# Master's program Interdiciplinary Neuroscience



## **Course Manual**

To the examination regulations 2023

October 2023

#### **Compulsory Modules**

	Name of module
INS IN 1	Introduction to Neuroscience 1
INS IN 2	Introduction to Neuroscience 2
INS BM	Basic Methods in Neuroscience
INS MN	Methods in Neuroscience
INS CC	Current Concepts in Neuroscience
INS MA	Master thesis

#### Elective modules with optional courses

#### INS A: Elective Module Basic Neuroscience

	Optional courses in elective A: Basic Neuroscience	Person in charge
INS A-0	External elective course "Basic Neuroscience"	Head of Master's program
INS A-7	Neurobiology of the Nematode <i>Caenorhabditis</i> elegans	Prof. Alexander Gottschalk
INS A-9	Cognition in mouse models of mental disorders: focus on dopaminergic systems	Dr. Natascha Diamantopoulou
INS A-10	Neurophysiology and Behaviour	Prof. Bernd Grünewald
INS A-12	The Neuro-Vascular Interface	PD Dr. Stefan Liebner
INS A-14	Genetics and Epigenetics of Neurogenesis and Gliogenesis	Prof. Dorothea Schulte
INS A-15	Recording neuronal activity in freely behaving animals	Dr. Torfi Sigurdsson
INS A-17	Auditory Function and Dysfunction: Behavior and Physiology	PD Dr. Bernhard Gaese
INS A-18	Information Processing in the Central Auditory System	PD Dr. Bernhard Gaese
INS A-19	Neuronal basis of acoustic communication in mammals	Dr. Julio Hechavarria
INS A-21	Cellular, molecular and systemic Neurobiology in mouse and zebrafish	Prof. Amparo Acker-Palmer
INS A-22	Optogenetics and calcium-recordings in freely behaving animals	Dr. Sevil Duvarci
INS A-23	Cellular and molecular mechanisms in neurovascular disorders	Prof. Jasmin Hefendehl
INS A-24	Deciphering brain activity during natural behaviour in real time	Dr. Martha Havenith, Dr. Marieke Schölvinck
INS A-25	Neuroscience of Navigation and Self-Motion	Dr. Jean Laurens

INS A-26	Analysis of Social Networks	Dr. Alison Barker
INA A-27	Instinctive Behaviour Circuits	Dr. Vanessa Stempel

#### INS B: Elective Module Clinical Neuroscience

	Optional courses in elective B: Clinical Neuroscience	Person in charge
INS B-0	External elective course "Clinical Neuroscience"	Head of Master's program
INS B-2	Physiology and Pharmacology of Inflammatory Reactions	Prof. Ellen Niederberger
INS B-4	Plasticity in Hippocampus – Morphology, Physiology, and Clinical Relevance	Prof. Thomas Deller
INS B-6	Brain Damage and Neuroprotection	Prof. Donat Kögel, Prof. Adelhay Rami
INS B-7	Clinical Paediatric Neurology	Prof. Matthias Kieslich
INS B-8	Clinical Neuroimaging	Prof. Stefan Weidauer
INS B-9	Clinical Auditory Neuroscience	Prof. Uwe Baumann
INS B-10	Experimental and Translational Psychiatry	Prof. David Slattery
INS B-11	Neurobiological human cell models	Prof. Andreas Chiocchetti
INS B-12	Neuroimaging Biomarkers in Psychiatry	Prof. Christine Ecker
INS B-13	Translational Neuro-Oncology Research	Dr. Ann-Christin Hau

#### INS C: Elective Module Cognitive and Computational Neuroscience

	Optional courses in elective C: Cognitive and Computational Neuroscience	Person in charge
INS C-0	External elective course "Cognitive and Computational Neuroscience"	Head of Master's program
INS C-1	Modern non-invasive Methods in Human Cognition research	Prof. Jochen Kaiser
INS C-4	Virtual Hippocampus - Introduction to Computational Neuroscience	Prof. Peter Jedlicka
INS C-7	Cognitive Neuroscience – Higher Cognitive Functions	Prof. Christian Fiebach
INS C-8	Systems Neuroscience – Sensorimotor and Cognitive Networks	PD Dr. Christian Kell

INS C-10	Computational Neuroanatomy – quantitative analysis and modelling	Dr. Hermann Cuntz
INS C-11	Computational Modeling of Neuronal Plasticity	Prof. Jochen Triesch
INS C-14	Cognitive Psychology – Attention, Perception & Memory	Prof. Melissa Vo
INS C-15	Developmental and Cognitive Neuroscience	Prof. Yee-Lee Shing
INS C-16	Cognitive and perceptual processes in the human brain	Prof. Rosanne Rademaker

#### INS D: Elective Module Applied Neuroscience

	Optional courses in elective D: Applied Neuroscience	Person in charge
INS D-0	External elective course "Applied Neuroscience"	Head of Master's program
INS D-1	Behavioral Biology in Zoos	Prof. Paul Dierkes
INS D-2	Attention analysis of students' media use via eye-tracking	Dr. Maruschka Weber

#### **INS WP: Free choice studies**

INS WP	Free-choice studies	Head of Master's program
--------	---------------------	--------------------------

## **Compulsory Modules:**

IN	IS IN 1	Einführung in die		Comp	Compulsory module		8 CP = 240 h				
In N	troduction to euroscience 1	Neurowisse 1	Neurowissenschaften me 1				Contact stu 7 SWH / 10	1dy )5 h	Self study 135 h	8 CP	
С	ontent										
C	Introductory session Introducing neurobio Lecture Selected top Content: Cellular, mo Mechanisms of signal system function, basi anatomy of the huma Seminar related to the The students will ass Colloquium (WS, SE Participation in 7 neu Weekend seminar ( Presenting and discuss legally relevant aspect earning results / Competition The students have a b	n (WS) logy researce pics in Neuro blecular and al transduction s of cognition in brain, good the lecture st ess research S) proscience-o WS) ssing researce tence objection proad interdi	ch in Frankfu coscience I ( physiologic on. Plasticity on, developm od scientific Selected top papers relev riented collo ch projects w urosciences wes sciplinary ba	urt. Pres (WS) al back, y, learni nent of practice <b>bics in P</b> vant to t oquia in vithin th	senting ground ing, me the ner <b>Neuros</b> the lect the lect the ins ne Mass	the Ma to the to mory, s vous sy vous sy cience to ures stitutes ter's pro-	ster's progr function of 1 sensory syste ystem, rhyth I (WS) ogramme; th neuroscienc	am nerve and ; ems, moto mic contro nematisatio	glia cells. r control, nervo ol of nerve func on of ethical an ir possible appl	bus tion and d ications.	
	They are familiar with neuroscientific research concepts and are able to link different subfields and paradigms of neuroscience. They will be able to critically assess scientific research papers in the form of an oral presentation. They have knowledge of the guidelines for good scientific practice.										
R	equirements for particip	oating									
	none										
H	elpful previous knowled	lge									
Δ	ssignment of module (n	rogram / den	artment)			MSc	Interdiscin	linary Neu	roscience / FB	15	
S	uitable for other study n	rograms	ar tillent)			10100	meruiseip			15	
T	imes offered	1051000				In the winter semester, colloquia also in the Sumr semester					
D	uration					2 Se	2 Semesters				
P	erson in charge					Head	d of study p	rogram			
Se	emester-related proofs										
	Proof of participation	l				Proof of participation (regular and active participation) for all events, (except lectures)					
	Study achievements					1 seminar talk (30 minutes) in the seminar to the lecture series "Selected Topics in Neuroscience I"				r to the cience	
T	eaching forms					Lect	ure, semina	r, colloqui	a		
T	uition language					Eng	lish				
M	Module exam Module final exam consisting of:			Forn Writt Neur	n / duration/ ten exam for roscience I'' (d	<b>content(if</b> the lecture ' duration: 90	applicable) "Selected Topics ) minutes)	of			
	Introduction to Neu	roscience	Form of	S	SWH	СР		Sei	mester		
	Vorlesung Selected t	topics in	teaching V	3	3	4	1 X	2	3	4	
	Selected topics in Neuroscience I	re	S	1	1	2	Х				
L	Introductory session	1	V	1	1	0.5	X				
	Colloquia		Ко	(	).5	0.5	Σ	K			

Weekend seminar	S	0,5	1	Х		
Sum		7	8			

	E'. ("1		madula 5 CD 150 h						
INS IN 2 Introduction to	Einführung in die Neurowissenschafter	Compulsory	module	5 CP = 150	h		E CD		
Neuroscience 2	2	•		Contact st	udy	Self study	SCP		
				3 SWH/4	5 h	105 h			
Contont									
Lecture Selected t	onics in Neuroscien	ce II (SS)							
The lecture delves	into specific aspects	of experimenta	l neuro	logy, patholo	ogy and dia	gnostics inclu	ding non-		
invasive studies of	the human brain, de	generative disea	ases of	the nervous s	system and	medical psyc	nology, as		
well as methodolog	gical developments su	ich as optogenet	ics.						
Seminar to the Lecture Selected topics in Neuroscience II (SS)									
I he students will as	The students will assess research papers relevant to the lectures								
	betence objectives								
The students have a broad interdisciplinary basic knowledge of the neurosciences and their possible applications.									
of neuroscience. They will be able to critically assess scientific research papers in the form of an oral									
presentation.									
	· · · · · · · · · · · · · · · · · · ·								
none	none								
Helpful previous knowl	Helpful previous knowledge								
none									
Assignment of module (	program / departmen	t)	MS	Sc Interdiscip	linary Neur	oscience / FB	15		
Suitable for other study	programs	·		1					
Times offered			Int	the Summer s	emester				
Duration			1 S	emester					
Person in charge			He	ad of study p	rogram				
Semester-related proofs					- 8				
Proof of participatio	, 		Pro	of of particir	nation (requ	lar and active			
1 1001 01 put ticipati	<b>,</b>		par	ticipation) fo	r the semin	ar			
Study achievements			1 s	1 seminar talk (30 minutes) in the seminar to the					
			lec	lecture series "Selected Topics in Neuroscience II"					
Teaching forms			Lee	Lecture, seminar					
Tuition language			Eng	glish					
Module exam			For	rm / duration/	content(if a	pplicable)			
Module final exam o	consisting of:		Wr	itten exam for	the lecture "	Selected Topics	of		
	uroscience II" (	(duration: 90	minutes)						
Introduction to	Form of	SWH	СР		Sei	nester			
Neuroscience 2	teaching			1	2	3	4		
Lecture Selected to	opics in V	2	3		Х				
Neuroscience II			-			_			
Seminar to the lect	ture S	1	2		X				
Neuroscience II									
Nethoscience									

INS BM	Basismethoden der	Compulsory module	13 CP = 390 h				
Basic Methods in Neuroscience	Neurowissenschaften		Contact study 11 SWH / 165 h	Self study 225 h	13 CP		
Content							
The module focus	ses on the following areas	S:					
(1) Methods of cel basics for working fractioning and ce principles of mole	l biology, molecular biology, with chemical solutions, entrifugation, preparation cular genetics and genom	by and genetics: Impa physical-chemical fea of cell cultures, imp ics.	rting of knowledge or tures of proteins and t nune-histology and n	n practical and theo heir isolation, subc nicroscopy and the	oretical cellular e basic		
(2) Anatomy of the the development of the cerebral blood of brains and anim	ne central nervous system of the human brain and sp supply. Furthermore ima- nal model organisms are of	: Using slices, plastic binal cord are shown, ging methods like MR liscussed.	models and stored d including the autonor I and fMRI are introd	ata-sets the structu nous nervous syste uced. Also the eva	are and em and luation		
(3) Electrophysiol forwarding of por recognition and an are discussed. Bot	ogy: In lectures and semin ptentials, synaptic morph alysis of single neurons ( h electrical and optical te	nars/discussions the ba nology/geometry/func extracellular, intracell chniques of neural stin	asics of membrane portion are dealt with. alar, patch-clamp) and mulation are presented	tentials, action pote Important metho d neural networks a d.	entials, ds for activity		
(4) MATLAB-pro MATLAB are di introduced, discus	pgramming and statistics: scussed. A focus lies o sed and realised in MAT	Basics of programmi n practical programm LAB.	ng of neural data reco ning exercises. Basic	ordings and analys c statistical metho	is with ds are		
(5) Legal and ethical aspects of animal experimentation, genetic manipulations, biological safety and proper scientific conduct are imparted.							
Learning results / Com	petence objectives			1	.1		
contents of the stu techniques and pro they have basic km well as animal mo adequately. They p potentialities and 1 in assessing signif good scientific pra welfare	contents of the study. They attain practical competence in cellular and molecular lab techniques, cell culture techniques and programming of neuro-biological questions in MATLAB. When having finished the module they have basic knowledge on neurogenetics. They have fundamental knowledge on human brain anatomy as well as animal models, can identify important cerebral structures and interpret histological preparations adequately. They possess basic knowledge regarding neural potentials and synaptic mechanisms and can assess potentialities and limitations of electro-physiological technologies. They can apply adequate statistical methods in assessing significance and comparison of neural records. They will attain competence regarding rules of good scientific practice, and to keep the directives regarding genetic works, bioassay practices, and animal						
Requirements for part	icipating						
none							
Helpful previous know	ledge						
Assignment of module	(program / department)	MSc	Interdisciplinary Net	uroscience / FB15			
Suitable for other stud	v programs						
Times offered		In th	e winter semester				
Duration		1 Se	mester (block course	over 6 weeks)			
Person in charge		Head	l of study program				
Semester-related proof	fs						
Proof of participat	ion	Regulectu	alar participation in al	ll events (except			
Study achievement	Study achievements       Successful completion of study achievements         ("pass") in the form of tests/exercises following each of the focus areas listed under "Content" or a portfolio across all focus areas.						
Teaching forms		Lec	ture, seminar, exercis	es			
Tuition language		Eng	lish				
Module exam Module final exam	consisting of:	For	m / duration / content e e	(if applicable)			

	Form of teaching	SWH	CP	Semester			
	I official of teaching	2	01	1	2	3	4
Basic Methods in	V, S, Üb	11	13				
Neuroscience							
 Methods of cell biology,	V, S, Üb						
molecular biology and genetics							
Anatomy of the central nervous system	V, S, Üb			v			
Electrophysiology	V, S, Üb			X			
MATLAB programming and statistics	V, Üb						
Legal and ethical aspects of animal experimentation	V, Üb						
Sum		11	13				

IN	IS MN	Vertiefung		Con	pulsory		15 CP = 45	0 h			
M No	ethods in euroscience	neurowisse Arbeitstech	nschaftlicher niken	mod	ule		Contact stu 15 SWH/ 2	ıdy 5 225 h 2	Self study 225 h	15 CP	
C	ontent										
_	The module is a p	ractical on "	Deepening sci	ientifi	c researc	h techn	iques". The	aim is to te	ach the stude	ents as	
	much as possible	about the mo	ost important e	experi	mental te	echniqu	es recomme	nded for the	e specialised	topics of	
	their Master's pro	ject so that th	heir thesis wo	rk car	n be com	pleted s	uccessfully	in the time	available.		
Le	earning results / Con	petence obje	ectives								
	After completing	the module,	the students w	ill be	familiar	with th	e basic techi	niques that	apply directl	y to a	
	Master's project in	n their chose	n topic. They	will t	be able to	efficie	ntly find info	ormation at	out methods	from	
	publications and t	he Internet a	nd evaluate th	e feas	sibility of	experii	mental desig	gns. They w	ill be compe	tent in	
D	criticizing method	is and assess	ing artefacts.								
K	Successful comple	tion of the r	nodules "Intra	ducti	ion to Ne	uroscie	nce I" "Intr	aduction to	Neuroscieno	e II" and	
	"Basic Methods in	Neuroscien	ce" as well as	at le	ast 2 out	of the 3	elective mo	dules	reuroscient		
H	elpful previous know	ledge		/ 41/ 10		01 110 5		auros.			
	none	8-									
As	ssignment of module	(program / d	lepartment)			MSc	Interdiscip	linary Neur	oscience / Fl	B15	
St	itable for other stud	y programs									
Ti	mes offered					Each semester					
D	uration					1 Se	1 Semester (block course over 6 weeks)				
Pe	erson in charge					Rep	resentatives	of elective	modules		
Se	mester-related proo	fs									
	Proof of participat	ion									
	Study achievement	ts				Prot	ocol (10-30	pages)			
Te	eaching forms					Prac	tical				
Т	Tuition language						lish				
Module exam						Form	n / duration /	/ content (if	applicable)		
	Module final exam consisting of:										
	Methods in Neur	oscience	Form of teach	ning	SWH	CP		Sen	nester		
				mg	5 11		1	2	3	4	
	Practical		Р		15	15			Х		

IN	IS CC	Forschung	skonzepte	Compulse	ory	16 CP = 4	80 h				
C N	urrent Concepts in euroscience	in den Neurowiss	enschaften	module		Contact s	tudy / 245 h	Self study	16 CP		
						10 SWH	/ 245 n	235 h			
С	ontent										
	The module compri	ses a projec	t work and	a seminar v	with th	e aim of p	rovidin	g students with the	e essential		
	theoretical basis for	developing	a research	concept in	a neur	obiologica	al subfie	eld. After familiari	zation with		
	them During the se	ork, students minar the d	ifferent res	arch direc	open q	uestions a	na aeve ter's pro	or research strate	gies to address		
	discussed in the form	m of scienti	fic posters.			of the wids	ter s pro	gram win be pres			
L	earning results / Comp	etence objec	tives								
	Upon completion of	f the module	e, students a	are familia	r with	the develo	opment o	of scientific resear	ch concepts and		
	are able to integrate	them into a	third-party	funding p	roposa	al. The stu	dents ha	we developed jud	gment regarding		
	the relevance and re	alism of dif	ferent and a	lso contrad	ictory	theories a	nd resea	rch concepts. The	students acquire		
	extended competend	ces regardin	g rules of g	ood scient	ific pr	actice and	ethical	aspects of neuroso	cience. They are		
R	equirements for partic	inating		ine poster.							
	Successful completi	on of the m	odules "Int	roduction t	o Neu	roscience	I". "Intr	oduction to Neuro	science II" and		
	"Basic Methods in I	Neuroscienc	e" as well a	is at least 2	out o	f the 3 elec	ctive mo	odules.			
H	elpful previous knowle	edge									
	none										
A	ssignment of module (p	program / de	partment)			MSc	Interdis	ciplinary Neurosc	ience / FB15		
Sı	itable for other study	programs									
Ti	mes offered					Each	semeste	er			
D	uration					1 Sen	1 Semester block course over 6 weeks)				
Pe	erson in charge					Repre	Representatives of elective modules				
Se	mester-related proofs										
	Proof of participatio	n									
	Study achievements					Writt	en resea	rch concept (10-	20 pages), 1		
						semir	har talk	(20 minutes),			
						Produ	iction/pi	resentation of 1-2	scientific		
Т	eaching forms					Proie	rs ct. semi	nar			
T	ition language					Engli	sh				
M	Module exam					Form	/ durati	on / content (if app	licable)		
1.1	Module final exam consisting of:					none					
		0									
	<b>Current Concepts</b>	in	Form of	SWH	СР			Semester			
	Neuroscience		teaching	5,411		1	2	3	4		
	Projectwork		Proj	15	15			X			
	Weekend seminar		S	1	1			X			
	Sum			16	16						

IN	S MA	Masterarbeit	Compulsory	module	30  CP = 900	) h		
Ma	asterthesis				Contact stu 30 SWH / 4	dy 50 h	Self study 450 h	30 CP
Co	ntent							
	As part of the Mas	ter's degree, the stude	ent works on a	problem	from the fiel	d of neuros	science comp	rehensively
	and in depth accor	ding to scientific met	hods. The wo	rk can be	experimenta	l, empirica	l or analytic.	The results
	must be written up	in a Master's thesis in	n the style of a	a scientific	c paper. The	quality of t	he work will	be assessed
Ia	based on the writte	en thesis by the superv	visor and a sec	cond refer	ee			
LC	After successful co	ompletion of the Mast	er's thesis stu	dents are	able to ident	ifv delimi	t and explain :	a research-
	related scientific p	roblem in a subfield of	of neuroscienc	e. They w	vill be able to	analyze, e	evaluate or sol	ve it using
	specialized knowle	edge and scientific me	ethods. They a	ire able to	critically an	alyze relev	ant contributi	ons to
	research and asses	s their relevance to th	eir own resear	ch questi	on. They are	able to app	propriately pro	esent and
	critically evaluate	the results within a gi	ven period of	time usin	g scientific s	tandards, a	ind to recogni	ze and
Do	assess central lines	sol development in th	ie relevant sut	meia.				
NC	Proof of at least 79	) CP						
Не	lpful previous knowl	edge						
	none							
As	signment of module (	program / department	;)	MSc	Interdiscipli	nary Neuro	oscience / FB1	5
Su	itable for other study	programs						
Tiı	nes offered			Each	semester			
Du	ration			1 Ser	nester			
Pe	rson in charge			Repr	esentatives o	of elective r	nodules	
Ser	mester-related proofs	l.		none				
	Proof of participati	ion						
	Study achievement	s						
Те	aching forms							
Tu	ition language			Engli	ish			
Mo	odule exam			Form	/ duration /	content (if a	pplicable)	
	Module final exam of	consisting of:		Grad	ed written w	ork in the f	form of a Mas	ter's thesis
				(40–9	90 Seiten)			
				the g	rade is doub	le weighted	l against the g	rades of
				all ot	her modules			
	Masterthesis	Form of	SWH	CP		Sei	nester	
		teaching	5 10 11		1	2	3	4
	Masterarbeit		30	30				X

## **Optional courses in elective A: Basic Neuroscience**

External elective course "Basic Neuroscience"       Wahlpflichtver- anstaltung,, "Neurowissen- schaftliche Grundlagen- forschung"       Image: Contact study 11 SWH / 165 h       Self study 165 h       Image: Contact
course "Basic       anistanting, ,,Neurowissen- schaftliche Grundlagen- forschung"       interverse
Neuroscience       ,,,recuroscience         schaftliche       Grundlagen-         forschung"       forschung"         Content       This elective course teaches basic methods and techniques in the field of basic neuroscience research. Student work on their own current projects under supervision.         The elective course can be offered by departments of Goethe University, by other universities in Germany and abroad as well as by non-university research institutions.         Learning results / Competence objectives         The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
Grundlagen-forschung"         Content         This elective course teaches basic methods and techniques in the field of basic neuroscience research. Student work on their own current projects under supervision.         The elective course can be offered by departments of Goethe University, by other universities in Germany and abroad as well as by non-university research institutions.         Learning results / Competence objectives         The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
Content         This elective course teaches basic methods and techniques in the field of basic neuroscience research. Student work on their own current projects under supervision.         The elective course can be offered by departments of Goethe University, by other universities in Germany and abroad as well as by non-university research institutions.         Learning results / Competence objectives         The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
Content         This elective course teaches basic methods and techniques in the field of basic neuroscience research. Student work on their own current projects under supervision.         The elective course can be offered by departments of Goethe University, by other universities in Germany and abroad as well as by non-university research institutions.         Learning results / Competence objectives         The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
<ul> <li>This elective course teaches basic methods and techniques in the field of basic fieldoscience research. Student work on their own current projects under supervision.</li> <li>The elective course can be offered by departments of Goethe University, by other universities in Germany and abroad as well as by non-university research institutions.</li> <li>Learning results / Competence objectives</li> <li>The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.</li> </ul>
The elective course can be offered by departments of Goethe University, by other universities in Germany an abroad as well as by non-university research institutions.         Learning results / Competence objectives         The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
Interference course can be only acparations of obecare only ensures in obtained and as well as by non-university research institutions.         Learning results / Competence objectives         The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
Learning results / Competence objectives         The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
The students have knowledge in conducting neurobiological experiments in the field of basic research. They are able to work on scientific questions based on relevant literature.
able to work on scientific questions based on relevant literature.
Requirements for participating
none
Helpful previous knowledge
none
Assignment of course (program/department) Interdisciplinary Neuroscience / FB 15
Suitable for other study programs
Times offered         Depending on provider
Duration Depending on provider
Person in charge Head of study program
Semester-related proofs
Proof of participation Regular participation
Study achievements The regulations of the provider of the elective
course are applied. If the provider does not
request any study proofs, a working report must
be written, and talks have to be given on both,
results of own experiments (20 minutes) and topical
literature (20 minutes).
Teaching forms     Practical, seminar
Tuition language     Depending on provider
Module exam     Form / duration / content (if applicable)
Module final exam consisting of:The regulations of the provider of the elective
course are applied.
If grading is not scheduled by the provider, the module completion even shows a graded
protocol (10-30 pages)
External elective Form of teaching SWH CP Semester
Course "Basic     1     2     3     4
Protical D 10
Seminar S 1 1 Y
Sum         1         1         A

IN	IS A-7	Neurobiologie	Elective c	ourse		11 CP = 330 h				
No of	eurobiology the	des Nematoden				Contact study	Self stud	y	11 CP	
N	ematode	Caenorhabditis				11 SWH / 165 h	165 h			
Ca ela	ienorhabditis gans	elegans								
C	ontent					I				
La	This course molecular bi assays, withor receptors, G synapse. In endogenous repertoire of light media electrophysic sarning results Students hav methods for	teaches basic m iology methods out and with the ABAA receptors addition, cell bi proteins (via sp the laboratory. I ted by the tra ological recordin / Competence ob ve knowledge o crossbreeding, a	ethods for will be use influence o ), which are ological me ecific antib More specif ansgene e: ags from C. jectives f standard nd cell bio	studying the ne d, genetic meth f specific agonis e used for gener ethods for expro- odies) dependir fic methods used xpressed photo elegans muscle methods for th logical and mol	rvous system of 6 ods (crosses, gen ats for ligand-gate al characterizatio ession analysis of ag on the genetic d are exogenous s -activated cation cells. e analysis of an ecular biological	Caenorhabditis e otyping) as well d ion channels (n n of the function f transgenes (GF background, ar timulation of new n channel chan invertebrate ner methods. They y	elegans. Mo as simple nicotinic acc of the neur P fusion p e part of the rrons in C. melrhodops	re gen behavi etylcho omusc roteins e stand elegans sin-2, m, gen to add	eral oral oline ular ) or dard s by and netic ress	
	scientific qu	estions based on	relevant lit	erature.	ceutar biologicar	methous. They v		to aut	1035	
R	equirements fo	r participating								
	none									
H	elpful previous	knowledge								
	none	( 11			MCCLART	1'	/ ED 1	-		
As	ssignment of co	ourse (program/d	epartment)		MSC Interdiscip	plinary Neurosci	ence / FB 1	0		
St	itable for othe	r study programs	6		<b>D</b> 1					
Ti	mes offered				Each semester					
D	uration				I Semester (block course over 4-6- weeks)					
Pe	erson in charge	•			Prof. Alexander Gottschalk					
Se	mester-related	proofs								
	Proof of part	ticipation			regular participation					
	Study achiev	ements			Seminar: 1 talk experiments; Pra module exam is	(20 minutes) on actical: 1 work r a written exam)	the results of the port (if the	of own final		
Т	eaching forms				Practical, semin	ar				
Т	uition language	2			English					
Μ	odule exam				Form / duration	/ content (if appli	cable)			
	Module final exam consisting of:			Practical: graded exam (45 minter	d protocol (10–3 s)	0 pages) or	writter	n		
	Neurobiolog	gy of Form of	teaching	SWH	СР	Semester				
	the Nemato Caenorhabd	de litis				1 2	3		4	
	Practical	Р		10	10					
	Seminar	S		1	1	Х				
	Sum			11	11					

TN	IS A O	Kognition in	Flootive course		11  CD = 220  k						
	SA-9	Kognition in Mausmodellen für	Elective course		11  CP = 330  h		11				
m	ouse models of	psychische			Contact study	Self study	C				
m	ental disorders:	Störungen:			11 SWH / 165 h	165 h	Р				
fo	cus on	Schwerpunkt auf donaminergen									
do	paminergic stems	Systemen									
C	ontent										
	The practical co	vers basic in vivo ele	ctrophysiologic	al techniques of the	e dopaminergic 1	nidbrain syste	m and				
	neuronal imaging	g of dopamine dynami	cs in the striatur	n with fiber photom	etry during behav	vioural tasks in	n mice.				
	The students wor	rk on their own project	s under supervis	sion and present thei	r results in the fo	rm of a semin	ar talk.				
	In a further semi	nar talk they present an	original piece o	of research from the	field of basal gan	glia neurophys	siology				
	and pathophysio	logy (e.g. Parkinsos's	disease, schizop	ohrenia, drug addicti	on). The main fo	cuses are me	asuring				
	statistical evaluating f	tion methods. The stur	ls benavioral al	it the associated stochastic background and how to use the							
	relevant software	e or how to implement	data analysis in	Matlab, which invol	ves interdisciplir	ary cooperatio	on with				
	the BSc/MSc cou	urses in mathematics.	<i>aaaa aaaa j</i> 515 111		, es merererer pin	ing cooperation					
Le	earning results / Co	mpetence objectives									
	Students will have	ve knowledge to perfor	rm electrophysic	ological, behavioral,	and fiber photor	netric experim	ents to				
	measure and ana	alyze the electrical act	tivity of dopam	inergic neurons and	changes in fluc	rescence that	reflect				
	dopamine dynam	nics in vivo. They can o	combine in vivo	techniques with neu	roanatomical and	l immunohisto	logical				
	analyses. They l	have knowledge of bas	ic computationa	I modeling of neuro	nal activity and s	tochastic desc	ription				
	and statistical a	inalysis of recorded	time-sequence	data. They have	an understandin	g of the mo	mouse				
	models, with par	ticular emphasis on scl	hizophrenia.	of the dopanninergi	e system and the	corresponding	mouse				
R	equirements for par	rticipating									
	none										
H	Helpful previous knowledge										
	Matlab knowled	ge									
As	ssignment of course	e (program/department)		MSc Interdisciplin	nary Neuroscienc	e / FB 15					
Su	itable for other stu	dy programs									
Ti	mes offered			In the summer semester							
D	uration			1 Semester (block course over 4 weeks)							
Pe	erson in charge			Dr. Natascha Diamantopoulou/ Prof. Jochen Roeper/							
G				Prof. Gaby Schne	ider						
Se	mester-related pro	ofs		1							
	Proof of participa	ation		regular participati	on	1. 0					
	Study achievement	nts		Seminar: I talk (2	0  minutes) on the	e results of ow	'n				
T	aching former			Procticel coming	$\kappa$ (20 minutes) of	i current litera	uure				
10 T				Fractical, Seminar							
	lition language			English	······································						
M	odule exam			Form / duration / d	content (il applica						
	Woulde Infai exal	ii consisting of:		Flactical. graded	protocol (10-30 p	lages)					
	Cognition in		GD	Semester							
	mouse models o	<b>f</b> Form of teaching	SWH	CP	1 2	3	4				
	mental disorder	s:					•				
	focus on										
	dopaminergic										
	systems		10	10							
<u> </u>	Practical	P	10	10							
	Seminar	5		1							
I	Sum	1	11	11							

IN	S A-10	Neurophysiologie	Elective c	ourse			11 CP = 330 h			
Ne an	europhysiology d Behaviour	und Verhalten					Contact st 11 SWH /	tudy 165 h	Self study 165 h	11 CP
Co	ontent									
	The practical i	investigates the neu	rophysiolo	gical basis o	f beha	viour control. 7	The student	s work o	on their own	project
	on a theme d	lefined together be	forehand.	The techniq	ues th	hat are taught i	include: ce	ell physi	iology (patcl	helamp
	preparation	confocal laser n	ictance, cal	fluorescer	ing, co	picroscopy): h	abavioural	y (staini	iments (beb	, brain
	pheparation,	extracellular cond	luctance. le	arning and r	nemo	ry, social behav	iour). Insec	ets (hone	ev bees, dros	ophila)
	are used as	model organisms.	The princ	ciple areas	are: 1	now ion chann	els and tr	ansmitte	er receptors	work,
	neuromodulat	ion, learning behav	viour, olfac	ctory memor	ry for	mation, and so	cial behav	iour of	bees. The st	udents
	present their r	results in the form	of a semina	er talk and p	oster.	In a further ser	ninar talk	they lear	rn how to cr	itically
	assess analyti	c physiological an	d behaviou	ral research	pape	rs. These prese	entations a	re held	in English a	ind the
	students receiv	ve comprehensive f	eedback ab	out the cont	ent an	d style of the pr	esentation.	They be	ecome famili	ar with
Ic	writing a scier	Competence objecti	y producing	g a protocor	in the	Torini or a paper	•			
	The students of	competence objecti can plan carry out a	ves and evaluat	e neurobiolo	ogical	experiments T	hev have ki	nowledg	e in the	
	measurement	of ionic currents an	d perform	behavioral o	bserv	ations and beha	vioral quan	tificatio	ons. They are	
	familiar with 1	neuroanatomical m	ethods. The	ey are famili	ar wit	h approaches to	scientific of	question	s and literatu	ire
	work and prep	pare scientific paper	rs and prese	entations.						
Re	equirements for	participating								
	none									
He	Helpful previous knowledge									
	none		4		MG	Intendicainline		ion oo /1	ED 15	
As	signment of cou	rse (program/depar	(ment)		MSG	<sup>c</sup> interdisciplina	iry neurosc		ГД ІЗ	
Su Ti	mas offered	study programs			in the summer semester					
D	iration				1 Semester (block course over 4 weeks)					
Pe	rson in charge				Prof	Bernd Grünev	vald	1 WCCR	57	
Se	mester-related r	proofs			1101					
	Proof of partic	cipation			regu	lar participation	1			
	Study achiever	ments			Sem	inar 1 talk (20	minutes) o	n the res	sults of own	
	Study achieved	licity			expe	eriments, 1 talk	(20 minute	es) on cu	rrent literatu	re
Те	eaching forms				Prac	tical, seminar				
Тι	Tuition language				Eng	lish				
Μ	Module exam				Form	n / duration / co	ntent (if apj	plicable)		
	Module final exam consisting of:				Prac	tical: graded pr	otocol (10-	-30 page	es)	
	Neurophysiol	logy Form of t	reaching	SWH		СР	Semester			
	and Behaviou	ir in one	caening	5,011			1	2	3	4
	Practical	Р		10		10				
	Seminar	S		1		1		Х		
	Sum			11		11				

IN	S A-12	Die neuro-	Elective c	ourse		11 CP = 330 h				
Tł Va In	ne Neuro- nscular terface	vasculäre Schnittstelle				Contact study 11 SWH / 165 h	Self study 165 h	11 CP		
C	ontent									
	The course p development blood-brain experiments BBB format reporter mou "loss-of-fund of cortex m confocal and immunoprec	provides basic that and under patho barrier (BBB), in the laboratory ion. This work use lines for detection" lines), pro- icrocapillaries ful live-cell micros ipitation.	eoretical an ological con and its im y setting that may include ection of the cessing of b rom mice, copy, bioch	d experimental additions. The re- aportance for n at will contribut de the followin e Wnt signaling rain tissue for in transfection ar hemical techniq	knowledge of the search focus is the euronal function. the to the understan g: basic work wi g pathway, as well a situ hybridization and infection technues ues such as protei	e cerebrovascular e development an . Students will p nding of the mole th transgenic mo ll as conditional/i n and immunohist niques of cells, i n gel electrophore	system in em d maintenanc participate in cular mechan use models ( nducible "gai ochemistry, I mmunofluore esis, western l	bryonic e of the current isms of (various n-" and solation escence, plot and		
Le	earning results	/ Competence ob	jectives							
	Students kno gained exper tissue from r to communic	ow basic technique rience with trans nice according to cate and write sci	tes of cellul genic mice subsequen entifically	lar and molecula and/or cells in t methods. Stud in English.	ar neurobiology. E vitro, and they w ents operate in an	By the end of the c will have learned international env	course, they w how to proce	vill have ss brain are able		
R	equirements fo	r participating								
	None									
H	elpful previous None	knowledge								
As	signment of co	ourse (program/de	epartment)		MSc Interdiscip	linary Neuroscier	nce / FB 15			
Su	itable for othe	r study programs								
Ti	mes offered				in the summer s	emester				
D	iration				1 Semester (block course over 4 weeks)					
Pe	rson in charge	•			Dr. Stefan Liebner					
Se	mester-related	proofs								
	Proof of part	ticipation			regular participa	ation				
	Study achiev	ements			Seminar: 1 talk experiments, 1 t	(20 minutes) on t alk (20 minutes)	he results of concurrent lite	own erature		
Те	aching forms				Practical, semin	ar				
Τι	ition language	2			English					
Μ	odule exam				Form / duration	/ content (if applic	able)			
	Module final exam consisting of:				Practical: graded	d protocol (10-30	pages)			
	-			1		I				
	The Neuro-	Form of	teaching	SWH	СР	Semester				
	Vascular Interface		-			1 2	3	4		
	Practical	Р		10	10					
	Seminar	S		1	1	x				
	Sum	~		11	11					

IN	IS A-14	Genetik und	Elective co	ourse		11 CP = 330 h				
G El No an G	enetics and bigenetics of eurogenesis id iogenesis	Epigenetik der Neurogenese und Gliogenese				Contact study 11 SWH / 165 h	Se 16	elf study 55 h	11 CP	
Co	ontent									
Le	The topic of study this in neurodevelo the followin and differen based meth microscopy, Students wo	this practical is healthy organism pmental disorder g skills: bioinfor tiation of cell lin ods for genome basic biochemic rk as full membe	the control ns and in di s. Dependin matic analy es and sten modificat al methods. rs of the res iectives	of neuron and g fferent disease ng on the ongoir yses of existing n cells (adult ne ion, retro- and search group, w	glia production by states, with a focu- ng projects at the t genome-wide da eural stem cells, r lentiviral gene ith supervision, o	r genetic and epig is on glial, brain ime of the course tasets (ChIP-seq nouse ES cells), transfer, immun n their own smal	genet tumo , the , RNA qPC nohis	ic processe ors and chil course wil A-seq), cu R, CRISPI tochemistr jects.	s. We dhood l teach lturing X/Cas- y and	
D	Students hav solid knowl histone mod developing a	re hands-on expe edge of the regu lifications, DNA and conducting th	rience with lation of g methylation neir own res	basic as well as ene expression, on) and stem c search project.	some advanced r different epigen cell biology. Stud	nolecular¬geneti etic modification lents will have	c met is on gaine	thods. The chromatined experies	y have 1 (e.g. nce in	
R	equirements fo	r participating								
Н	elnful previous	s knowledge								
	none	moneage								
As	signment of co	ourse (program/de	epartment)		MSc Interdiscip	linary Neuroscie	nce /	FB 15		
Su	itable for othe	er study programs								
Ti	mes offered				in the summer s	emester				
D	iration				1 Semester (block course over 4 weeks)					
Pe	erson in charge	e			Prof. Dorothea Schulte					
Se	mester-related	l proofs								
	Proof of par	ticipation			regular participa	ation				
	Study achiev	rements			Seminar: 1 talk	(20 minutes) on alk (20 minutes)	he re	esults of ov	/n ature	
Те	aching forms				Practical, semin	ar				
Т	iition languag	9			English					
Μ	odule exam				Form / duration	/ content (if appli	cable	)		
	Module final exam consisting of:				Practical: grade	d protocol (10-30	) page	es)		
	Genetics an	d F	4 <b>h</b> :	сули	CD	Semester				
	Epigenetics	of Form of	teaching	змн	Cr	1 2		3	4	
	Neurogenes	is .								
	and Glioger	nesis D		10	10					
	Sominar	۲ ۲		10	10	v	┝			
	Sum	3		11	11		┝			
L	Sum			11		I				

IN	S A-15	Ableitungen	Elective course	;		11 CP = 330 I	1			
Re neu act fre bel ani	cording 1ronal ivity in ely naving mals	der neuronalen Aktivität in sich frei bewegenden Tieren				Contact study 11 SWH / 165	y 5 h	Self study 165 h	1 1 C P	
Co	ntent									
	During this focus on or course): ex microscope the mouse recording n and histolog will be pres	event, participant te of two method tracellular record . Participants will brain using stered eural activity duri gical methods to ented at the end o	s will learn met s (depending o lings using fix learn to perfor otactic surgery, ing behavioral t confirm the pla of the practicum	hods for stu n the exper ed implant m behaviora both the th asks; metho cement of t	dying neu iments ru ed electr al tests in heory beh ods for an the measu	uronal activity unning in the l odes or calciu mice, how me nind the measu alyzing neural urement probe	in freely movi ab during the im imaging u casurement pro- irement methor signals related s. The collected	ng animals. T time window using a mini- obes are impla- ods and their d to mouse be ed and analyz	This will w of the aturized anted in use for ehavior; zed data	
Lea	arning results	/ Competence obj	ectives	14					<b>1</b>	
	the neural a literature.	ctivity of freely n	noving animals,	and they w	ill be abl	e to address sc	ientific question	ons based on a	relevant	
Re	quirements fo	or participating								
	none									
He	lpful previous	s knowledge								
	none	( )			MC - L		. N	/ ED 15		
Ass	signment of co	ourse (program/de	epartment)		MSc In	iterdisciplinary	Neuroscience	e / FB 15		
Sui	itable for othe	er study programs								
Tir	nes offered				in the summer semester					
Du	ration				1 Semester (block course over 4 weeks)					
Per	rson in charge	2			Dr. Torfi Sigurdsson					
Ser	nester-related	l proofs								
	Proof of par	ticipation			regular	participation				
	Study achie	vements			Semina experir	ar: 1 talk (20 m nents, 1 talk (2	inutes) on the 0 minutes) on	results of ow current litera	n ature	
Tea	aching forms				Practic	al, seminar				
Tu	ition languag	e			English	1				
Mo	Module exam Module final exam consisting of:				Form / Practic	<b>duration / cont</b> al: graded prot	ent (if applicab ocol (10-30 pa	le) ages)		
	<b>Recording neuronal</b> Form of SWH		SWH	CP	Semester					
	activity in	freely	teaching	5,011		1	2	3	4	
	behaving a	nimals	,	10	10					
	Practical		Р	10	10		37	 		
	Seminar			1	11		Х			
	Module exam Module fina Recording activity in f behaving a Practical Seminar Sum	l exam consisting o neuronal freely nimals	of: Form of teaching P	SWH 10 1 11	Practic CP 10 1 11	Semester	2 X	ages)	4	

IN	S A-17 Gestörte Elective course					11 CP (insg.) = 3	30 h				
Au Fu Dy	ditory nction and sfunction:	Wahrnehmung beim Hören: Verhaltens-				Contact study 11 SWH / 165 h	Self study 165 h	11 CP			
Be	havior and	untersuchungen									
Ph	ysiology ntont	una Physiologie									
Le	ntent This course of working therapeutic characterizi necessary s experimenta tests, basic of will work of content of the hearing phy possible put addition, or arning result The student statistical e invasive pre	teaches methods f with animal mod approaches to ser ng these disorder steps for carrying al variables, pharr electrophysiologic n their own projec he course are: Me visiology and statis blication. At the e iginal papers in th s / Competence obj s are able to perfor valuation) and pl	For determine lels, the me asory process as accurated out a pro- nacological al technique tunder sup- easurement tical evaluated and, the indited e field of con- ectives form quantitated typiologicates	aning auditory fur- ethods will be a essing damage s tely as possible oject are taught l treatment of a es are taught to ervision and the and analysis of tion. This will is vidual projects ognition and her ative behavioral l experiments is knowledge o	nction and hearing used to study the such as tinnitus o e through behavi t: Planning the s nimals, and data determine physio results will be pr f behavioral data, finally lead to a s will be presented aring will be discu- tests (handling o with electrophysio	g loss in laborator effects of pharr r hearing loss. E oral testing. For study, handling a analysis. In para logical changes in esented in a semi efficient executi ummary of the re and discussed in ussed in a semina of animals, analysis	y rodents. Exer naceuticals and mphasis is pla this purpose, mimals, deter llel to the beh hearing. Parti- nar lecture. Im- on of experim sults in the for a seminar lect r. is of behaviors ements in mir	mplary d other ced on all the mining avioral cipants portant ents in rm of a cure. In al data, iimally			
	invasive pro	eparations. Studen	ts have bas	ic knowledge o	f computer-assist	ed data analysis,	signal processi	ng and			
	current liter	ature and assess fl	ne possibili	ties and limitati	ons of animal mo	dels for disturbed	le questions in brain function	om the			
Re	quirements f	or participating	ie possiem				- orum runetion	10.			
	none										
He	lpful previou	s knowledge									
	none										
As	signment of c	ourse (program/de	partment)		MSc Interdiscip	linary Neuroscie	nce / FB15				
Su	itable for oth	er study programs									
Tiı	nes offered				in the summer s	emester					
Du	ration				1 Semester (block course over 6 weeks)						
Pe	rson in charg	e			PD Dr. Bernhar	d Gaese					
Ser	nester-relate	d proofs									
	Proof of par	ticipation			regular participa	ation					
	Study achie	vements			Seminar: 1 talk experiments, 1 t	(20 minutes) on talk (20 minutes)	he results of o on current lite	wn rature			
Те	aching forms				Practical, semin	ar					
Tu	ition languag	je			English						
Mo	Module exam				Form / duration	/ content (if appli	cable)				
	Module final exam consisting of:				Practical: grade	d protocol (10-30	pages)				
	Auditory	Form of	teaching	SWH	СР	Semester					
	Function a	nd	8		-	1 2	3	4			
	Dystunctio Behavior	n: nd									
	Physiology	iiu									
	Practical	Р		10	10						
	Seminar	S		1	1	x					
	Sum			11	11						

INS A-18 Informationsver Elective course						11 CP (insg.) = 330 h 11				
Information Processing in the	arbeitung im Zentralen Hörsystem					Contact stud 11 SWH / 16	y 5 h	Self study 165 h	P C P	
Central										
Auditory										
Content										
Content         This cours         as an exar         under ane         Cognitive         their own         and analys         modern si         leads to a         and discus         in a semin         Learning resu         Students v         and analy         neuroanato         computeri         importanc         scientific o         Requirements         none	the teaches the manple. Emphasis sthesia. The ac- influences (e.g. project under s sis of neuronal gnal processing summary of the sed in a semina ar. <b>Its / Competence</b> vill have experi- zing electroph omical and his zed data mana e of cognitive in <u>questions from</u> <b>for participatir</b>	nethods used to study t s is placed on the elect tivity of neurons is re- attention, context depe- upervision, the results activity with different n g techniques, efficient of the results in the form of ar presentation. In addit <b>e objectives</b> ence in performing phy ysiological activity of tological staining techn agement, signal process the current literature.	he activ trophysi corded endence are pres methods data man a possifi ion, orig siologic f single niques.	ity of neur ology of s with the a ) are contr- ented in a cof in-vive nagement ble publica ginal work al experim cells). They have ata analys sensory ir	rons in processi ingle neurons i im of understar olled and taken seminar lecture o electrophysiol of large data se tion. At the end in the field of c ents (handling a hey can supple basic knowled sis, and graphi- formation as th	ng sensory in in laboratory in inding acoustic into account. ' c. Important co ogy. The subs ots and statistic d, the individu cognition and l animals, surgic ement physio dge of behavi cal presentati he basis of beh	formation odentically t The parameters ontentical ana al pro- nearing cal tec logical oral eison. The avior	tion, using h s, both awal riggered bel articipants w s are the rec tt analysis in alysis. This jects are pre g will be dis chniques, rec l techniques xperiment c 'hey overvie and can for	earing ce and lavior. ork on ording cludes finally sented cussed ording s with ontrol, ew the mulate	
Helpful previo	ous knowledge									
Assignment of	° course (progra	m/department)		MSc Inte	rdisciplinary N	euroscience /	FB15			
Suitable for of	her study progra	ams		nibe inte		curoscience /	1010			
Times offered				in the su	nmer semester					
Duration				1 Semest	er (block course	e over 6 week	s)			
Person in cha	rge			PD Dr. B	ernhard Gaese		/			
Semester-rela	ted proofs									
Proof of p	articipation			regular p	articipation					
Study achi	evements			Seminar: experime	1 talk (20 minu ents, 1 talk (20 r	utes) on the re ninutes) on cu	sults o rrent l	of own literature		
Teaching form	15			Practical	, seminar					
Tuition langua	age			English						
Module exam				Form / du	iration / content	(if applicable)				
Module fin	al exam consist	ing of:		Practical	graded protoco	ol (10-30 page	es)			
Informati	on	Torms of toook in -	CWIT		CD	Semester				
Processin	g in the	ronn of teaching	SWH		Cr	1	2	3	4	
Central A	uditory									
System			10		10					
Practical			10		10		v			
Sum		3	11		11		^			

19.10.2023

IN	IS A-19	Neurona	ale	Elective c	course		11 CP (insg.) =	: 330	h	
No of	euronal Basis Acoustic	Grundla akustisc	igen her				Contact study		Self study	11 CP
C	ommunication	Kommu	nikation				11 SWH / 165	h	165 h	
in	Mammals	bei Saug	getieren							
C	ontent	J			:			ſ		
	the neural ba	u acoustic	itory por	antion, it	is essential to	understand both th	d on the broader	1 SO	raceiver apr	n and
	and is divide	$\frac{1}{1}$ into two	nory per	the first i	nart the gene	ration of communi	cation calls in t	vo n	ammalian si	noach
	(gerbil bat) is	s investio	ated Usir	og bioacou	stic methods	a vocal alphabet for	r bats and gerbil	s wil	l be defined	In the
	second part. t	he "recei	ver" prop	erties of n	eurons in the	auditory cortex of	the gerbil will h	e in	vestigated wi	th the
	main goal of	understan	ding how	behaviora	lly relevant so	ound stimuli are pro	cessed. At the b	egin	ning of each	of the
	two parts of t	he practic	al, the th	eoretical k	nowledge nec	essary for the expe	riments will be	orov	ided in the fo	orm of
	lectures and o	liscussion	ns. An int	roduction	to statistics ar	d Matlab relevant	to the practical	will	also be giver	1. The
	results are to	be summa	arized in	the form of	f a scientific p	aper and presented	in the form of a	sen	ninar talk.	
Le	earning results /	Compete	nce object	tives						
	(1) Understar	nding of I	basic con	cepts of b	ioacoustics, s	ound propagation,	and acoustic m	easu	rement techr	niques
	using various	micropho	one system	ns and ana	alog-to-digital	converters.				
	(2) Measuren	ient and a	inalysis o	f importan	t parameters of	of sound events (fre	equency, duratio	n, in	tensity).	
	(3) Learning	of surgica	ıl techniq	ues for cor	tical measure	ment data collectio	n			c: 1.1
	(4) Understar	iding imp	ortant coi	icepts in n	euroscience, e	e.g: Action potenti	ial, local field po	tent	ial, receptive	field,
	cortex topogr	aphy, "sp	ike cluste	ring", neu	ronal oscillati	ons.				
	(5) Test hypo	theses us	NOVAN	statistical	tests (normal	distribution tests,	parametric and	non	-parametric t	-tests,
D	Requirements for participating									
N	none	participa	ung							
н	elnful previous	knowledg	ρ							
	none	kilowicug								
As	signment of co	irse (prog	ram/dena	rtment)		Interdisciplinary	Neuroscience / 1	FB15	5	
Su	itable for other	study pro	ograms					210	·	
Ti	mes offered		0			in the summer set	mester			
D	uration					1 Semester (block	k course over 5	veek	as)	
Pe	erson in charge					Dr. Julio Hechav	arria			
Se	mester-related	proofs								
	Proof of parti	cipation				regular participat	ion			
	Study achieve	ments				Seminar: 1 talk (2	20 minutes) on t	ne re	sults of own	
						experiments, 1 ta	lk (20 minutes)	on c	urrent literatu	ire
Т	eaching forms					Practical, seminar	r			
Т	iition language					English				
Μ	odule exam					Form / duration /	content (if applic	able	)	
	Module final e	exam cons	isting of:			Practical: graded	protocol (10-30	pag	es)	
-							•			
	Neuronal Ba	sis of	Form of t	eaching	SWH	СР	Semester			
	Acoustic			8			1	2	3	4
	Communicat	tion in								
	Mammals						<u> </u>		$\downarrow$	
	Practical		Р		10	10	<u> </u>			
	Seminar		S		1	1		<		
	Sum				11	11				

INS A-21 Zelluläre, I		Elective co	Elective course									
С	ellular,	molekulare und				Contact study		Self study	11			
m	olecular and	Neurobiologie				11 SWH / 165	h I	165 h	СР			
ne	urobiology	in Maus und										
in	mouse and	Zebrafisch										
ze	brafish											
	mtent	1 1	4	· · · · · · · · · · · · · · · · · · ·			. 11 1	1 1	1			
	The practica	al provides basic	theoretical	and experime	ntal knowledge i	n the field of o	ellul	lar, molecul	ar and			
	present the i	results in the form	n of a lectu	ure In another 1	ecture they prese	nt an original n	aner	from the th	ematic			
	area of their	projects. They le	earn how to	write a scientif	ic paper by design	ning a protocol	of res	sults accord	ingly.			
	The practica	l is divided into	two units.	The first part ir	cludes the follow	ving work: Bas	c tec	chniques of	mouse			
	genetics, pro	ocessing of brain	tissue for	immunohistoch	emistry, basics o	of working with	neu	ronal cell c	ultures			
	including ge	neration of prima	ary neurona	l,astrocytic or en	ndothelial cell cul	tures, immuoflu	ores	cence micro	oscopy,			
	confocal mi	croscopy and bio	chemical te	chniques includ	ling protein gel e	lectrophoresis a	nd w	fich record	In the			
	includes leav	of the practical, s	viology and	histology meth	ode using variou	s microscopes	eora mani	inulating ze	n. 11118 brafish			
	embryos, an	d performing sin	ple behavio	oral tests.	ous, using variou	s meroscopes,	man	ipulating Ze	oransii			
Le	arning results	/ Competence ob	jectives									
1	Students wi	ll have experience	e in basic t	echniques of ce	ellular, molecular	and systemic r	euro	biology. Th	ey can			
	independent	ly perform steri	le work or	n cultured cells	, independent w	ork on fluores	cence	e microscoj	pe and			
	stereomicros	scope, basic zebi	afish work	such as handlin	ng embryos and g	genetic techniqu	ies, a	and comput	ational			
	analysis of la	aboratory data an	d image file	es. Students will	operate in an inte	ernational enviro	onme	ent and will	be able			
R	to present an	or participating	their results	in English.								
IN	none	a participating										
H	elpful previous	s knowledge										
	none											
As	signment of co	ourse (program/de	epartment)		MSc Interdisciplinary Neuroscience / FB 15							
Su	itable for othe	er study programs	6									
Ti	mes offered				in the summer s	emester						
D	iration				1 Semester (blo	ck course over	ó we	eks)				
Pe	erson in charge	e			Prof. Amparo A	cker-Palmer, D	r. Be	ettina Kirchi	naier			
Se	mester-related	l proofs										
	Proof of par	ticipation			regular participa	ation						
	Study achiev	vements			Seminar: 1 talk	(20 minutes) or	the	results of ov	wn			
T	eaching forms				Practical semin	aik (20 minutes	) on	current liter	ature			
т.	ution language	<b>a</b>			Fnglish	ui						
10 M	a dula anguago	5			English	/ contont (if onn	icah	lo)				
IVI	odule exam Modulo final	ovom consisting	of.		Practical: grade	d protocol (10.3	1 na					
	would infai	cxam consisting (			Tractical. grade		o pa	iges)				
	Cellular,	E 6	taaahir -	CW/II	CD	Semester						
1	molecular a	nd Form of	teaching	SWH	Cr	1 2		3	4			
	systemic											
	neurobiolog	gy in										
	mouse and											
	Zebraiish Droctice 1			10	10	<u>├</u> ───						
┣──	Practical	<u>Р</u>		10	10	╞───┤ 、	7					
┣—	Seminar	5		1			ι.					
	Sum			11	11							

IN	S A-22	Optogenetik	Elective course			11 CP (i	nsg.) = 330	h			
Oj an re fro an	ptogenetics d calcium cordings in cely behaving imals	und Calcium- Messungen in sich frei verhaltenden Tieren				Contact 11 SWH	study [ / 165 h	Self study 165 h	11 CP		
Co	ntent										
	The goal of this while performi Students will le well as behavio using "fiber ph and calcium m specific behavi	course is to int ng behavioral t earn how to pe oral tasks and c otometry" and easurements ar oral tasks such	roduce students to o asks. rform chronic surge optogenetic experim then analyze them i e mainly performed as reward learning	ptoger ery for ients. I in relat in the paradig	netics and "fib virus injectic Furthermore, tion to animal midbrain do gms.	per photometry ons and fiber they learn ho l behavior. Th pamine system	y" techniqu optic cable w to regist ie optogen m while th	ues used in a e implantati- ter calcium etic manipu ne animals p	nimals ons, as signals lations erform		
Le	arning results / C	competence obj	ectives			-					
	Students know experiments wi	the basics in the freely behav	performing behaving animals. They ca	ioral t an desi	asks, as well gn experimen	l as optogene its to test spec	etics and ific hypoth	calcium rec neses. They o	ording operate		
	in an internatio	nal environme	nt and can present a	nd con	nmunicate the	eir results in E	nglish.				
Re	quirements for p none	articipating									
He	elpful previous kr	owledge									
	none										
Assignment of course (program/department) MSc Interdisciple						isciplinary Ne	uroscience	e / FB15			
Su	itable for other s	tudy programs									
Ti	mes offered				in the summ	ner semester					
Du	iration				1 Semester (block course over 4 weeks)						
Pe	rson in charge				Dr. Sevil Dı	uvarci					
Se	mester-related p	oofs									
	Proof of partici	pation			regular parti	icipation					
	Study achievem	ents			Seminar: 1	talk (20 minut	tes) on the	results of o	wn		
					experiments	s, 1 talk (20 m	inutes) on	current liter	rature		
Te	aching forms				Practical, se	eminar					
Tu	ition language				English						
M	odule exam				Form / dura	tion / content (	(if applicab	ole)			
	Module final ex	am consisting o	f:		Practical: gr	raded protoco	l (10-30 pa	ages)			
	Optogenetics	Form of	SWH	CP		Semester					
	and calcium	teaching	5 11	Cr	F	1	2	3	4		
	recordings in	0									
	freely										
	Denaving										
	Practical	D	10	10							
	Sominor	r c	10	10			v				
	Sum	د ا	11	11			^				

IN	S A-23	Zelluläre und	Elective c	ourse		11 CP = 33	0 h					
Ce	llular and Jecular	molekulare Mechanismen				Contact stu	ıdy	Self study	11 CP			
me	chanisms	neurovaskulärer				11 SWH / 1	165 h	165 h				
in	movecenter	Erkrankungen										
dis	orders											
Co	ntent											
	The practica	l course provides l	pasic theore	etical and exper	imental knowledg	e in the field	l of neur	rodegenerati	ve and			
	vascular dis	eases. The practica	al course in	cludes cellular	and molecular asp	pects address	sed in th	ne model org	ganism			
	mouse. The	se include the foll	owing wor	k: Basic techni	ques of mouse ge	netics and e	xperime	ental OR me	thods,			
	immunofluc	or brain ussue	opy confo	cal microscon	v and biochemic	orking with al technique	n prina es Pri	imary cell cu	nures,			
	experiments	are used to an	nalyze tecl	hniques such	as phagocytosis	efficiency	of diff	ferent cell	types.			
	Immunohist	ochemistry is used	l to analyze	e cell specific n	narkers in differen	t disease sta	tes. Mic	croscopy allo	ows us			
	to record the	e cellular and system	nic events.	The data obtain	ned will be further	analyzed by	the stud	lents, thus te	aching			
	them how t	o use image proce	essing and	analysis softwa	are. In addition,	students wil	ll have	the opportu-	nity to			
-	observe surg	gical methods such	as experin	nental stroke su	irgery and in vivo	2-photon mi	icroscop	by.				
Le	Students will	5 / Competence obje	ctives	abrigues used i	uses used in the study of neurodegenerative diseases, among other							
	The differen	t methods allow to	ne basic teo	ted questions	Accordingly the s	tudents can	assess f	he advantag	es and			
	disadvantag	es of different mo	del systems	s. The students	operate in an inte	ernational en	vironm	ent and are	able to			
	present and	communicate their	results in 1	English.	1							
Re	quirements fo	or participating										
	none											
He	lpful previou	s knowledge										
	none											
As	signment of c	ourse (program/dep	partment)		MSc Interdisciplinary Neuroscience / FB 15							
Su	itable for oth	er study programs										
Tiı	nes offered				Each semester							
Du	ration				1 Semester (bloc	ck course ove	er 4 wee	eks)				
Pe	rson in charg	e			Prof. Jasmin Hef	fendehl						
Sei	mester-related	l proofs			1							
	Proof of par	ticipation			regular participa	tion						
	Study achiev	vements			Seminar: 1 talk (	(20 minutes)	on the i	results of ow	/n			
Те	aching forms				Practical, semina	ar	morata					
Tu	ition languag	e			English							
Mo	odule exam				Form / duration /	content (if a	pplicabl	le)				
	Module fina	exam consisting of	:		Practical: graded	l protocol (1	0-30 pa	ges)				
		U			-	•						
	Cellular an	d Form of t	teaching	SWH	CP	Semester						
	molecular		cuennig	5,,,,,		1	2	3	4			
	mechanism	s in										
	neurovascu	lar										
	Dractice1	<u></u>		10	10							
$\vdash$	Sominor	r c		10	10		Y					
$\vdash$	Sum	3		11	11		~					
	Sum			11	11							

IN	S A-24	Dekodierung	Elective of	course		11 CP = 330 h					
De br du be re	cciphering ain activity ring natural haviour in al time	von Hirnaktivität während des natürlichen Verhaltens in Echtzeit				Contact s 11 SWH	study / 165 h	Self study 165 h	11 CP		
Co	ontent					I					
	People often represented s of these proc simultaneous between spec trained to per neuronal pop begins, inclu virtual reality	can't multitask imultaneously esses affects ne ily represent suc- cies. To this enc- form naturalist ulations in thei ding mouse/mo y (VR) experim	- but their b in the same uronal active ch cognitive l, we are con ic foraging r visual syst nkey behav ents, and in	prains can! Cogn brain areas. Pre- vity in isolation. processes and v nducting paralle tasks in a virtua tem. Different ta ioral training, M vivo electrophy	itive processes su vious studies have In contrast, in our whether these are l experiments in r l environment, wh ssks will be offere latlab/Python pro- ssiology.	tch as learn e focused p r lab we ar evolutiona nonkeys a nile we rec d dependin gramming.	ning and a predomina e investig rily cons nd mice. ' ord the ac ng on who psychop	attention are antly on how gating how n erved or vary These anima ctivity of larg en the practio hysics in hum	often y each eurons y ls are ge cal mans,		
Le	earning results	/ Competence ol	ojectives								
	Students will and/or monk electrodes, an addition, stud analysis proj able to prese	be familiar with eys), training the nd electrophysical dents are able to ect to learn Mate nt and commun	th all the tec e animals to ological rec perform V clab/Python icate their re	chniques require o perform a natu ordings from the R psychophysic programming. S esults in English	quired for in vivo electrophysiology: handling animals (mic natural task in a virtual environment, surgeries to implant m these electrodes as the animals perform their task. In nysics on human subjects, and are given their own data ng. Students are in an international environment and are light.						
Re	equirements for	r participating		0							
	none										
He	elpful previous	knowledge									
•	none	<i>,</i> , , , , , , , , , , , , , , , , , ,	• • • •		MC	1' NT.	•	/ FD 15			
As	signment of co	urse (program/c	lepartment)		MSc Interdiscip	linary Net	iroscience	e / FB 15			
Su	itable for othe	r study program	S								
Ti	mes offered				Each semester		1.5	1 )			
Du	iration				I Semester (blo	ck course	over 4-6	weeks)			
Pe	rson in charge				Dr. Martha Hav	enith / Dr	Marieke	Schölvinck			
Se	mester-related	proofs									
	Proof of part	icipation			regular participa	ation	\ .1	1. 6			
	Study achiev	ements			Seminar: 1 talk	(20 minute	es) on the	results of ov	wn		
Те	aching forms				Practical semin	ar		uic			
Т	uition language				English						
м	odule exam				Form / duration	/ content (i	f applical	ole)			
	Module final	exam consisting	of:		Practical: grade	d protocol	(10-30 pa	ages)			
	Deciphering	Form	fteaching	SWH	СР	Semester					
	brain activit	y	i teuennig	57711		1	2	3	4		
	during natu	ral real									
	time	i i cai									
	Practical	Р		10	10						
	Seminar	S		1	1	X	Х				
	Sum			11	11						

INS	5 A-25	Neurowisse	enschaft	Elective course			11 CP =	330 h		
Net e of Nav and Mo	iroscienc f vigation l Self- tion	liche Grund der Naviga und Eigenbeweş	llagen tion gung				Contact 11 SWH h	study 7/165	Self study 165 h	11 C P
Co	ntent									
	We intera a new sho the circui world. N where the and deve the techr theoretica topics: N Bayesian	act with the v ppping mall; ts in the bra eural derivat ey can sit on lop models of iques of ex al and system avigation (h- modeling.	world by and whe in respon- tions are moving of self-m tracellula ms neuro ead-direc	moving and navigating enever we drive a car or isible for sensing how o performed on small, sq platforms or move free otion perception based ar recordings and neur science, and can then c tional cell system), intr	throug climb ur bod uirrel- ly in r in part al dat onduc insic r	h it wheneve a mountain lies move, co -sized monke natural cages. ticular on the a analysis, r t an in-depth notion (vestil	r we walk path. The ntrolling I eys called We are a Bayesian notion an research pular syste	into our research palance, a marmos comput formalia d naviga project em), cere	kitchen or e group is st and navigat ets in exper ational labo sm. Student ation science in one of the bellar phys	explore udying ing the iments ratory, ts learn ce, and ne lab's iology,
Lea	students Students spiking d also beco physiolog communi	Its / Compete are familiar ata and LFP me familiar gy, Bayesian cate their re	with syst analysis with one modelin sults in E	ettives ems neuroscience techn ; 3D motion tracking an of the scientific areas o g. Students are in an i nglish.	echniques: chronic implant design and operation; neural ag and analysis, robotic platform programming. They have eas of the lab: navigation, self-motion sensing, cerebellar an international environment and are able to present and					
Ree	quirements	for participa	ating							
He	none	us knowledg	ie.							
	Basic kno Lab proje algebra a	owledge of N ects are typic nd statistics	Matlab pr ally focu is helpfu	ogramming. used on motion science, l.	data a	nalysis, and r	nodeling,	so a basi	c knowledg	;e of
Ass	signment of	course (prog	gram/dep	artment)	MSc	: Interdiscipli	nary Neu	roscience	e / FB 15	
Sui	table for ot	her study pr	ograms							
Tin	nes offered				Eacl	n semester				
Du	ration				1 Se	mester (bloc	k course o	ver 4 we	eks)	
Per	son in chai	·ge			Dr.	Jean Laurens				
Sen	nester-relat	ted proofs								
	Proof of p	participation			regu	lar participat	ion			
	Study acl	nievements			Sem expe	inar: 1 talk (2 eriments and	20 minute on currer	s) on the nt literatu	results of o are	wn
Tea	ching form	15			Prac	tical, semina	r			
Tui	ition langua	ige			Eng	lish				
Mo	dule exam				Form	n / duration /	content (if	applicab	ole)	
	Module fin	al exam cons	isting of:		Prac	tical: graded	protocol (	(10-30 pa	ages)	
	Neurosci Navigati Self-Mot	ence of on and ion	Form of	teaching	S W H	СР	Semester 1	2	3	4
	Practical		Р		10	10				
	Seminar		S		1	1	X	Х		
	Sum				11	11				

INS A-26 Analysis of Social Networks	Analyse von sozialen	Elective course	11 CP = 330 h		11 CP					
	Netzwerken		Contact study 11 SWH / 165 h	Self-study 165 h	СР					
Content	Content									
This practical will provide an introduction into bioacoustics, neuroethology, and machine learning. Participants will										

This practical will provide an introduction into bioacoustics, neuroethology, and machine learning. Participants will have the opportunity to be involved in projects studying the interaction between vocal communication and cooperation, using the naked mole-rat as a model species. Students will have the opportunity to collect and analyze vocalization data using programs in Python and R and to develop machine learning tools for characterizing acoustic features of different vocalization types. Additionally, students will have the opportunity to participate in behavioral studies of naked mole-rats in a wide range of cooperative assays.

Learning results / Competence objectives

Students will be able to use Python modules to analyze bioacoustics and neuronal data, as well as design and perform basic behavioral tests.

R	equirements for participating										
nc	one										
H	elpful previous knowledge:										
Pı	oficiency in Python, knowledge of	Matlab and R									
As	signment of course (program/depart	ment)		Interdisciplinary Neuroscience / faculty 15							
St	iitable for other study programs										
Ti	mes offered			Winter Ser	Winter Semester						
D	uration			1 semester (block course over 4 weeks)							
Pe	erson in charge			Dr. Alison	Barker						
Se	Semester-related proofs										
Proof of participation				Regular participation							
	Study achievements				seminar tal result n curren	talk (20 n s, 1 semi t publicati	minutes) or nar talk (2 lons	n 20			
Т	eaching forms			Practical, seminar							
Т	iition language			English							
Μ	odule exam			Form / dur	ation / co	ntent (if a	pplicable)				
	Module final exam consisting of:			Practical: (	Graded p	rotocol (1	0-30 page	s)			
	Analysis of Social Networks	Teaching forms	SWH	CP	Semest	er					
		reaching forms	5.011	CI	1 2 3 4			4			
	Practical	Р	10	10							
	Seminar	S	1	1	X	X					
	Sum		11	11							

INS	S A-27	Schaltkreise des	]	Elective	e course		11 CP = 33	0 h		11	
Inst Beh	tinctive naviour Circuits	Instinktverhalte	ns				Contact stu 11 SWH / 1	udy 165 h	Self-study 165 h	СР	
Cor	ntent										
The mo in e We init recu vitr the	The goal of the internship is to provide an introduction into the mechanistic study of instinctive behaviours using modern systems neuroscience techniques, such as <i>in vivo</i> neural activity recordings and manipulation experiments in ethologically-relevant behavioural tasks in mice, as well as molecular, cellular and circuit-level analyses <i>in vitro</i> . We focus our analysis on evolutionarily conserved circuits in the rodent midbrain that are critically involved in the initiation and execution of instinctive behaviours, such as escape from predators and hunting of crickets. Depending on the projects in progress at the time of the module, the course will give an introduction to the following methods: recordings, manipulations and analysis of instinctive behaviours, stereotaxic surgeries, patch-clamp recordings <i>in vitro</i> , immunohistochemical analyses. Students work as full members of the research group, with supervision, on their own small projects embedded within a group member's research focus.										
Students will gain practical and theoretical experience with basic as well as advanced methods from neuroethold											
and reco Stu wil	lents will gain pr l systems neurosci ordings, stereotaci dents gain experie l be exposed to we	tic injections, neu ence in developin ence in developin ork with laborato	behavioural uronal mani ag and cond ory animals	l experi ipulatio lucting (Mus r	ments, r ments, r ons <i>in viv</i> their ow nusculus	c as well a neurophysi vo and <i>in v</i> n research s).	ological me <i>itro</i> , and im question, p	thods such munohis rogramm	the share of the second	mp alyses. and	
Rec	quirements for par	ticipating									
nor	ne										
Hel	pful previous know	vledge:									
Bas	sic knowledge of l	Python (or anothe	er programi	ming la	nguage)	, willingne	ess to work	with lab	mice.		
Ass	ignment of course	(program/depart	ment)			Interdisciplinary Neuroscience / faculty 15					
Sui	table for other stud	dy programs									
Tin	nes offered					Each sen	nester				
Du	ration					1 semeste	er (block co	urse ove	r 4-6 weeks)		
Per	son in charge					Dr. Vane	ssa Stempe	1			
Sen	nester-related proc	ofs									
	Proof of participa	tion				Regular J	participation	1			
	Study achievemen	ts				Seminar: results, 1 publication	1 seminar t seminar ta	talk (20 r lk (20 m	nin) on experin in) on current	nental	
Tea	aching forms					Practical	, seminar				
Tui	ition language					English					
Мо	dule exam					Form / dı	iration / con	tent (if a	pplicable)		
Module final exam consisting of:				Practical	: Graded pro	otocol (1	0-30 pages)				
	Instinctive Behavi	our Circuits	Teaching f	forms	SWH	СР	Semester 1	2	3	4	
$\Box$	Practical		Р		10	10					
	Seminar		S		1	1	Х	Х			
	Sum				11	11					

## **Optional courses in elective B: Clinical Neuroscience**

INS B-0	Externe Wahlpflicht	- Elective course			11 CP = 330 h		11			
External	veranstaltung				Contact study	Self study	CP			
elective	,,KIIIIISCHE Neurowissenschafte	n"			11 SWH / 165 h	165 h				
Course "Clinical	i veuro wissensenarie.	1								
Neuroscience"										
Content										
The electiv	ve course teaches bas	ic methods and technic	ues in the fie	ld of clinica	al neuroscience. St	udents work or	ı their			
own proje	cts under supervision									
The electiv	ve course can be offe	red by departments of	Goethe Univ	ersity, by o	other universities in	n Germany and				
abroad as	well as by non-unive	rsity research institution	ons.							
Learning resu	lts / Competence obje	ctives								
The stude	nts have knowledge i	n conducting neurosci	entific investi	gations in	the field of clinica	research. The	y are			
able to wo	rk on scientific quest	ions based on relevant	t literature.							
Requirements	for participating									
none										
Helpful previo	us knowledge									
none										
Assignment of	course (program/dep	artment)	MSc Interdisciplinary Neuroscience / FB 15							
Suitable for ot	her study programs									
Times offered			Dependir	ng on provi	der					
Duration			Dependir	ng on provi	der					
Person in char	ge		Head of s	study progr	am					
Semester-relat	ed proofs									
Proof of pa	articipation		regular p	articipatior	1					
Study achi	evements		The regu	lations of t	he provider of the	elective				
			course ar	e applied. I	If the provider doe	s not				
			request a	ny study pi	roofs, a working re	port must				
			be writte	n,and talks	have to be given of	on both,				
			results of	own exper	riments (20 minute	es) and topical				
			literature	(20 minute	es).					
Teaching form	IS		Practical	, seminar						
Tuition langua	ige		Dependir	ng on provi	der					
Module exam			Form / dı	iration / coi	ntent (if applicable)					
Module fin	al exam consisting of:		The regu	lations of t	he provider of the	elective course	are			
			applied.	lf grading i	s not scheduled by	the provider, t	the			
			module c	completion	exam shows a gra	ded				
	<b>.</b>		protocol	(10-30 pag	es).					
External	elective course	Form of teaching	SWH	СР	Semester					
"Clinical	neuroscience"	-		10	1 2	3 4	1			
Practical		Р	10	10	4					
Seminar		S	1	1	X					
Sum		1	11	11						

INS	S B-2	Physiologie und	Elective course			11 CP = 3	30 h			
Phy and Pha of	ysiology l armacology	Pharmakologie von Entzündungsreaktionen				Contact s 11 SWH /	tudy ′ 165 h	Self study 165 h	11 CP	
Infl	lammatory									
Res	sponse									
	ntent The sum of a	1	4	4:	1	.f. :fl	ation T		- i 1	
	The practica	il course teaches basic me	thous for the invest	tigation of mec	nanisms	of inflamm	ation. I	n particular, ai	nimal	
	nharmacolo	are models are applied an	ts work on their ow	or possible ther	apies are	ision Exper	u by life riments	include deper	nding	
	on the proje	ct behavioral experiment	s with mice tissue r	preparations cu	ltivation	and stimula	ation of	cells processi	ng of	
	materials to	protein and RNA. PCR a	nd Western blot ana	lvses. immuno	staining o	of tissue sec	tions.	cens, processi	115 01	
Lea	arning results	/ Competence objectives		<b>,</b>	0					
	Students wi	ll have competencies in	several of the follo	owing: Behavio	oral obse	rvations of	experir	nental animals	s and	
	presentation	of different models of ir	flammation, prepar	ration of tissue	s for imm	nunohistoch	nemistry	and Western	blot,	
	preparation	of neuronal cell cultures	familiarization wi	th in vitro cell	culture	models to s	study th	e pharmacolo	gy of	
	inflammator	y mechanisms, measurem	ent of inflammatory	y mediators in c	ell cultur	e models. S	students	are able to wo	ork on	
	scientific qu	estions based on relevant	literature							
Rec	quirements ic	or participating								
Hol	Helpful previous knowledge									
	none	, Kilowicuge								
Ass	signment of c	ourse (program/departmen	t)	MSc Interdisc	iplinary 1	Neurosciend	ce / FB	15		
Sui	table for othe	er study programs								
Tin	nes offered			in the summer	· semeste	r				
Du	ration			1 Semester (b	lock cour	rse over 4 w	veeks)			
Per	son in charge	e		Prof. Dr. Eller	n Niedert	berger				
Sen	nester-related	l proofs								
	Proof of par	ticipation		regular partici	pation					
	Study achiev	vements		Seminar: 1 tal	k (20 mii	nutes) on the	e result	s of own		
				experiments a	and on c	urrent litera	ture			
Tea	aching forms			Practical, sem	inar					
Tui	ition languag	e		English						
Мо	dule exam			Form / duratio	n / conter	nt (if applica	ble)			
	Module final	exam consisting of:		Practical: grad	led proto	col (10-30 p	pages)			
	Physiology	and Pharmacology of	Form of teaching	SM/H	CP	Semester				
	Inflammato	ory Response	Form of teaching	ЗМП		1	2	3	4	
	Practical		Р	10	10					
	Seminar		S	1	1		Х			
	Sum			11	11					

IN	IS B-4	Plastizität im	Elective c	ourse		11  CP = 330	) h					
Pl	asticity in	Hippocampus				Contact stud	dv s	elf study	11			
Hi	ippocampus Morphology	— Mornhologie.				11 SWH / 16	65 h 1	.65 h	СР			
- I Ph	viorpnoiogy, ivsiology,	Physiologie										
an	d Clinical	und klinische										
Re	elevance	Kelevanz										
	Practical and	l seminar provid	le an interdi	sciplinary over	view of plastic ch	anges in the l	hinnoca	mous The	course			
	will focus on	a guestions conc	erning morp	phological and p	hysiological chan	ges of hippoc	campal r	neurons aft	er CNS			
	damage or	neuronal overex	citation, ce	llular network	dynamics and m	olecular mec	hanisms	s of hippo	campal			
	plasticity an	d homeostasis.	The organo	typic slice cult	ure model of the	hippocampus	s is use	d to scient	ifically			
	investigate t	he underlying n	nolecular ar	id cell biologica	al processes. The	goal is to lea	arn vari	ous techni	ques to			
	cell imaging	immunocytoc	hemistry r	optogenetic and atch_clamp_an	d methods in m	olecular biol	logy St	udents wil	l learn			
	appropriate	techniques in the	e context of	their own project	ct, perform their o	wn experime	ents und	er instructi	on, and			
	present their	results in a sen	ninar. The w	veekly seminars	will train student	ts to work wit	ith scien	tific public	cations,			
	multiple mo	dels and metho	ods and dis	cuss the transla	tion of results to	o clinical app	plicatior	ns in the f	field of			
I	neurological	Competence of	viectives	id original paper	-S.							
LC	The students	s have knowleds	ge in the bas	sics of electrop	nysiological and a	anatomical wo	ork. in t	the prepara	tion of			
	organotypic	section cultures	and in conf	ocal microscopy	7. They are able to	work on scie	entific q	uestions ba	ased on			
	relevant liter	rature.										
Re	Requirements for participating											
none												
119	Experience	working experin	nentally in a	"wet lab".								
As	signment of co	ourse (program/d	lepartment)		MSc Interdiscip	linary Neuros	science	/ FB 15				
Su	itable for othe	er study program	s									
Ti	mes offered				Each semester							
D	uration				1 Semester (block course over 4-6 weeks)							
Pe	erson in charge	2			Dr. Tijana Radic, Dr. Tassilo Jungenitz, Prof. Thomas							
					Deller							
Se	mester-related	l proofs										
	Proof of par	ticipation			regular participa	ation						
	Study achiev	rements			Seminar: 1 talk	(20 minutes)	on the r	results of o	wn			
					experiments, 1 t	alk (20 minut) f the final mo	tes) on (	current lite	rature,			
					exam)		June ex	ann is a wi	luch			
Те	eaching forms				Practical, semin	ar						
Тι	ition language	e			English							
Μ	odule exam				Form / duration	/ content (if a	pplicabl	e)				
	Module final	exam consisting	of		Practical: grade	d protocol (10	0-30 pag	ges) oder w	ritten			
					exam (45 minut	es)						
	Plasticity in Form of teaching SWH		CP	Semester								
	Hippocamp	us –	. warning	5,011		1	2	3	4			
	Morpholog	y,										
	Clinical	allu										
	Relevance											
	Practical	Р		10	10							
	Seminar	S		1	1	Х						
1	Sum			11	11							

IN	NS B-7	Klinische	Elective c	ourse		11 CP = 3	330 h		11		
	linical adjatric	Neuropadiatrie				Contact s	study	Self study	СР		
N	eurology					11 SWH	/ 165 h	165 h			
С	ontent										
	In the pract	ical course, ne	urological p	roblems in ch	ildren are exami	ned. Spec	ial emp	hasis is pla	ced on		
	development	al neurological	examinatio	n in the first	year of life, ap	plied neur	ophysio	logy in chil	dhood,		
-	neuropediatr	ic pathology inc	luding epiler	osy syndromes	, and neurotrauma	tology.					
L	earning results	/ Competence ob	jectives	1 6 1 1	1						
	The students	have become f	amiliar with	standard meth	ods of clinical net	aropediatri	cs They	acquire exp	erience		
	in dealing w	and patients and sed on the relevant	ant literature	ation of typica	ii chincai pictures	. They are	able to	deal with sc	lentific		
R	equirements for	r participating		•							
	none	participating									
Helpful previous knowledge											
	Basic knowledge of German language										
A	Assignment of course (program/department)				MSc Interdiscip	linary Neu	iroscienc	e / FB 15			
Sı	uitable for othe	r study program	5								
Ti	imes offered				In the winter ser	nester					
D	uration				1 Semester (block course over 4 weeks)						
Pe	erson in charge				Prof. Matthias Kieslich						
Se	emester-related	proofs									
	Proof of part	icipation			regular participa	ation					
	Study achiev	ements			Seminar: 1 talk	(20 minute	es) on the	e results of o	wn		
	-				experiments, 1 t	alk (20 mi	nutes) or	n current lite	rature		
Т	eaching forms				Practical, semin	ar					
Т	uition language	:			English						
Μ	odule exam				Form / duration	/ content (i	f applica	ble)			
	Module final	exam consisting	of:		Practical: graded	d protocol	(10-30 p	ages)			
		_			•						
Clinical Paediatric Form of teaching SWH				SWH	CP	Semester					
	Neurology	1.511	· · · · · · · · · · · · · · · · · ·			1	2	3	4		
	Practical	Р		10	10						
Seminar S 1			1	Х							
1	Sum			11	11						

IN	IS B-8	Klinisches	Elective co	ourse		11 CP = 330 h				
Cl Ne	inical euroimaging	Neuroimaging				Contact study 11 SWH / 165 h	Self study 165 h	11 CP		
Co	The practical course introduces the basics of image analysis, image interpretation and the preparation of findings in examinations of the CNS (cerebral and spinal) with imaging procedures in neuroradiology. The following procedures are used: magnetic resonance imaging (MRI) of the head and spine, computed tomography (CT) of the skull and spine, digital cerebral and spinal subtraction angiography (DSA), as well as introduction to the basics of interventional neuroradiological procedures. In addition, the practical course teaches theoretical / physical principles of the individual examination modalities in neuroradiology with emphasis on magnetic resonance imaging. The following will be covered: physical principles of MRI / image formation, sequences and sequence parameters of MRI, diffusion and perfusion weighted MRI imaging, tractography (fiber tracking), functional MRI (fMRI), nuclear spin spectroscopic examinations (MR spectroscopy). Depending on the project, (co-) authorship in a publication may also be possible and encouraged. <b>Learning results / Competence objectives</b> The students have knowledge of neuroanatomy (cerebral/spinal) as well as of the cranial skeleton and the spine and basic knowledge of the relevant neurological diseases. They also have basic knowledge of the indication of neuroradiological examinations, image formation and image interpretation as well as the assignment to individual typical clinical pictures.									
Re	neuroradiological examinations, image formation and image interpretation as well as the assignment to individual typical clinical pictures.         They are able to deal with scientific questions based on relevant literature.         Requirements for participating									
	none									
H	elpful previous	knowledge	10000000							
٨	basic knowl	euge of German	nartmont)		MSc Interdiscin	linary Neuroscien				
A	signment of to	n study program/u			Mise interdiscip	initary Neuroscienc	<i>L</i> / <b>I D I</b> J			
ы т:	mag offered	a study programs	)		Each comoster					
	mes offered				Lach semester					
					1 Semester (block course over 4-6 weeks)					
Pe	erson in charge	2			Prof. weldauer,	Ploi. Hattingen, L	DI. POIKOWSKI			
Se	mester-related	l proofs			1	<i></i>				
	Proof of par	ticipation			regular participa	ation	1. 6			
	Study achiev	ements			Seminar: I talk	(20  minutes)  on th	e results of ow	n ture		
Te	eaching forms				Practical. semin	ar				
Т	ition language	2			English					
М	odule exam				Form / duration	/ content (if applica	ble)			
	Module final exam consisting of:			Practical: graded	d protocol (10-30 j	pages)				
	Clinical	Form of	teaching	SWH	CP	Semester				
	Neuroimag	ing				1 2	3	4		
<u> </u>	Practical	Р		10	10					
<u> </u>	Seminar	S		1	1	Х				
	Sum			11	11					

IN	S B-9	Klinische		Elective of	course			11 CP =	330 h			
Cl Au Ne	inical Iditory Turoscience	Auditoris Neurowis	che senschaften					Contact 11 SWH	study / 165 h	Self study 165 h	11 CP	
Co	ontent											
	The practic	cal provide	es knowledge	e of the m	ost impor	tant o	bjective and s	ubjective	audiomet	ric measur	ement	
	techniques	for the di	fferential dia	agnosis of	hearing d	lisorde	ers. Sound and	d speech a	udiometr	y as well	as the	
	application	of otoacou	istic emissio	ns, impeda	ance audio	metry	, and different	technique	s of brain	stem audio	metry	
	(BERA, Cl	EKA, ASS	K, MIMIN) at	re used. II	ne treatme	nt of I	The use of	intraoper	i impianta	able nearin	g aids	
	conduction	technique	s will be den	nonstrated	i practical	use.	The use of	muaopera		liopitysioi	Jgicai	
	An own cu	rrent proje	ct is determi	ned within	the scope	of the	course, which	h is to be v	worked or	n by the stu	dents	
	under guid	ance. The	results are to	be presen	ted in a lec	ture.	Another lectur	e is sched	uled to pr	esent origi	nal	
	work in the	e field of el	lectrophysiol	ogical stin	nulation/de	erivati	on of auditory	potentials	s. Main to	pics are:		
	Psychoaco	ustic meas	urements of	auditory p	erception d	luring	electrical stin	ulation by	cochlear	implants,	6	
	investigatio	on of new 1	rejection tech	iniques for	r frequency	y-spec	on diagnosis	of hearing	, disorder	s, creation	fc	
Le	arning result	ts / Compet	ence objectiv	res	unnunus ge	nerau	011.					
	The stude	nts are ab	le to perfor	m psycho	acoustic e	experin	ments and m	easuremen	t of aco	ustically e	voked	
	potentials,	and have	basic knowl	edge of a	udiometry	as we	ll as basic kn	owledge o	of the fur	ction of h	earing	
	implants. T	hey are ab	le to work of	n scientific	c questions	based	d on relevant	literature.			-	
Re	Requirements for participating											
	none											
He	elpful previou	is knowled	ge									
•	none		anom/donont	mont)		MS	Interdisciplin	Nouro	anionaa /	ED 15		
As	itable for oth	er study n	rograms	ment)		MSC	meruiscipiii	lary neuro	science /	FD IJ		
Ti	mes offered	ier study p	l'ograms			Each semester						
Dı	iration					1 Semester (block course over 4 weeks)						
Pe	rson in charg	ge				Prof	. Uwe Bauma	nn				
Se	mester-relate	ed proofs										
	Proof of pa	rticipation				regu	lar participatio	on				
	Study achie	evements				Sem	inar: 1 talk (20	) minutes)	on the re	sults of ow	n	
T	1. 0					expe	riments, 1 tall	<u>k (20 minu</u>	tes) on cu	urrent litera	ture	
Те	aching form	8				Prac	tical, seminar					
Tu	ition langua	ge				Eng						
M	Iodule exam Module final even consisting of					Гог	n / duration / c	ontent (II a	pplicable	)		
	Module final exam consisting of:					Prac	ucai: graded p		0-50 page	(12)		
	Clinical A	uditory	Form of t	ahing	SWIT		CD	Semester				
	Neuroscier	nce	FORM OF tea	uning	SWH		Cr	1	2	3	4	
	Practical		Р		10		10					
	Seminar		S		1		1	У	K			
	Sum				11		11					

IN	IS B-10	Experin	nentelle	Elective of	course		11 CP (insg.) = 33	60 h	
Ex an Ti Ps	xperimental Id ranslational sychiatry	und translat Psychia	tionale Itrie				Contact study 11 SWH / 165 h	Self study 165 h	11 CP
C	ontent						I		
	The goal of psychiatric d include cell of and behavior transfer, gen characterizat techniques magnetoence disorders.	this pra isorders culture te al analys he knock ions wil (e.g., ephalogr	ictical is In doing echniques sis of mic cout). Fo l be perf functi aphy) for	s to introd so, they v for functi e that have llowing s ormed. In onal m r detecting	luce students to vill be able to pa onal evaluation e been pharmaco uch experiment addition, there hagnetic reso g abnormalities	a range of exper rticipate in a wide of candidate gene logically treated of s, a series of in is an opportunity nance imaging of neural proces	erimental technique e range of translati s previously identi or genetically modi nmunohistochemic y to gain insight g, electroencep ssing and coordin	tes for the stu onal projects. fied in large co ified (e.g., vira cal and histol- into neural im bhalography, ation in psycl	dy of These ohorts l gene ogical aging and niatric
Le	earning results	/ Compe	tence obj	ectives					
	Students wil psychiatric d addition, a se knowledge r attention-def	l have k lisorders eries of s regarding icit/hype	nowledge and will seminars g these d eractivity	e of a rang be able to (and optio isorders, j disorder.	ge of commonly o design their or nal participation particularly affe	used molecular a wn experiments u n in case presentat ctive disorders, a	and behavioral me using the knowled tions) will provide anxiety disorders,	ethods for anal ge thus acquir students with schizophrenia	yzing ed. In basic a, and
Re	equirements for	r partici <sub>l</sub>	pating						
	none		-						
H	elpful previous	knowled	lge						
	none								
As	ssignment of co	urse (pro	ogram/de	partment)		MSc Interdiscip	linary Neuroscien	ce / FB 15	
Su	itable for othe	r study p	rograms						
Ti	mes offered					Each semester			
D	uration					1 Semester (blo	ck course over 6 w	veeks)	
Pe	erson in charge					Prof. David Slat	ttery		
Se	mester-related	proofs							
	Proof of part	icipation	L			regular participa	ation		
	Study achiev	ements				Seminar: 1 talk experiments, 1 t	(20 minutes) on th alk (20 minutes) o	e results of ov on current liter	vn ature
Те	eaching forms					Practical, semin	ar		
Тι	iition language	:				English			
м	odule exam					Form / duration	/ content (if applica	able)	
1.1	Module final exam consisting of:			Practical: grade	d protocol (10-30	pages)			
	Experiment	al and	Eorm of	tagahina	SWH	CD	Semester		
	Translation	al	FOLM OF	teaching	зип	Cr	1 2	3	4
	Psychiatry							-	
	Practical		Р		10	10			
	Seminar		S		1	1	Х		
	Sum				11	11			

IN	IS B-11	Neurobi	ologische	Elective of	course			11 CP =	330 h			
Ne hu me	eurobiological ıman cell odels	humane Zellmod	elle					Contact 11 SWH h	study / 165	Self study 165 h	11 CP	
Co	ontent	•										
	The goal of t variants in hu cell culture n techniques), production of Following ge assays will be can be gained	this pract man neum nethods fr and fluor f cerebral enetic mo e applied 1.	ical is for ral progeni or culturin escence an organoids dification and evalua	students t tor cells a g and neu nd lucifera and iNeu of cell lin- ated. In ad	to learn the l nd to be able rronal differe ase assays for rons can be l es, a series of dition, insigh	basic to apentiat or function earned of imonts in	s of experiment pply them inde- ion, genomic of actional analysed. munohistocher to the basics of	ntal techn pendently editing of sis. Speci mical, fun f transcrip	iques for y. These to sequence ifically, to ctional a otome and	r studying g techniques i tes (CRISPF techniques f and morphol d genome an	enetic nclude 2/Cas9 For the ogical nalysis	
Le	earning results	/ Compete	ence objecti	ives								
	neurons and can plan and perform their own experiments with the knowledge thus acquired. At the end, students will have the necessary know-how to use human neural progenitor cells, or human stem cells and their derivatives as an effective model for psychiatric disorders. In addition, in a series of seminars, also in close collaboration with adult psychiatry, students are given the basic knowledge regarding underlying disorders such as autism spectrum disorder, attention deficit/hyperactivity syndrome, or social behavior disorder.											
Re	Requirements for participating											
	none											
He	Coll oulture	knowledg	e									
Δ	signment of co	urse (proc	uram/denau	•tment)		MS	c Interdiscipli	nary Neur	oscience	/ FR 15		
Su	uitable for other	study prog	ograms	(incirc)		IVIL	e interdiscipii		oscience			
Ti	mes offered	study pr	ograms			Each semester						
Du	iration					1 S	emester (block	course o	ver 6 we	eks)		
Pe	erson in charge					Pro	of. Andreas Ch	iocchetti				
Se	mester-related	proofs										
	Proof of parti	icipation				reg	ular participati	ion				
	Study achieve	ements				Ser exp	ninar: 1 talk (2 periments, 1 tal	20 minutes lk (20 min	s) on the utes) on	results of or current liter	wn ature	
Те	eaching forms					Pra	ctical, seminar					
Тι	iition language					Eng	glish					
Μ	Module exam					For	m / duration /	content (if	applicab	ole)		
	Module final exam consisting of:				Pra	ctical: graded	protocol (	10-30 pa	nges)			
	Neurobiolog human cell r	ical nodels	Form of te	eaching	SWH		СР	Semester 1	2	3	4	
	Practical		Р		10		10					
	Seminar		S		1		1	Х	Х			
	Sum				11		11					

IN	IS B-12	Neuroimaging	aging Elective course			11 CP (ins	g.) = 330	h	11		
Ne Bi Ps	euroimaging- omarkers in sychiatry	Biomarkers in in der Psychiatrie				Contact str 11 SWH / 1	udy 8 165 h 1	Self study 165 h	— СР		
С	ontent										
Tł	ne goal of the p	practical is to pro	ovide stude	ents with insigh	t into the analysis	of magnetic	resonan	ce imaging	(MRI)		
da	ta of the hum	an brain. This w	vill include	analysis of M	RI data from indiv	viduals with	autism	spectrum di	isorder		
(A	(SD) compare	d to control gro	ups in tern	ns of different	anatomical feature	es of the hu	man bra	in, such as	cortex		
th	ickness, surfa	ce area, or gyri	lication ind	bex. Statistical	analyses are perf	ormed base	d on reg	gions of the	e brain		
	nere is also an	opportunity to	oninion pi oain insiol	ograms and sor	naging techniques	and data m	uata are	ent Studer	nts will		
al	so gain knowl	edge of how str	uctural MR	I data is used t	o determine differ	ences in ner	uroanato	my of psyc	hiatric		
di	sorders such a	s ASD.						5 1 5			
Le	earning results	/ Competence ob	jectives								
St	udents will be	able to use com	mon progr	ams and softwa	are to analyze MRI	l data and w	ill have	acquired ba	sic		
kr	nowledge of A	utism Spectrum	Disorder a	nd other psych	iatric disorders as	appropriate.	They ar	e able to pe	rform		
th	eir own analys	ses of a data set	in the form	of statistical ev	aluations using R	and/or Mat	lab, visu	alize and pi	resent		
R	e results.	r narticinating									
nc	one	i participating									
H	Helpful previous knowledge										
Ba	asic knowledg	e in MatLab and	d R								
As	signment of co	ourse (program/d	epartment)		MSc Interdiscip	linary Neuro	oscience	/ FB 16			
Su	itable for othe	r study program	s								
Ti	mes offered				in the summer semester						
D	uration				1 Semester (block course over 6 weeks)						
Pe	erson in charge				Prof. Christine E	Ecker					
Se	mester-related	proofs									
	Proof of part	icipation			regular participa	tion					
	Study achiev	ements			Seminar: 1 talk	(20 minutes)	) on the	results of o	wn		
					experiments, 1 ta	alk (20 minu	utes) on	current liter	ature		
Te	eaching forms				Practical, semina	ar					
Τι	iition language	•			English						
Μ	odule exam				Form / duration /	/ content (if a	applicab	le)			
	Module final exam consisting of:				Practical: graded	l protocol (1	10-30 pa	ges)			
Neuroimaging Form of teaching SWH				SWH	СР	Semester					
	Biomarkers	in in in it is in the second s				1	2	3	4		
	Psychiatry			10	10	<u> </u>					
	Practical	P		10	10		N/	<u>├</u>			
Seminar S 1				1			Х	├			
l	Sum			11	11						

INS B-13	Translationale Neuro-	Elective course	11 CP = 330 h	11 CP	
Translational Neuro- Oncology Research	Onkologie-rorschung		Contact study 11 SWH / 165 h	Self-study 165 h	Cr

#### Content

During this practical, students have the opportunity to be involved in ongoing research projects in the field of translational, neuro-oncological research. This includes both participation in routine laboratory workflows and the development of an independent scientific project within the conceptual orientation of the "Translational Neuro-Oncology" working group.

The routine laboratory processes include the generation of 3D cultures, so-called tumor organoids, based on surgical tissue from patients suffering from brain tumors. These organoids are routinely characterized on several molecular levels to ensure the preservation of the histopathological, (epi-)genetic and transcriptional features of the primary parental tumours. We are also using these tumor organoids as a preclinical model for our exploratory drug profiling workflow to eventually improve personalized medicine approaches and therapeutic options for cancer patients.

Furthermore, we are generating patient-derived orthotopic xenografts (PDOXs) by intracortical implantation of the tumor organoids into immunodeficient mice. These PDOXs enable long-term propagation of patient tumors and are clinically relevant patient avatars for precision oncology studies.

Additionally, we have a strong interest in recapitulating early brain tumor evolution by sequential oncogenic editing of the genome of human induced pluripotent stem cells (hiPSCs). Cerebral organoids, so-called "mini-brains", are used to grow hiPSC-derived brain tumors within a physiologically relevant 3D brain microenvironment. This model allows us to study the impact of specific mutations on tumor metabolism and to test new treatment strategies ex vivo.

#### Learning results / Competence objectives

After completing the internship, the students have gained theoretical knowledge and hands-on experience in the field of neuro- and cellular molecular biology including basic techniques of cellular model system development and, to a limited extent, of applied molecular biology. The students will be able to describe their purposes and apply them in practice.

Basic techniques include the generation of brain tumor organoids from fresh tumor tissue, the cultivation of human brain tumor cell lines, working with hiPSCs and associated cerebral organoid cultures, and the practical use of various cellular assays. The standard techniques, taught in this internship, include the quantification of invasive cells, the measurement of proliferation behavior, the detection of tumorigenicity via colony formation and survival, as well as live cell imaging of 2D and 3D cell cultures and compound screenings in a medium-throughput manner. Array-based DNA methylation analysis, CRISPR-Cas based (epi)genome modification and the associated basic molecular biological methods and bio-informatic analyzes represent more specialized methods depending on the particular scientific project and are not necessarily always taught in this practical. Students will work on their own scientific project with the help and guidance of experienced scientists. They will be able to independently develop a patient-oriented, translational research hypothesis and how to design experiments to validate it. The students have acquired skills and knowledge in order to deal with advanced topics in cell, molecular and neurobiology as well as related disciplines, and will be able to evolve them independently.

Requirements for participating						
None						
Helpful previous knowledge:						
Experience with sterile cultivation of cell lines is an advantage						
Assignment of course (program/department)	MSC Interdisciplinary Neuroscience / FB 15					
Suitable for other study programs						
Times offered	Each semester					
Duration	1 Semester (block course 6 weeks)					
Person in charge	Dr. Ann-Christin Hau					
Semester-related proofs						
Proof of participation	Regular participation					
Study achievements	Seminar: 1 seminar talk (20 minutes) on literature,					
	1 seminar talk (20 minutes) on the research project					
Teaching forms	Practical, seminar					
Tuition language	English and/or German					
Module exam	Form / duration / content (if applicable)					

#### 19.10.2023

Module final exam consisting of:	Practical: Graded protocol (10-30 pages)							
Translational Neuro- Teaching forms SWH				Semester				
<b>Oncology Research</b>	reaching forms	5.011	C1	1	2	3	4	
Practical	Р	10	10	X				
Seminar	S	1	1		Х			
Sum 11			11					

#### **Optional courses in elective C: Cognitive and Theoretical Neuroscience**

INS C-0	Externe Webbeflichterene steltere	Elective cours	e		11 CP	P=3	30 h			
External	Kognitive und	g			Conta	nct st	tudy	Self study		11 CP
Course	theoretische				11 SW	VH/	165 h	165 h		Cr
"Cognitive	Neurowissenschaften"									
and theoretical										
Neuroscience"										
Content										
The course	e teaches basic method	s and techniques	in th	e field	of cog	niti	ve or/an	d theoretical r	neurosci	ence.
Students w	ork on their own currer	it projects under s	superv	vision a	nd pres	sent	the resu	Its in the form	of a ser	nınar
presentatio	n. The course can be of	ered by departme	ents of	r Goeth	e Unive	ersit	ty, by ot	ner universities	s in Geri	many
L oorning rosult	ts / Competence objective		stituti	ons.						
Students g	ain knowledge in cond	ucting neuroscies	atific	invoctio	rations	in	tha fiald	of comitive	nouroso	ionco
or/and know	wledge in computer-bas	ed modeling of n	euroh	iologics	al quest	tions	They	are able to addr	ress scie	ntific
questions b	ased on relevant literation	ire.	curoo	lologici	ii quest	lion	s. They a		035 5010	nunic
<b>Requirements</b>	for participating									
none	I I I I I I									
Helpful previou	ıs knowledge									
none										
Assignment of	course (program/departı	nent)	MSc	: Interdi	isciplina	ary	Neuroso	cience / FB 15		
Suitable for oth	Suitable for other study programs									
Times offered			Dep	ending	on prov	vide	r			
Duration			Dep	ending	on prov	vide	r			
Person in charg	ge		Head of study program							
Semester-relate	ed proofs									
Proof of pa	rticipation		regular participation							
Study achie	evements		The regulations of the provider of the elective							
			cour	se are a	pplied.	. If t	he provi	ider does not		
			requ	est any	study p	proc	ofs, a wo	rking report m	ust	
			be w	ritten,a	nd talks	s ha	ive to be	given on both	,	
			resu	lts of ov	wn expe	erin	nents (20	) minutes) and	topical	
			liter	ature (2	0 minu	ites)	•			
Teaching form	S		Prac	tical, se	eminar					
Tuition langua	ge		Dep	ending	on prov	vide	r			
Module exam			Form	n / dura	tion / co	onte	nt (if ap	plicable)		
Module fina	al exam consisting of:		The	regulati	ions of	the	provide	r of the electiv	e course	e are
			appl	ied. If g	grading	is n	ot schee	luled by the pr	ovider,	the
			mod	ule con	npletion	n ex	am shov	vs a graded pro	otocol (1	0-30
			page	es).						
External elective course Form of teaching			SWH	C	CP	Semeste	r	,		
"Cognitive and theoretical						1	2	3	4	
Neurosciel	nce	D		10		_				
Practical	P S			10	- 10	.0			├	
Seminar S			1		1	X				
Sum				11	1	1				

IN	IS C-1	Nicht-invasive	Elective of	ourse		11  CP = 33	30 h				
No In M in Co R	on- vasive ethods Human ognition esearch	Methoden der Kognitionsforschun am Menschen	g			Contact st 11 SWH / h	tudy 5 165 1	Self study 165 h	11 CP		
C	ontent										
	The practice of the practice of the practice of the practice of the preception of th	ctical course teaches behavioral studies EG) or functional logical principles ar on, attention or work re research method a projects in the Institu	iques of non- ements of b sonance imag ch question, s They will be basic evaluat l Psychology.	invasive research orain activity usi ging (fMRI). Aft tudents conduct th made aware of the ion steps. The que	of human ng electro/ er a theore heir own exp e advantages estions to be	cognitiv /magneto etical int periment s and dis e workeo	te functions bencephalog troduction ts on questi advantages d on are ba	s. This graphy to the ons of of the sed on			
Le	earning res	ults / Competence ob	jectives								
	The stud are fami scientific	ents have basic know liar with behavioral c questions based on	vledge of the or psychop relevant liter	design and im hysiological a rature.	plementation of co methods (fMRI, E	ognitive exp EEG, MEG)	eriments) and are	s in humans e able to a	. They ddress		
R	equiremen	ts for participating									
none											
H	Helpful previous knowledge										
	Basic kn	owledge in cognitiv	e psychology	r							
As	ssignment	of course (program/d	epartment)		MSc Interdiscipl	inary Neuro	oscience	/ FB 15			
Su	iitable for	other study programs	5								
Ti	mes offere	d			in the summer semester						
D	uration				1 Semester (block course over 4 weeks)						
Pe	erson in cha	rge			Prof. Jochen Kaiser						
Se	emester-rel	ated proofs									
	Proof of	participation			regular participation						
	Study ac	hievements			Seminar: 1 talk (	(20 minutes)	) on the	results of o	wn		
-					experiments, 1 ta	alk (20 minu	utes) on	current liter	ature		
Т	eaching for	ms			Practical, semina	ar					
Т	uition lang	uage			English						
Μ	odule exar	n			Form / duration /	content (if a	applicabl	le)			
	Module f	inal exam consisting		Practical: graded	l protocol (1	10-30 pa	ges)				
	Non-Invasive Form of teaching SWH		SWH	СР	Semester						
	Method	s in	eaching	5.011		1	2	3	4		
	Human Cognitie	'n									
	Researc	h									
	Practical	<u>.</u> Р		10	10						
	Seminar	S		1	1		Х				
	Sum			11	11						

INS C-4 Virtueller Elective course				11 CP (insg.) = 330 h				
Virtual Hippocampus – Introduction to Computational Neuroscience	Hippocampus – Einführung in die Computer- Modellierung neuronaler Systeme				Contact s 11 SWH	tudy 5 / 165 h	Self study 165 h	- 11 CP
Content	•							
The practical modeling of which studie computer model that are close anatomical a network sime simulations is models to unLearning results for biologic	I provides an ov hippocampal ne s the brain at di odels. The goal i sely linked to e und biophysical ulations in biop n morphologica <u>derstanding brai</u> / <b>Competence ob</b> have basic know gically moti	erview of c urons and r fferent leve s to learn s experimenta properties ohysically r ally reconst in function jectives wledge of c vated s	computational n networks. The c els (from synap tandard techniq al data, especia . Planned com ealistic and da ructed neurons will be discusse ompartment and mulations c	nodeling of neura ourse is an introd ses and dendrites ues for the forma lly those involvi putational experi ta-driven models in the hippocam ed using examples d network modeli of neurons	l systems of uction to c of to neuron ation, mana ing hippoc ments (in of the hip npus. The s from rece and n s receive ho	with parti omputation is and neural agement, campal ce silico) in ppocampurelevance ent researce can use NI etworks	cular emph onal neuros ural circuits and use of ells with conclude larg us, and sing of compute ch articles.	asis on cience, ) using models omplex e-scale gle-cell ational
http://www.r	euron.yale.edu/	neuron) and	d are able to add	iress scientific qu	estions ba	sed on rel	levant litera	ture.
None	participating							
Helpful previous	knowledge							
Programming	g experience							
Assignment of co	urse (program/d	epartment)		MSc Interdiscip	linary Neu	iroscience	e / FB15	
Suitable for other	r study programs	5						
Times offered				Each semester				
Duration				1 Semester (blo	ck course o	over 4 we	eks)	
Person in charge				Prof Dr Peter	ledlicka		)	
Somoston volated	nnoofs				Сински			
Due of of mont				rogular particip	otion			
					$\frac{1000}{20}$			
Study achiev	ements			experiments, 1 talk	(20 minute talk (20 mi	nutes) on the	current lite	rature
Teaching forms				Practical, semin	ar			
Tuition language				English				
Module exam				Form / duration	/ content (i	f applicab	ole)	
Module final	exam consisting		Practical: grade programming ta	d protocol 1sk (1-30 p	(10-30 pa ages)	ages) or		
Virtual	Form of	teaching	SWH	СР	Semester			
Hippocamp	us –	teaching	SWI	Cr	1	2	3	4
Introduction	n to							
Computatio	nal							
Dractical	<b>с</b>		10	10				
Sominor	r c		10	10		(		
Sum	<u>د</u>		11	11		<b>`</b>		

IN	S C-7	Höhere	course		11 CP (in	(sg.) = 33	0 h				
Co No Hi Co	ognitive euroscience – gher ognitive	kognitive Funktionen				Contact s 11 SWH	study / 165 h	Self study 165 h	11 CP		
FL C	Inclions										
	The practical of current pr control, as w Depending of neurocogniti- of neurophys analysis and and to carry of	gives an insight ojects in the are ell as partly also on the current ve studies (fNIR iological data. T interpretation of out parts of the s	into the re- ca of work their deve research p S, fMRI, E he aim is to the corresp tudy thems	search of the neu ing memory, la lopment in child projects, the pr EG, behavioral o learn the theore ponding data. In selves.	aronal basis of hig nguage processin lren of primary sc actical course er measurements) as etical background doing so, students	ther cognit ag, movem shool age. nables the s well as in of the proj- s are encour	ive perfo ent perc student the field ects as w raged to	ormance on the eption or exec s to participa d of data proce rell as the colle work independ	basis cutive nte in essing ction, lently		
Le	arning results	/ Competence obj	ectives								
	Students are and are family scientific que	familiar with cog liar with the ba estions based on	gnitive and sics of co relevant lit	neurocognitive llecting and an rerature.	hitive models as well as experimental psychological methods d analyzing neurocognitive data. They are able to address						
Re	equirements for	· participating									
	None										
H	elpful previous knowledge										
	Basic knowle	edge in Matlab, I	Python ode	r other program	ming skills						
As	signment of co	urse (program/de	epartment)		MSc Interdiscip	olinary Neu	iroscienc	e / FB15			
Su	itable for othe	r study programs									
Ti	mes offered				in the summer s	emester					
D	iration				1 Semester (blo	ck course o	over 4 w	eeks)			
Pe	rson in charge				Prof. Christian I	Fiebach					
Se	mester-related	proofs									
	Proof of part	icipation			regular participa	ation					
	Study achieve	ements			Seminar: 1 talk experiments or o	(20 minute on current	es) on the literature	e results of ow e	'n		
Te	aching forms				Practical, semin	ar					
Τι	ition language				English						
Μ	odule exam				Form / duration	/ content (i	f applica	ble)			
	Module final	exam consisting (	of:		Practical: grade	d protocol	(10-30 p	bages)			
	Cognitive	Form of	teaching	SWH	CP	Semester					
	Neuroscienc	e –	couching	~		1	2	3	4		
	Higher Cogi	nitive									
	Practical	P		10	10						
	Seminar	S		1	1		х				
-	Sum	~		11	11						

IN	S C-8	Sensomo	otorische	Elective	course		11 CP (insg	.) = 33	0 h				
Sy Ne Se an ne	stems euroscience – nsorimotor d cognitive tworks	und kognitio Netzwer	nstragende ke				Contact stu 11 SWH / 1 h	dy 65	Self study 165 h	11 CP			
С	ontent												
	The pracical and sensorin language pro translation o Healthy vol magneto-end brain surgery Students bec networks. S will attend w	introduc notor proc ocessing a f the find unteers a cephalogr y or stereo ome fami tudents w veekly ser	es students cessing. One and motor c ings into im nd patients aphic techni p-EEG in ep liar with the vill be assign ninars.	to neural focus is c ontrol of mediate p are studie ques. In a ilepsy pat e methods ned to a cu	networks (corti on the study of h hand movemen atient care, e.g. d with respect ddition, electro- ients. used and acquir urrent project, v	cal and subcortion termispheric lateration. Another part using closed-loo to their behavior corticographic da re knowledge of t vill participate in	cal) that are alization, par of the group p control. al responses tha are collect the organizin data collecti	impor ticular p is co and u ted fro g prin- ion an	tant for cog rly with resp oncerned wi using electro om patients d ciples of neu d/or analysis	nitive ect to th the - and uring uronal s, and			
Le	arning results	/ Compet	ence objectiv	/es	1 1								
	Students are neurophysio questions ba	familiar logical ex sed on rel	with the coll periments o levant literat	ection and n healthy ture.	thy control subjects and patients and are able to address scientific								
Re	equirements fo	r particip	ating										
	None												
H	elpful previous	knowledg	ge										
	Programmin	g knowle	dge in Pytho	on and/or	Matlab								
As	signment of co	ourse (pro	gram/depart	ment)		MSc Interdisci	plinary Neur	oscien	nce / FB15				
Su	itable for othe	r study pr	ograms										
Ti	mes offered					Each semester							
D	iration					1 Semester (Bl	ock course o	ver 4-	6 weeks)				
Pe	rson in charge	!				PD Dr. Christia	an Kell		*				
Se	mester-related	proofs											
	Proof of part	icipation				regular particip	oation						
	Study achiev	ements				Seminar: 1 talk experiments, 1 literature	talk (20 minutes) (20 min	s) on th utes) o	he results of on current	own			
Те	eaching forms					Practical, semi	nar						
Тι	ition language					English							
Μ	odule exam					Form / duration	n / content (if	applic	able)				
	Module final	exam con	sisting of:			Practical: grade	ed protocol (	10-30	pages)				
	Systems Neuroscience Sensorimote cognitive ne	ce – or and tworks	Form of tea	ching	SWH	СР	Semester 1	2	3	4			
	Practical		Р		10	10							
	Seminar		S		1	1	X						
	Sum				11	11	1						

INS C-10	INS C-10 Neuroanatomische Computational Modellierung		Elective course			11 CP (in	(sg.) = 33	0 h					
Computat neuroanat – quantita analysis a modelling	tional tomy ative nd	Modellie	rung					Contact s 11 SWH	study / 165 h	Self study 165 h	11 CP		
Content	,												
Based neurog techni the m princi into c the int simple and th	l on ne genetic iques an icrosco ples. Fo ircuits terconn e quant ne desig	uroanaton technique nd quantit py image or exampl during dev tection and itative mo <u>n of a scie</u>	nical data es, models ative analy s. The dig e, time-lap velopment. d functionin dels. This o entific theo	obtained the are created visis methods ital form the se methods. The struct ng of circu- course on corry using sing ves	anks to stat l with a foc s are applie nen allows r s can be use ure of dendu its in the ner omputationa mple compu	te-of- us on d in t measu d to c rites a rvous al neu tter m	the-art develop dendritic and he computer to ured geometric observe and me and axons then system. The la roanatomy thus odels.	ments in axonal intr digitize a properties asure the p allows con- ws learned bridges th	microsco eractions natomics to be a precise a nclusion l from th ne gap be	ppy technolo s. Image proo al componen ssigned biop ssembly of r s to be drawn is are then te etween data a	gy and cessing ts from hysical leurons n about ested in analysis		
The particular function of the particular functi	articipa ermore, e appro	they will aches from	le to deal s be able to <u>m current r</u> ting	cientificall create simp esearch top	y with biolo ple models t vics of the gr	gical hat an roup.	data using quar re strongly relat	ntitative m and to the b	ethods (a	incl. use of N al data. The p	Iatlab). projects		
None		purticipu	ing										
Helpful p	lelpful previous knowledge												
Progra	amming	g skills (e.	g. Python,	Matlab, Ja	va)								
Assignme	nt of co	urse (prog	ram/depart	tment)		MS	e Interdisciplina	ary Neuros	cience /	FB15			
Suitable f	or othe	r study pro	ograms										
Times off	ered					Each semester							
Duration						1 Se	emester (block o	course ove	r 4 week	cs)			
Person in	charge					Dr.	Hermann Cuntz	Z					
Semester-	related	proofs											
Proof	of part	icipation				regu	ılar participatio	n					
Study	achiev	ements				Serr exp	ninar: 1 talk (20 eriments, 1 talk	minutes) (20 minut	on the rees) on c	esults of own urrent literatu	ıre		
Teaching	forms					Prac	ctical, seminar						
Tuition la	nguage					Eng	lish						
Module ex Modul	Module exam Module final exam consisting of:					For Prac task	m / duration / co ctical: graded pu (1-30 pages)	ntent (if ag cotocol (10	oplicable 0-30 pag	) es) or progra	mming		
Comp neuro quant analy mode	outatio panator titative sis and lling	nal ny –	Form of te	aching	SWH		СР	Semester 1	2	3	4		
Practi	cal		Р		10		10						
Semin	Seminar S 1			1		1	)	<					
Sum 11				11		11							

IN	S C-11	Compu	ter- Elective c	11 CP (insg.) = 330 h 1								
Co M No Pl	omputational odeling of euronal asticity	Modelli neurona Plastizi	ierung aler tät			Contact stu 11 SWH / 1	udy 165 h	Self study 165 h	— CP			
Co	ontent		·									
Le	The practical p networks and computational levels. Standa themselves. T role in learnin are discussed earning results /	provides the mod l neurosc ard neuro the focus g process using ex. Compete	an introduction to deling of neural p tience methods tha on models and n is on the role of ses. The possibiliti amples from the li ence objectives	the developmer plasticity mecha t use computati etwork architec plasticity mech ies and limitatic terature.	ant and implementa anisms. The cours onal models to stu- ctures are progra- anisms, their influ- ons of computer m	tion of comp se is a hand dy the work mmed and dence on ne hodels for un	putation ds-on in tings of t analyze twork d derstand	al models of troduction the brain at d by the su ynamics, an ding brain fu	neural to core various tudents id their unction			
	The students	have kno	owledge in progra	mming compu	ter models of neu	iron networ	ks, as w	vell as of di	ifferent			
	plasticity med	chanisms	and learning pro	ocesses. They	are able to work	on a scier	ntific pr	oblem agai	nst the			
	background of	f relevan	t literature.									
Re	equirements for	participa	ating	1. 6 1	1							
ц	Please consult	with the	e person in charge	before applying	g regarding prior e	experience						
п	Programming	skille in	at least one progra	amming langua	ge (e.g. Python N	Matlah Java	.)					
	Background in	Background in a quantitative discipline (e.g., physics, mathematics, computer science, or engineering). Basic										
	knowledge of	linear al	gebra, probability.	, differential eq	uations, numerica	l methods.	, or eng	,incomig). E	, asie			
As	signment of cou	rse (prog	gram/department)	, <b>_</b>	MSc Interdiscip	linary Neur	oscience	e / FB15				
Su	itable for other	study pro	ograms									
Ti	mes offered				in the summer s	emester						
D	iration				1 Semester (blo	ck course ov	ver 4 we	eks)				
Pe	rson in charge				Prof. Dr. Jochen	n Triesch						
Se	mester-related p	proofs										
	Proof of partic	cipation			regular participa	ation						
	Study achiever	ments			Seminar: 1 talk experiments	(20 minutes	) on the	results of o	wn			
Те	eaching forms				Practical, semin	ar						
Τι	ition language				English							
Μ	odule exam				Form / duration	/ content (if	applicab	ole)				
	Module final e :	xam cons	sisting of:		Practical: graded programming ta	d protocol (1 sk (1-30 pag	10-30 pa ges)	ages) or				
	Computation	al				Semester						
	Modeling of		Form of teaching	SWH	СР	1	2	3	4			
	Neuronal						-	5	r			
	Plasticity											
	Practical		Р	10	10							
	Seminar		S	1	1		Х					
	Sum			11	11							

INS	C-14	Kognitive P	sychologie –	ve cou	rse	11 CP (ins	sg.) = 330	h	11			
Cog Att Me	gnitive Psychology – ention, Perception & mory	Aufmerksar Wahrnehm Gedächtnis	nkeit, ung und				Contact st 11 SWH /	tudy 165 h	Self study 165 h	СР		
Cor	ntent											
	This practical provid	des an introc	luction to har	nds-on r	reseai	rch in l	numan cog	nitive sc	ience, also k	nown as		
	cognitive psycholog	y. In particu	ılar, participai	nts will	have	e the o	pportunity	to gain	hands-on ex	sperience		
	designing, program	ning, conduc	sting, and ana	alyzıng	expe	riments	in the ar	eas of v	isual attentic	on, scene		
	perception, and mem	ory.	pipets in the Se	oono Cre		or Lob	studente me		noto in nouro	aconitiva		
	studies using FFG ex	ve tracking (h	oth stationary	and usir	amma ng ma	al Lau, s obile FT	olasses) a	nd/or psy	vchophysical	methods		
	The goal of the semi	inar is to aco	uire theoretics	all backg	roun	d know	ledge on th	ne project	s as well as	practical		
	skills such as data co	llection and a	analysis, and in	nterpreta	ation	of the re	esults.	le project	is, us wen us	praetical		
Lea	rning results / Compete	ence objective	es	<u> </u>								
	Students have acquire	ed the theoret	ical backgrour	nd know	ledge	e in the a	areas of atte	ention, pe	rception, and	memory,		
	as well as learned m	ethods of ex	perimental psy	ychology	y, ba	sics of	collecting a	and analy	zing (neuro)	cognitive		
	data, how to perform	basic statisti	cal analyses, a	nd how	to wi	rite a sc	ientific arti	cle.		C		
Rec	uirements for participa	ating										
	none											
Hel	pful previous knowledge											
	Basic knowledge of Matlab/Pythons and statistical data analysis with "R".											
	Further useful inform	nation can als	o be found on	the web	osite:	www.S	ceneGrama	arLab.cor	n.			
Ass	ignment of course (pro	gram/departn	nent)			MSc In	terdisciplin	ary Neur	oscience / FE	3 15		
Sui	table for other study pr	ograms										
Tin	nes offered					In the winter semester						
Du	ration					1 Seme	ster (block	course o	ver 6 weeks)			
Per	son in charge					Prof. M	elissa Vo					
Sen	nester-related proofs											
	Proof of participation	l				regular	participatio	on				
	Study achievements					Semina	r: 1 talk (20	) minutes	s) on the result	ts of		
						own ex	periments					
Tea	ching forms					Practica	al, seminar					
Tui	tion language					English						
Мо	dule exam					Form /	duration / c	ontent (if	applicable)			
	Module final exam con	sisting of:				Practic	al: graded j	protocol	(10-30 pages)	or		
						project	report (10-	30 pages	)			
	Cognitive Psycholog	gy –	Form of teach	ing C	wu	CP	Semester					
	Attention, Perceptio	on &	Form of teach		νν Π	Cr	1	2	3	4		
	Memory				<u>.</u>				-			
	Practical		Р	1	0	10						
	Seminar S					1	Х					
	Sum	1	1	11								

IN	S C-15	Neurok	ognitive	Elective c	ourse		11 CP = 330 h 11						
De	evelopmental	Entwic	klung				Contact	study	Self study	— СР			
ne	uroscience						11 SWH	/ 165	165 h				
~							11						
C	ontent												
	Our brain is	highly p	lastic and	undergoe	s dynamic chai	iges across the li	fespan. Th	lese devel	lopmental c	hanges			
	in how the h	uman bra	ain and co	gnitive sv	stems develop	throughout the life	fespan, par	ticularly	in how age-	-related			
	neurocogniti	ve chang	es influen	ce the way	y we learn and e	extract regularitie	s from the	environm	ent and our	ability			
	to create men	mories of	f unique e	xperience	S.								
	For this, we	conduct	experime	nts in whi	ich we test part	incipants of differ	rent age gr	oups, usi	ng cognitiv	e tasks			
	Depending o	n the sta	ge of the e	experimen	t that you will	work on, you ma	y get expe	rience in	programmi	ng			
	cognitive tas	ks, Matla	ab/Python	/R program	mming, process	sing of behaviour	al/neuroin	naging da	ta, and/or	0			
_	conducting s	tatistical	/computat	ional moc	lel analyses.								
Le	earning results	/ Compet	tence obje	ctives									
	Students will	l be fami	liar with v	various teo	chniques used t	o collect experim	ental hum	an data: c	ognitive tas	sks to			
	collect behav	vioral dat	ta from pa	rticipants,	, neuroimaging	data while partic	ipants are	performine	ng tasks, an	d/or			
	tasks, and ha	ve learne	ed various	methods	for data analys	is, for which they	v will use N	and progr Matlab/Pv	thon/R	/e			
	programming	g. Studer	nts have w	orked in a	an international	environment and	l are able t	o present	and comm	unicate			
	their results in English.												
Re	equirements for	r particip	oating										
Н	none	knowled	σe										
11	none	KIIOWICU	gu										
As	signment of co	ourse (pro	ogram/dep	artment)		MSc Interdisci	olinary Ne	uroscienc	e / FB 15				
Su	itable for othe	r study p	rograms										
Ti	mes offered					Each semester							
D	iration					1 Semester (Bl	ock course	over 4 w	eeks full-da	ay, or 8			
						weeks half-day	)						
Pe	rson in charge					Prof. Dr. Yee L	ee Shing						
Se	mester-related	proofs											
-	Proof of part	icipation				regular particip	ation						
	Study achiev	ements				Seminar: 1 talk	(20 minut	es) on the	e results of	own			
T.						experiments an	d on curre	nt literatu	re				
16	eaching forms												
II M	lition language	•				Eligiisii	l contont (	"if annliad	hla)				
M	odule exam Module final	avam coi	reisting of:			Practical: grade	d protocol	(10-30) n					
	Wibuule iiilai	cxam coi	isisting of.			Thetical. grade	a protocol	r (10-50 p	ages)				
	Developmen	ntal	Form of t	anching	SWH	СР	Semester						
	cognitive		FOLLIOL	eaching	зип	Cr	1	2	3	4			
	neuroscienc	e	<b>D</b>		10	10							
<u> </u>	Practical		P		10	10		v					
<u> </u>	Seminar		5		11	11	×	X					
	Sum				11	11	1	1					

INS C-16	Kognitive und	Elect	tive course		11  CP = 3	330 h		11		
Cognitive and perceptual processes in the human brain	Wahrnehmungspro im menschlichen G	ozesse ehirn			Contact s 11 SWH	study / 165 h	Self study 165 h	- CP		
Content		•								
Our lab studies ba	sic human cognitiv	ve processes	such as at	tention a	nd workin	ng memo	ory and how	<sup>7</sup> these		
cognitive processes	affect our basic per	ception of th	e world. Co	onsequen	tly, most c	of this wo	ork uses the	human		
visual system as the	basis for such ques	tions becaus	e the visual	system i	s well defi	ned and	it can be ima	iged in		
humans using non-1	nvasive imaging tec	chniques such	as fMRI. I	n this cou	urse, stude	nts will v	vork with me	embers		
of the lab to define a	a research project. P	ossible resea	rcn projects	s could ra	inge from (	lesigning	g and progra	ational		
techniques to analy	ze these data. The a	nalysis of fM	IRI data is a	iaia (EE)	ible	J) 10 US	ing comput	ational		
Learning results / Comp	etence objectives	1141y515 01 1141								
Students are familia	r with the many ast	pects of cogn	itive neuroscience research. They have learned about both							
cognition (e.g., atter	ntion, working mem	orv. etc.) and	the visual	system (e	e.g., retinot	opic org	anization in	cortex.		
tuning properties of	f early sensory neu	rons, etc.) a	nd computa	ational ar	proaches	(e.g., mu	iltivariate ar	alysis,		
simulations, etc.).	They have experien	ce with all t	echniques 1	used in t	he laborate	ory inclu	ding fMRI,	MEG,		
psychophysics, data	analysis, and com	putational mo	odeling. Stu	idents op	erate in a o	close and	l very intern	ational		
environment, with a	mple opportunity to	perfect both	their social	and scien	ntific comr	nunicatio	on skills in E	nglish.		
Requirements for partici	pating									
Programming skills	age (Matlah odor Duthe	<b>n</b> )								
Assignment of course (pr	(Mailab Oder Fylic	лп <i>)</i>	Interdi	sciplinar	v Neurosci	ence / FF	3 15			
Suitable for other study	ogram/ucpartment)									
Times offered	programs		Fach semester							
Duration			1 Seme	ester (blo	ck course (	over 1 w	eeks)			
Duration Derson in charge			Dr Ro	$\frac{1}{100}$	demaker	0vci 4 w	ccks)			
Somester related proofs			DI. KO	same Ka	uemaker					
Broof of participatio	<b>n</b>		rogular	norticin	ation					
			ieguiai			<u>\</u>	1. 0			
Study achievements			Semina	ar: I talk	(20 minute	es) on the	e results of o	wn		
Tas shine farmer			Draatia	nents and	a on curren	it interatu	ire			
Tracing forms			English		lai					
Turtion language			English	Jame	1	f and lead	<b>h</b> 1~)			
Module exam	an station of the		Form /	duration	/ content (I	(10, 20, m)				
Module final exam c	Module final exam consisting of:					(10-50 p	ages)			
Cognitive and per	ceptual	C . 1 .	CIVIT	CD	Semester					
processes in the hu	man Form	of teaching	SWH	CP	1	2	3	4		
brain						-	5			
Practical	Practical P			10						
Seminar	Seminar S				X	х				
Sum	11	11	]							

<b>Optional courses in</b>	elective D:	Applied A	Aspects of Neuroscience
optional courses in	ciccuite D.		ispects of ficul obelefier

INS D-0	Externe		Elective course11 CP = 3301								
External Elective Course "Applied Aspects of Neuroscience	Wahlpflichtver "Angewandte A Neurowissensch	anstaltung Aspekte in den haften"				Contac study 11 SW 165 h	ct H /	Self study 165 h	- CP		
Content											
This elec their own can be of non-univ	ive course teaches projects under su fered by department ersity research inst	basic methods and pervision and presents of Goethe University itutions.	d techniq ent the re ersity, by	ues in applied esults in the for other univers	d areas of ne orm of a sen sities in Gerr	euroscien ninar pre nany an	nce. St esentati d abroa	udents wo ion. The c ad as well	ork on ourse as by		
Learning res	ilts / Competence o	bjectives									
Students	have knowledge ir	conducting scient	ific inve	stigations in t	he field of a	pplied n	eurosc	ience. The	ey are		
able to w	ork on scientific qu	uestions against the	e backgro	ound of releva	int literature.						
Requirement	s for participating										
Helpful previ	ous knowledge										
none	ous kilowicuge										
Assignment o	f course (program/	department)	Interdi	sciplinary Net	uroscience /	FB 15					
Suitable for o	ther study program	15									
Times offered	l		Depend	ling on provid	der						
Duration			Depend	ling on provid	der						
Person in cha	rge		Head of study program								
Semester-rela	ted proofs										
Proof of p	articipation		regular	participation							
Study acl	ievements		The reg applied workin both, re literatu	gulations of the l. If the providing g report must esults of own re (20 minute	ne provider o der does not be written,a experiments s).	of the electrequest and talks (20 mir	ective c any stu have t nutes) a	course are ady proofs to be given and topica	s, a n on 1		
Teaching for	ns		Practic	al, seminar							
Tuition langu	age		Depend	ling on provid	der						
Module exam Module fi	nal exam consisting	Form / The reg applied module pages).	duration / con gulations of th l. If grading is e completion of	ttent (if appli- ne provider of s not schedul exam shows	cable) of the ele ed by th a gradee	ective c ne prov d proto	course are ider, the col (10-3)	D			
External	elective course	Form of teaching		SWH	CP	Semest	ter				
"Applied Neurosci	Aspects of ence"	r onn or teaching		5 11 1		1	2	3	4		
Practical		Р		10	10		1				
Seminar		S		1	1	У	X				
Sum				11	11						

IN	S D-1	Verhalter	Elective c	ctive course			11 CP (ins	sg.) = 33	0 h	11		
Be Bi Zo	havioral ology in oos	in Zoos						Contact st 11 SWH /	tudy 165 h	Self study 165 h	- CP	
Co	ontent	•						•				
Le	The cours topics of a lecture an deepen th contexts. & breedin veterinary zoos. The focus, cla examinati with high arning resu The stude husbandry	se includes zoo biolog id then dis neoretical Other topi ng program / basics, or methodolo ssical and ions), imag -speed can <b>alts / Comp</b> ents have k	s the comp y are taugl cussed. Th foundation cs include: ms in zoo rganization ogical appr modern me ging techni neras). etence obje	onents sen at the be e excursion is. Empha: Historical s, animal and struct oach to the ethods of be ques (e.g. <b>ctives</b> in basic co aspects) and	ninar, practica ginning using ns to differen sis is placed development husbandry (nural develop practical cou ehavioral rese thermographi ntents of zoo d in the applic	al & g orig g orig on f z on of z nutrit ment rse c c earch ic mo	excursion. In t ginal papers, wl os and the resea ecological, ph oos, zoos & spe tion, behavior, , enclosure dest omponents incl a, laboratory act easurements wi	he seminar hich are pro- rch practic ysiological ecies conse enrichmen ign and pla udes, deper ivities (mic th infrared	r, basic esented al at the l and e rvation, it, com nning, e nding or croscopi camera n zoos, iiques (t	aspects and by the studer e Opel Zoo s thological re population t nunity husb educational w the chosen o c and physio s or video an enrichment,	current its in a erve to search biology andry), vork in content logical halyses animal 4, high-	
	speed car	neras). Th	ey have m	ethodologi	cal knowledg	ge to	conduct behav	vioral studi	ies and	are able to a	uddress	
Re	auirements	for partic	inating	buckgroui		inter	ature.					
I	none											
He	elpful previ	ous knowle	edge									
	none		0									
As	signment o	f course (p	rogram/dep	oartment)		MS	Sc Interdisciplir	nary Neuro	science	/ FB15		
Su	itable for o	ther study	programs									
Ti	mes offered	l				in the summer semester						
Dı	iration					1 \$	emester (block	course ove	er 5 wee	ks)		
Pe	rson in cha	rge				Pro	of. Paul Dierkes	5				
Se	mester-rela	ted proofs										
	Proof of p	articipatio	n			reg	ular participati	on				
	Study ach	ievements				Ser exp	minar: 1 talk (2 periments, 1 tal	0 minutes) k (20 minu	on the r tes) on o	esults of ow current litera	n ture	
Te	aching form	ns				Sei	minar, Practical	l, Excursio	n			
Τι	ition langu	age				En	glish					
Μ	odule exam					Fo	rm / duration / c	ontent (if a	pplicabl	e)		
	Module fi	nal exam co	onsisting of	:		Pra	ctical: graded p	protocol (1	 0-30 pag	ges)		
	:		-		-							
	Behavior	al	Form of te	eaching	SWH		СР	Semester				
	Biology in	n Zoos		0				1	2	3	4	
	Practical		Р		10		10					
	Seminar		S		1		1		х			
	Exkursion	1	Ex						~			
	Sum				11		11					

IN	IS-D2	Eye-tracking	Elect	tive course	course 11 CP = 330 h				11		
At of us	ttention analysis students' media e via eye-tracking	Verhaltensanaly Studierenden be Umgang mit div Lehr-Medien	im ersen			Contact str 11 SWH / 1	udy 165 h	Self-study 165 h	СР		
С	ontent										
Th pr al Do fo R' St re St an se qu Ra Go	ne goal of the coursentation and use ouds (RTA: intervi epending on the pro- llowing methods: I TAs, Statistical ana udents will work in search focus of the earning results / Con- udents will have pro- id physiological pro- arches. Students ar restions. equirements for par-	rse is to provide of diverse media ewing subjects for rojects in progress Design of experin alysis. In the research gra- group. <b>mpetence objectiv</b> ractical and theor occessing of visual re familiar with do <b>ticipating</b>	e an introduction using modern nor cognitive pro- ss at the time of nents, Recordin oup under supe es etical experience l information, in eveloping, imple	on to the seuroscience cess data i f the mode g and anal rvision on ee with bas neluding ey ementation	study of at e technique n addition to ule, the con ysis of eye their own ic and adva ye-tracking n, analyzing	tention and es as eye-tra to their eye- urse will co -tracking da clearly defi unced methor, RTAs, and g, and prese	l cognitiv acking an -tracking onsist of ata, Reco ned proje ods for st d log-dat enting the from Ge	ve processing d retrospective data). practical tasks ording and anal ects embedded cudying the cog a analysis of o eir own researc	during think- in the ysis of in the gnitive nline h		
H	elpful previous know	wledge:	- d:1 d (								
Ŵ	mingness to work	(program/departs	mont)	•	Interdisci	nlinary No	uroscien	pa / faculty 15			
As	signment of course	(program/departi	nent)		Intertuiser		uroscienc	c / faculty 15			
Т		11 505			Each semester, depending on availability						
	mes offered				Each semester, depending on availability						
Du	uration				1 semeste	er (block co	ourse ove	r 4-6 weeks)			
Pe	erson in charge				Dr. Maru	schka Web	er				
Se	mester-related proc	ofs									
-	Proof of participa	tion			Regular p	participation	n				
	Study achievemen	its			Seminar: results, 1 publication	1 seminar ta seminar ta ons	talk (20 r llk (20 m	nin) on experin in) on current	mental		
Te	eaching forms				Practical,	seminar					
Τι	uition language				English						
Module exam					Form / du	ration / con	tent (if a	pplicable)			
Module completion exam					Practical	Graded pr	otocol (1	0-30 pages)			
	Attention analysis media use via eye-	of students' tracking	Teaching forms	s SWH	СР	Semester 1	2	3	4		
	Practical		Р	10	10						
	Seminar		S	1	1	Х	X				
	Sum			11	11						

INS WP		Freies Studium			Wahlpflichtmodul		11 CP = 330 h			11	
Free-choice Studies					-		Contact stu	ıdv	Self study	СР	
							11 SWH / 1	65x h	165x h		
Content											
	See description of the selected module										
	Courses from all departments of Goethe University can be credited. Courses from the departments of Computer Science and Mathematics (EB12) Biochemistry Chemistry and Pharmacy (EB14) Biochemistry									Iences	
(FB15), Philosophy and Historical Sciences (FB8), Psychology and Sports Sciences (FB8), Psychology and Sport							Sciences (F	( $B5$ ) seem to b	e		
	particularly suitable. The module can also be from other universities in Germany and abroad. Alternative								atively, a		
	business or r esearch practical (4-6 weeks) can be carried out in a university or non-university research									ch	
Institution or company.											
See description of the selected module											
Requirements for participating											
none											
Helpful previous knowledge											
none						Inter	Interdissinlinger, Nourossianas / ED 15				
Assignment of module (program / department)						Inter	Intertuisciplinary Neurosciellee / FB 15				
Suitable for other study programs											
Times offered						Depe	Depending on provider				
Duration					Depe	Depending on provider					
Person in charge					Head	Head of study program					
Semester-related proofs											
Proof of participation						regul	regular participation				
Study achievements					The	The regulations of the provider of the course are					
						appli	applied. If the provider does not request any study				
						proo have	proofs, a working report must be written, and talks have to be given on both results of own				
						expe	experiments (20 minutes) and topical literature (20				
						minu	minutes).				
Teaching forms						Prace	Practical, Übung, Vorlesung, Seminar, Exkursion				
Tuition language						Je na	Je nach Anbieter				
Module exam						Form	Form / duration / content (if applicable)				
	Module final exam consisting of:						The regulations of the provider of the course are				
						appii the n	the module completion exam shows a graded				
						prote	protocol (10-30 pages).				
	Free-choice studi	es	Form of		SWH	СР	Semester				
			teaching		5,111	CI	1	2	3	4	
	Practical, tutorial,	lecture,	P, Ü, V, S	, Ex	11	11					
	seminar, excursior	1					2	X			
	Sum				11	11					