

# M.Sc. Neuroscience

## Module Handbook

### Module 1: Foundations of Neuroscience

Winter Semester 2019/20



**In case of questions, please contact the program coordinator:**

Dr. Birgit Ahrens

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Modulname	Nummer
Foundations of Neuroscience	09LE03MO-NF
Modulverantwortlicher	
Prof. Dr. Carsten Mehring	
Fachbereich/Fakultät	
Faculty of Biology	

ECTS-Punkte	13
Semesterwochenstunden (SWS)	10
Empfohlenes Fachsemester	1
Moduldauer	1
Pflicht/Wahlpflicht (P/WP)	P
Präsenzstudium	122 h
Selbststudium	268 h
Workload	390 h
Angebotsfrequenz	winter semester only

Teilnahmevoraussetzung (zwingende Voraussetzung)
none

Verwendbarkeit
MSc Neuroscience

Zugehörige Veranstaltungen					
Name	Art	P/WP	ECTS	SWS	Workload
From Membrane to Brain	Lecture	P	4	4	120 h
Physiology, anatomy and behavior of neuronal systems	Exercise	P	5	4.3	150 h
Selected Topics in Neuroscience	Seminar	P	4	2	120 h

<b>Qualifikationsziele</b>
<p>The student</p> <ul style="list-style-type: none"> <li>• can explain the contents of the accompanying lectures and answer detailed questions regarding these.</li> <li>• can design and perform a simple electrophysiological experiment, including the physiological preparation and the usage of electronic and IT equipment needed, and report the results.</li> <li>• can prepare a simple neuroanatomical sample, perform basic staining procedures, and make drawings of the observed anatomical structures.</li> <li>• can perform basic neurophysiology experiments, recording extracellular spike activity from a grasshopper nerve.</li> <li>• can use the acquired knowledge, insights and skills to read, summarize and critically discuss scientific publications in the neurosciences.</li> <li>• can give a well-structured scientific presentation in English about a neuroscientific topic</li> <li>• improves their abilities to work in small teams.</li> <li>• improves their English competencies</li> </ul>
<b>Lehrinhalte</b>
<b>Zu erbringende Prüfungsleistung</b>
Written examination at the end of the module on the content of the lecture
<b>Zu erbringende Studienleistung</b>
<ul style="list-style-type: none"> <li>• Regular participation in exercises</li> <li>• Successful completion of exercises</li> <li>• Regular participation in the seminar</li> <li>• Oral presentation of a neuroscience topic in the seminar</li> </ul>
<b>Gewichtung der Prüfungsleistung</b>

Modulname	Nummer
Foundations of Neuroscience	09LE03MO-NF
Veranstaltung	
From Membrane to Brain	
Veranstaltungsart	Nummer
Lecture	09LE03V-OM-05-0001
Fachbereich/Fakultät	
Faculty of Biology	

ECTS-Punkte	4
Semesterwochenstunden (SWS)	4
Empfohlenes Fachsemester	1
Pflicht/Wahlpflicht (P/WP)	P
Präsenzstudium	46 h
Selbststudium	74 h
Workload	120 h
Angebotsfrequenz	winter semester

<b>Inhalte</b>
<p>The lecture introduces the structural and functional principles underlying brain function and the neuroanatomical structures, organizational schemes, and processes in nerve cells and functional systems of the brain:</p> <ul style="list-style-type: none"> <li>• structure and function of single neurons (dendrites, axons, synapses) and neuronal networks</li> <li>• neuroanatomy of the mammalian brain</li> <li>• basic electrical properties of biological membranes</li> <li>• the generation and exchange of action potentials</li> <li>• the interactions of neurons within and between neuronal networks</li> <li>• physiology and molecular biology of synaptic plasticity and learning</li> <li>• general principles underlying learning and behavior</li> <li>• neurodevelopment: patterning, differentiation, axogenesis</li> <li>• auditory system, anatomy, networks and physiology</li> <li>• visual system, anatomy, networks and physiology</li> <li>• motor system, anatomy, networks and physiology</li> <li>• somatosensory system, anatomy, networks and physiology</li> <li>• prefrontal cortex and cognitive functions</li> <li>• basal ganglia</li> </ul>

<b>Qualifikationsziele</b>
The students can <ul style="list-style-type: none"><li>• explain the contents of this lecture and answer detailed questions regarding these.</li><li>• use this acquired knowledge and insights to read, understand and critically discuss scientific publications in the neurosciences.</li></ul>
<b>Zu erbringende Prüfungsleistung</b>
Written examination at the end of the module on the content of the lecture
<b>Zu erbringende Studienleistung</b>
none
<b>Teilnahmevoraussetzungen (zwingende Voraussetzungen)</b>
none
<b>Lehrmethoden</b>
Lectures

Modulname	Nummer
Foundations of Neuroscience	09LE03MO-NF
Veranstaltung	
Physiology, anatomy and behavior of neuronal systems	
Veranstaltungsart	Nummer
Exercise	09LE03Ü-OM-05-0002
Fachbereich/Fakultät	
Faculty of Biology	

ECTS-Punkte	5
Semesterwochenstunden (SWS)	4.3
Empfohlenes Fachsemester	1
Pflicht/Wahlpflicht (P/WP)	P
Präsenzstudium	50 h
Selbststudium	100 h
Workload	150 h
Angebotsfrequenz	winter semester

<b>Inhalte</b>
<p>In this practical course, first practical experience in basic neurobiology will be gained in two of the following three areas:</p> <ul style="list-style-type: none"> <li>• measuring physiological properties of neurons and neuronal networks in simple model systems, including handling measurement equipment, live tissue and incorporating key principles of experiment design and data analysis</li> <li>• comparative and functional neuroanatomy in rodents and humans on the basis of fixed tissue specimens and models, providing insight into basic mechanisms and cytoarchitecture of the mammalian brain.</li> <li>• observing and quantifying animal behavior in conjunction with optogenetic modulation of ongoing neuronal activity and training in the basics of neurogenetic tools, behavioral experiments.</li> </ul> <p>The students will be assigned to two out of the above three experiments on the basis of their priorities and available places.</p>

<b>Qualifikationsziele</b>
The student <ul style="list-style-type: none"><li>• can design and perform a simple electrophysiological experiment, including the physiological preparation and the usage of electronic and IT equipment needed, and report the results.</li><li>• can prepare a simple neuroanatomical sample, perform basic staining procedures, and make drawings of the observed anatomical structures.</li><li>• can use this acquired knowledge, insights and skills to read, understand and critically discuss scientific publications in the experimental neurosciences.</li><li>• improves their ability to work in small teams.</li></ul>
<b>Zu erbringende Prüfungsleistung</b>
None
<b>Zu erbringende Studienleistung</b>
<ul style="list-style-type: none"><li>• Regular participation in exercises</li><li>• Successful completion of exercises</li></ul>
<b>Teilnahmevoraussetzungen (zwingende Voraussetzungen)</b>
None
<b>Lehrmethoden</b>
Experimental work in groups and instructions given at the beginning of the experiments

Modulname	Nummer
Foundations of Neuroscience	09LE03MO-NF
Veranstaltung	
Selected Topics in Neuroscience	
Veranstaltungsart	Nummer
Seminar	09LE03S-NF-T3
Fachbereich/Fakultät	
Faculty of Biology	

ECTS-Punkte	4
Semesterwochenstunden (SWS)	1.7
Empfohlenes Fachsemester	1
Pflicht/Wahlpflicht (P/WP)	P
Präsenzstudium	26 h
Selbststudium	94 h
Workload	120 h
Angebotsfrequenz	winter semester

Inhalte
Student presentations of neuroscientific topics which extend the contents of the lectures "From membrane to brain"

Qualifikationsziele
The students <ul style="list-style-type: none"> <li>• extend their knowledge about the topics of the lecture "From membrane to brain"</li> <li>• can give a well-structured scientific presentation in English about a neuroscientific topic</li> </ul>
Zu erbringende Prüfungsleistung
None
Zu erbringende Studienleistung
<ul style="list-style-type: none"> <li>• Regular participation in seminar</li> <li>• Oral presentation of a neuroscientific topic</li> </ul>
Teilnahmevoraussetzungen (zwingende Voraussetzungen)
None
Lehrmethoden
Student presentations and moderated discussions