Module Name Neurobiochemistry

Identification Number	Workload	Credit Points	Term	Offered Every	Start	Duration
MN-BC-BSM08	360 h	12 CP	1st or 2nd term of studying	Summer term	summer term only	7 weeks

1	Course Types	Contact Time	Private Study	Planned Group Size*
	a) Lectures	16 h	80 h	max. 8
	b) Practical/Lab	96 h	72 h	max. 8
	c) Seminar	16 h	80 h	max. 8

2 Module Objectives and Skills to be Acquired

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.
- can characterize protein interactions between membrane receptors and synaptic proteins on a biochemical level using isothermal titration calorimetry and size exclusion chromatography.
- are able to apply the principle of immunodetection to microscopic samples as well as Western blot-based detection techniques.
- have acquired sterile working practice,are able to express synaptic proteins in cultured mammalian cells and analyze their subcellular distribution using fluorescence microscopy.
- are able to express Adeno-associated viruses (AAV) in a cultured mammalian cell line and enrich AAVs suitable for *in vitro* experiments.
- 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 Module Content

- 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*)
- Expression of synaptic proteins in cultured mammalian cells and immunostaining analysis
- Preparation of hippocampal neurons from mouse brain
- Fluorescence microscopy and image analysis
- Model organisms: vertebrates – *Mus musculus*, prokaryotes – *E. coli*

4	**Teaching Methods** Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form
5	**Prerequisites (for the Module)** Enrollment in the Master´s degree course "Biological Sciences" or in the Master's degree course "Biochemistry" **Additional academic requirements** For students of Master "Biological Sciences": Previous attendance of the lecture module "Neurobiology: Genes, Circuits, and Behavior (N)".
6	**Type of Examination** The final examination consists of two parts: Written examination on topics of lectures, seminars and the practical/lab part (1 hour; 50 % of the total module mark), oral poster presentation of (20-30 min; 50 % of the total module mark).
7	**Credits Awarded** 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 "Biological Sciences"
9	**Proportion of Final Grade** In the Master´s degree course "Biochemistry": 10 % 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	**Further Information** **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 01, 2022 at 2:00 p.m., online (further information/link will be sent to your Smail-Account) **Oral or written examination:** May 20, 2022, second/supplementary examination August 05, 2022; 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 5 students from the Master's degree course "Biochemistry".