Neurobiochemistry					
Identification number	Workload	Credit points	Term of studying	Frequency of occurrence	Duration
MN-B-SM (N 3)	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	80 h	max. 9
	b) Practical/Lab	80 h	80 h	max. 4-5
	c) Seminar	24 h	80 h	max. 4-5

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 isolate synaptic proteins from recombinant sources 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, size exclusion chromatography and immunoprecipitation experiments.
- are able to apply the principle of immunodetection to microscopic samples as well as Western blot-based detection 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 using confocal microscopy.
- have prepared hippocampal neuron cultures and quantified synaptic structures using semi-automated image processing.
- can independently carry out small scientific projects related to the topic of the module.
- have the ability to process, quantify and evaluate their experimental results.
- 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

In this course we will gain insight into the fundamental principles of neuronal communication and especially emphasize how these processes can be studied using biochemical and biophysical techniques. The specific areas that will be covered are:

- Structure and function of neurons
- 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 and immune-staining of cultured eukaryotic cells
- Preparation of hippocampal neurons from mouse brain
- Confocal laser scanning microscopy and image analysis
- Model organisms: vertebrates – *Mus musculus*, prokaryotes – *E. coli*

Neurobiochemistry (MN-B-SM [N 3]) continued

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", Specialization: (N) Neurobiology: Genes, Circuits, and Behavior Participating faculty: Prof. Dr. M. Bergami, Prof. Dr. G. Schwarz Dr. N. Kononenko, Dr. F. Liebsch, Dr. F. Neuser 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 08, 2021 at 9:00 a.m., online (further information/link will be sent to your Smail-Account) Written examination: May 31, 2021, second/supplementary examination August 06, 2021; the latter date may vary if students and module coordinator agree. More details will be given at the beginning of the module.

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

Corona note! Depending on the Corona situation during the summer term, practical work may be skipped either totally or in part. In this case, some or all practical parts will be replaced by adequate alternatives so that (i) the workload and (ii) the principle content of the modules remained unchanged.