizone, EAN); the BBB
- Clinics, pathogenesis and therapy of multiple sclerosis
- Role of inflammation in primarily neurological/neurodegenerative disorders (Alzheimer disease; inherited neuropathies)

## Teaching methods

Lectures

## Requirements for participation

Bachelor; enrollment in the Master’s program “Translational Neurosciences” Neurosciences

Additionally: basic knowledge in physics, anatomy and physiology, biology

## Type of examinations

- Exam prerequisites: Regular and active participation
- Exams: lecture

## Requisites for the allocation of credits

- Total module mark at least “adequate” (see examination regulations for details)

## Compatibility with other Curricula

Obligatory module in the Master’s degree program “Translational Neuroscience”

## Significance of the mark for the overall grade

In the Master’s degree course: 7 % of the overall grade

## Module coordinator and Participating faculty

- **Module coordinator:** Prof. Dr. Rudolf Martini, rudolf.martini@uni-wuerzburg.de
- **Participating faculty:** Prof. Dr. Rudolf Martini, Prof. Dr. Manfred Lutz, Prof. Dr. Thomas Kerkau, PD Dr. Niklas Beyersdorf, PD Dr. Andreas Weishaupt, Dr. Mathias Buttmann

## Additional information

- **Neurosciences - Focus of research:** Neurobiology
- **Literature:** Textbook - Kandel ER, Schwarz JH: Principles of Neural Science, Elsevier; original publications

## General time schedule

- one week (Mo. Fr.), preparation of the report

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# All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).
# Pain

**Identification number**: 03-TN-P  
**Credits**: 5  
**Workload**: 28 h  
**Frequency of occurrence**: winter term  
**Duration**: 1 semester  

<table>
<thead>
<tr>
<th>Type of lessons</th>
<th>Contact times***</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Lectures (L)</td>
<td>a) 3 h</td>
<td>20 h (Preparing and reworking matters of L and P; Preparing oral presentations)</td>
<td>10 Students</td>
</tr>
<tr>
<td>b) Practice/Lab (P)</td>
<td>b) 15 h</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) oral presentation (T)</td>
<td>c) 10 h (s.u.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Learning outcomes**  
In this course students will learn about the (patho-) physiology of pain, neuroanatomical structures and therapeutic opportunities. In molecular biology based experiments and calcium imaging in a hand-on-lab course methods in molecular pain research are demonstrated. An insight in pain examination in the clinical routine is given by demonstration of patients and in self-experience-based practical courses. Results are worked-out by the students and presented within a short talk at the end of the course.  

**Skills & Methods**  
Skills in pain examination, molecular essays, calcium imaging, literature study, presentation

**Contents Main topics:**  
- medical examination of Patients with pain  
- practical course in medical examination  
- immunohistochemistry/immunofluorescence of dorsal root ganglia/sciatic nerv  
- calcium imaging of dorsal root ganglia and in transfected HEK293 cells  

**Model animals:**  
*ratius norvegicus, mus musculus*

**Teaching methods**  
Lectures; Seminar; human physical examination; hands-on lab work

**Requirements for participation**  
Bachelor; enrollment in the Master’s program “Translational Neurosciences”  
Additionally: basic knowledge in neuroanatomy and neurophysiology

**Type of examinations**  
Exam prerequisites: Regular and active participation  
Exams: oral exam: Oral presentation of a publication in molecular pain (30 min + discussion)  
Requisites for the allocation of credits  
Total module mark at least “adequate” (see examination regulations for details)

**Compatibility with other Curricula**  
Mandatory module in the Master’s degree program “Translational Neuroscience”

**Significance of the mark for the overall grade**  
In the Master’s degree course: 5 % of the overall grade

**Module coordinator and Participating faculty**  
**Module coordinator:** PD Dr. H. Rittner, phone 201-30254, Rittner_H@klinik.uni-wuerzburg.de  
**Participating faculty:** PD Dr. H. Rittner, Prof. Dr. C. Sommer, Dr. B. Oehler, PD Dr. N. Üçeyler

**Additional information**  
Anesthesiology/Neurology - Focus of research: Molecular Pain  
**Literature:** Kandel ER, Schwarz JH: Principles of Neural Science, Elsevier. Wall and Melzack’s Textbook of Pain

**General time schedule:**  
Week 1-14 (WOCHENTAG): Lectures (a), practical course/lab (b) and oral presentation (c)
# Modulkatalog M.Sc. (Translational Neuroscience)

## Module name: Developmental Cognitive Neuroscience

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-DCN</td>
<td>150 h</td>
<td>5</td>
<td>summer term</td>
<td>1 Semester</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of lessons</th>
<th>Contact times***</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Lectures (L)</td>
<td>a) 6 h; b) 36 h</td>
<td>108 h (Preparing one paper presentation, reworking matters of L; Writing a peer-review of one paper at the end of the semester)</td>
<td>a) 10 students</td>
</tr>
</tbody>
</table>

## Learning outcomes

Students who successfully completed this module will have acquired insights into the current scientific debate of normal and abnormal cognitive skills and brain development. Developmental Changes of basic cognitive skills such as learning and memory, speech, attention, theory of mind and emotion processing will be addressed via behavioral and neuroscientific studies. Abnormal development will be explained in the context of the neuropsychiatric disorders learning disabilities, reading disabilities, attention-deficit / hyperactivity disorder, autism and anxiety / depression. The influences of genes, hormones and sex will be discussed.

## Main topics:

- normal cognitive development of learning and memory processes and its associated brain circuits including the hippocampus and the prefrontal cortex
- abnormal cognitive development of learning and memory processes in the context of learning disabilities and behavioral disorders
- normal language processing development and its associated brain regions / abnormal language development in the context of dyslexia
- normal cognitive development of attention and its associated brain circuits including the prefrontal cortex, parietal regions and the striatum / abnormal brain development
- normal development of "theory of mind" and its associated brain regions / abnormal development in the context of autism
- normal emotional development and its associated brain regions / abnormal development in the context of anxiety and depression

## Teaching methods

Lectures; paper presentations, intensive reflection of neuroscientific papers

## Requirements for participation

Bachelor; enrollment in Master Program Translational Neuroscience

Additionally: basic knowledge in cognition, functional anatomy, neuroscientific methods

## Type of examinations

Exam prerequisites: Regular and active participation

Exams:
1 paper presentation in course of the semester, a written peer-review of one paper (15 pages, accounts for 100 % of the total module mark)

## Compatibility with other Curricula

Obligative module in the Master’s degree program "Translational Neuroscience"

## Significance of the mark for the overall grade

In the Master’s degree course: 7 % of the overall grade

## Module coordinator and Participating faculty

Module coordinator: Dr. S. Neufang, phone 201-78190, Neufang_S@ukw.de, http://www.kjp.ukw.de/forschung.html

Participating faculty: Dr. S. Neufang, Prof. Dr. M. Romanos

## Additional information

Neurosciences - Focus of research: Developmental Changes

Literature:

## General time schedule:

- one week (Mo. Fr.), preparation of the presentation, preparation of the review

*All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).*
## Module name: Developmental Neuropsychiatry

<table>
<thead>
<tr>
<th>Identification number</th>
<th>Workload</th>
<th>Credits</th>
<th>Frequency of occurrence</th>
<th>Duration**</th>
</tr>
</thead>
<tbody>
<tr>
<td>03-TN-DNP</td>
<td>150 h</td>
<td>5</td>
<td>summer term</td>
<td>1 week (Block)</td>
</tr>
</tbody>
</table>

### 1. Type of lessons
- Lectures (L) + Practice (P)

### 2. Contact times***
- a) 12h
- b) 30h

### 3. Self-study times
- 108 h (preparation of oral presentations, reworking matters of lectures and practices)

### 4. Intended group size
- a) 10 students
- b) 10 students

### Learning outcomes
Students who successfully completed this module will have acquired insights into neurodevelopmental aspects of child and adolescent psychiatric disorders including clinical aspects, etiology and research approaches on ADHD, anxiety disorders, autism spectrum disorder and eating disorders. Developmental aspects of psychopharmacology are further discussed.

### Skills & Methods
- oral presentations, patient's exploration, application of transcranial ultrasound and EEG

### Contents Main topics:
- Neurodevelopmental aspects of ADHD, anxiety disorders, autism spectrum disorder and eating disorders
- Developmental psychopharmacology
- Transcranial ultrasound: theory and application
- EEG: theory and application

### Teaching methods
- Lectures, oral presentations by students, clinical hospitation with contact to patients, application of EEG and TCS

### Requirements for participation
- Bachelor; enrollment in the Master’s program “Translational Neurosciences”
- Additionally:

### Type of examinations
- Exam prerequisites: Regular and active participation
- Exams: oral exam (Friday afternoon)

### Requisites for the allocation of credits
- Total module mark at least “adequate” (see examination regulations for details)

### Compatibility with other Curricula
- Obligative module in the Master’s degree program “Translational Neuroscience”

### Significance of the mark for the overall grade
- In the Master’s degree course: 7 % of the overall grade

### Module coordinator and Participating faculty
- Module coordinator: Dr. R. Taurines, phone 201-78091, Taurines_r@ukw.de
- Participating faculty: Dr. R. Taurines, Prof. Dr. M. Romanos, Dr. J. Geissler, Prof. Dr. M. Gerlach, Dr. C. Drepper, Dr. S. Neufang, Dr. S. Dang

### Additional information

### General time schedule: one week (Mo. - Fr.), 6.00-17.00

# All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).
Module name: Biology and Diseases of the Peripheral Nerve

Identification number: 03-TN-PN
Credits: 5
Frequency of occurrence: summer term
Duration: 1 semester

<table>
<thead>
<tr>
<th>1</th>
<th>Type of lessons</th>
<th>Contact times***</th>
<th>Self-study times</th>
<th>Intended group size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a) Lecture (L)</td>
<td>(L) 6 x 2 h</td>
<td>124 h (Preparing and reworking matters)</td>
<td>a) 10 students</td>
</tr>
<tr>
<td></td>
<td>b) Seminar (S)</td>
<td>(S) 6-7 x 2 h</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Learning outcomes

Students who successfully completed this module will have acquired insights into cellular elements of the peripheral nerve, physiology and pathophysiology. The students will examine clinical aspects of diseases with the involvement of peripheral nerves with a focus on the molecular mechanisms and therapeutical options. Additionally, they will have learned how to evaluate and present data in oral form. Furthermore, the students will learn to critically read scientific publications in the field of peripheral nerve diseases and will be taught in the ability to extract relevant information from the original literature.

Skills & Methods

critical reading, evaluation and presentation of original literature, establishing of a deep understanding of theoretical aspects in peripheral nerve research by extracting results, the underlying experiments, and the modern interpretation from scientific work.

Contents Main topics:
- Cellular elements of the PN I: Origin, development, structure, myelin formation
- Cellular elements of the PN II: Lesion, Regeneration and surgical reconstitution
- Physiology and Pathophysiology
- Diseases I: inflammatory (GBS, CIDP, myasthenia; clinic and therapy)
- Diseases II: diabetic, iatrogene (e.g. vincristine; clinic and therapy)
- Diseases III: inherited NPs (including models and attempts for treatment approaches)
- The literature seminar bases on fundamental literature of lecture-relevant topics to document the experiments underlying our present knowledge in peripheral nerve research.

Teaching methods

Lectures; Seminar

Requirements for participation

Bachelor; enrollment in the Master’s program “Translational Neurosciences”
Additionally: basic knowledge in physics, anatomy and physiology, biology

Type of examinations

Exam prerequisites: Regular and active participation
Exams: oral exam by giving paper reports
Requisites for the allocation of credits
Total module mark at least “adequate” (see examination regulations for details)

Compatibility with other Curricula

Facultative module in the Master’s degree program “Translational Neuroscience”

Significance of the mark for the overall grade

In the Master’s degree course: 5 % of the overall grade

Module coordinator and Participating faculty

Module coordinator: Prof. Dr. Rudolf Martini, rudolf.martini@uni-wuerzburg.de
Participating faculty: Prof. Dr. Rudolf Martini, Prof. Dr. Claudia Sommer

Additional information

Neurosciences - Focus of research: Neurobiology

General time schedule: once a week

# All decimal numbers were rounded. The values correspond to the effective contact times over the total duration of the module (including examination times).