**Module Name**
Neurobiochemistry

| **Type of Module** | **Module Code** |
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| o Advanced Module | Neurobiochemistry |

| **Identification Number** | **Workload** | **Credit Points** | **Term** | **Offered Every** | **Start** | **Duration** |
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| MN-B-SM (N 3) | 360 h | 12 CP | 2nd term of studying | Summer term | summer term only | 7 weeks |

| 1 | **Course Types** | **Contact Time** | **Private Study** | **Planned Group Size*** |
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| | a) Lectures | 16 h | 80 h | max. 9 |
| | b) Practical/Lab | 96 h | 72 h | max. 9 |
| | c) Seminar | 16 h | 80 h | max. 9 |

**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*

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| **4** | **Teaching Methods**<br>Lectures; Practical/Lab (Project work); Seminar; Guidance to independent research; Training on presentation techniques in oral and written form |
| **5** | **Prerequisites (for the Module)**<br>Enrollment in the Master´s degree course “Biological Sciences” or in the Master’s degree course “Biochemistry”<br>**Additional academic requirements**<br>Previous attendance of the lecture module “Neurobiology: Genes, Circuits, and Behavior (N)”. |
| **6** | **Type of Examination**<br>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 presentation (20-30 min; 50 % of the total module mark) |
| **7** | **Credits Awarded**<br>Regular and active participation<br>Each examination part at least “sufficient” (see appendix of the examination regulations for details) |
| **8** | **Compatibility with other Curricula**<br>Biochemical subject module in the Master´s degree course “Biochemistry” |
| **9** | **Proportion of Final Grade**<br>In the Master´s degree course “Biological Sciences”: 15 % of the overall grade (see also appendix of the examination regulations |
| **10** | **Module Coordinator**<br>Prof. Dr. Günter Schwarz, phone 470-6440, e-mail: gschwarz@uni-koeln.de |

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| **11** | **Further Information**<br><br>**Subject module** of the Master´s degree course "Biological Sciences",<br>**Specialization:** (N) Neurobiology: Genes, Circuits, and Behavior<br><br>**Participating faculty**: Prof. Dr. M. Bergami, Prof. Dr. G. Schwarz Dr. N. Kononenko, Dr. F. Liebsch, Dr. F. Neuser<br><br>**Literature:**<br><br>• Kandel, E.R., Schwartz, J.H., Jessell, T. (2014) Principles of Neural Science. 5th edition, McGraw-Hill. Chapters 21, 22, 32.<br><br>• Further original publications will be handed out at the introduction to the module<br><br>**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<br><br>**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.<br><br>**Introduction to the module:** April 1, 2022 at 2:00 9.m., online (further information/link will be sent to your Smail-Account)<br><br>**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".