Neurobiochemistry					
Identification number	Workload	Credit points	Term of studying	Frequency of occurrence	Duration
MN-B-SM (BN 1)	360 h	12 CP	1st or 2nd term of studying	Summer term, 1st half	7 weeks

1	Type of lessons	Contact times	Self-study times	Intended group size*
	a) Lectures	16 h	40 h	max. 8
	b) Practical/Lab	160 h	120 h	max. 4
	c) Seminar	4 h	20 h	max. 4

2 Aims of the module and acquired skills

Students who successfully completed this module …

- have acquired detailed knowledge about the structure-function relations of ligand-gated ion channels as well as post synaptic proteins and their function within neuronal cells.
- are able to express and isolate synaptic proteins from *E. coli* cultures and murine tissue.
- can identify and characterize protein interactions between membrane receptors and synaptic proteins on a biochemical level using methods such as Isothermal Titration Calorimetry, Surface Plasmone Resonance Spectroscopy, size exclusion chromatography and pull down experiments.
- are able to apply the principle of immunodetection to microscopic samples as well as the immunoblot techniques.
- have acquired sterile working practice by cultivating mammalian cell lines.
- are able to express synaptic proteins in mammalian cell lines and analyze their subcellular distribution.
- have prepared hippocampal neuron cultures and analyzed them at the confocal laser scanning microscope.
- have the ability to process, quantify and evaluate their experimental results.
- can independently carry out small scientific projects related to the topic of the module.
- have learned how to present research results in oral and written form and to critically discuss scientific publications related to the topic of the module on a professional level.
- are able to transfer skills acquired in this module to other fields of biochemistry.

3 Contents of the module

- Structure and function of neurons, voltage-gated and ligand-gated ion channels
- Post-synaptic proteins, their structures and molecular interaction
- Neuronal receptors in health and disease
- Methods to visualize cellular structures and protein interactions (*in vitro* and *in vivo*)
- Transfection of neuronal cells and HEK/COS7 cells
- Preparation of cultures of hippocampal neurons from mouse brain
- Immuno-staining of neuroreceptors and synaptic proteins
- Fluorescence microscopy and confocal laser scanning microscopy
- Model organisms: vertebrates – *Mus musculus*, prokaryotes – *E. coli*

4	Teaching/Learning methods Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form
5	Requirements for participation Enrollment in the Master´s degree course "Biological Sciences" or in the Master's degree course "Biochemistry"
6	Type of module examinations The final examination consists of three parts: Two hours written examination about topics of the lectures and the practical/lab part (50 % of the total module mark), oral presentation (25 % of the total module mark) and seminar paper (25 % of the total module mark)
7	Requisites for the allocation of credits Regular and active participation; Each examination part at least "sufficient" (see appendix of the examination regulations for details)
8	Compatibility with other Curricula Biochemical subject module in the Master´s degree course "Biochemistry"
9	Significance of the module mark for the overall grade In the Master´s degree course "Biological Sciences": 15 % of the overall grade (see also appendix of the examination regulations)
10	Module coordinator Prof. Dr. Günter Schwarz, phone 470-6440, e-mail: gschwarz@uni-koeln.de
11	Additional information Subject module of the Master´s degree course "Biological Sciences", Focus of research: (B) Biochemistry, Biotechnology and Biophysics; (N) Neurobiology Participating faculty: Dr. F. Liebsch, Dr. F. Neuser, Prof. Dr. G. Schwarz Literature: • Kandel, E.R., Schwartz, J.H., Jessell, T. (2014) Principles of Neural Science. 5th edition, McGraw-Hill. Chapters 21, 22, 32. • Further original publications will be handed out at the introduction to the module General time schedule: Week 1-5 (Mon.-Fri.): Lectures, practical/lab, preparation for the seminar talk (topic and date will be arranged individually); Week 6 (Mon.-Fri.): Writing seminar paper; Week 7 (Mon.-Fri.): Preparation for the written examination Note:The module contains hand-on laboratory work conducted by small groups of students and individually and is taught in course rooms and research laboratories. The module does not contain computer-based practicals/research as a main component. Introduction to the module: April 02, 2020 at 9:00 a.m., Institute of Biochemistry, room 465 (fourth floor) Written examination: May 22, 2020, second/supplementary examination July 31, 2020; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.

* 2 students from the Master´s degree course "Biological Sciences" and 6 students from the Master's degree course "Biochemistry".