

M.Sc. Neuroscience

Module Handbook

Module 1: Foundations of Neuroscience

as of winter term 2019/20



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In case of questions, please contact the program coordinator:

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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

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

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

Inhalte
<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"> • structure and function of single neurons (dendrites, axons, synapses) and neuronal networks • neuroanatomy of the mammalian brain • basic electrical properties of biological membranes • the generation and exchange of action potentials • the interactions of neurons within and between neuronal networks • physiology and molecular biology of synaptic plasticity and learning • general principles underlying learning and behavior • neurodevelopment: patterning, differentiation, axogenesis • auditory system, anatomy, networks and physiology • visual system, anatomy, networks and physiology • motor system, anatomy, networks and physiology • somatosensory system, anatomy, networks and physiology • prefrontal cortex and cognitive functions • basal ganglia

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

Inhalte
<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"> 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 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. observing and quantifying animal behavior in conjunction with optogenetic modulation of ongoing neuronal activity and training in the basics of neurogenetic tools, behavioral experiments. <p>The students will be assigned to two out of the above three experiments on the basis of their priorities and available places.</p>

Qualifikationsziele
The student
<ul style="list-style-type: none">• 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.• can prepare a simple neuroanatomical sample, perform basic staining procedures, and make drawings of the observed anatomical structures.• can use this acquired knowledge, insights and skills to read, understand and critically discuss scientific publications in the experimental neurosciences.• improves their ability to work in small teams.
Zu erbringende Prüfungsleistung
None
Zu erbringende Studienleistung
<ul style="list-style-type: none">• Regular participation in exercises• Successful completion of exercises
Teilnahmevoraussetzungen (zwingende Voraussetzungen)
None
Lehrmethoden
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"> • extend their knowledge about the topics of the lecture “From membrane to brain” • can give a well-structured scientific presentation in English about a neuroscientific topic
Zu erbringende Prüfungsleistung
None
Zu erbringende Studienleistung
<ul style="list-style-type: none"> • Regular participation in seminar • Oral presentation of a neuroscientific topic
Teilnahmevoraussetzungen (zwingende Voraussetzungen)
None
Lehrmethoden
Student presentations and moderated discussions