Synaptic Physiology in Health and Disease

Identification number	Workload	Credit points	Term of studying	Frequency of occurence	Duration
MN-B-EM (am11 neuro)	180h	6 CP	During term break	Winter term	3 weeks

1	Type of lessons	Contact times	Self-study times	Intended group size*
	a) Lectures	10 h	30 h	max. 6
	b) Practical/Lab	74 h	66 h	

2 Aims of the module and acquired skills

Students who successfully completed this module …

- have acquired in-depth knowledge on identification and functional analysis of synapses in the mouse brain.
- have obtained an understanding of the advantages and disadvantages of different model systems (primary neuronal cell culture, ex-vivo mouse brain slice culture, and in-vivo mouse brain).
- have acquired experimental skills in state-of-the art imaging of synaptic physiology and can independently design and perform small scientific projects related to the topics of the module.
- have learned how to present research results in oral and written form and to critically discuss experimental results on a professional level.
- can apply acquired knowledge in clinical and experimental fields of neuroscience and to other fields of biology.

3 Contents of the module

- Primary culture of mouse cortical neurons, plasmid and viral transfections
- Organotypic slice culture of mouse cerebellum and viral transfections
- Imaging of synaptic activity using GCAMP- and pHluorin-based reporters in mouse primary neurons and organotypic slice culture
- Analysis of mouse models of neurodegenerative diseases
- Identification and analysis of synapses in electron microscopy (EM) images
- Fluorescence microscopy and quantitative analysis of microscopy data

4 Teaching/Learning methods

- Lectures; Practical/Lab (Project work); Guidance to independent research; Training on presentation techniques in oral and written form.
- The blended learning approach is used for the entire module (online material for self-study will be available for downloading).
- Some lectures will be given in “active leaning” form, i.e. students prepare answers to pre-assigned topics and then “teach” that topic to their peers.

5	**Requirements for participation** Enrollment in the Master´s degree course “Biological Sciences” or in the Master´s degree course “Experimental and Clinical Neuroscience”. **Additionally recommended:** Successful completion of the “Lecture Neurobiology: Genes, Circuits, and Behavior” module or “the Neural Function I" module, or participation in a neuroscience-oriented module that provides equivalent content.
6	**Type of module examinations** The final examination consists of the oral presentation about the practical work
7	**Requisites for the allocation of credits** Regular and active participation; pass in the exam.
8	**Compatibility with other Curricula*** Elective module in the Master´s degree course “Experimental and Clinical Neuroscience” Elective module in the Master`s degree course “Biological Sciences”
9	**Significance of the module mark for the overall grade** In the Master‘s degree course “Experimental and Clinical Neuroscience”: 6 % of the overall grade (see also appendix of the examination regulations) In the Master’s degree course “Biological Sciences”: not applicable (pass or fail).
10	**Module coordinator** Prof. Dr. Natalia L. Kononenko, phone 470-84302, e-mail: natalia.kononenko@uk-koeln.de
11	**Additional information** **Elective module** of the Master´s degree course “Biological Sciences” and the Master´s degree course “Experimental and Clinical Neuroscience”. **Focus of research:** (N) Neurobiology **Participating faculty:** Prof. Dr. N. Kononenko, Dr. M. Tolve, M. Overhoff **Literature:** • Kandel, E.R., Schwartz, J.H., Jessell, T. (2000) Principles of Neural Science. 4th edition, NcGraw-Hill. Chapters 21, 22, 32 • Purves, D., Augustine, G.J., Fitzpatrick, D., Hall. C.W. *et al.* (2007) Neuroscience. 4th edition, Palgrave Macmillan. Chapters 5-7, 14 • Siegel, G.J., Albers, R.W., Brady, S.T., Price, D.L. (2006) Basic Neurochemistry. 7th edition, Academic Press. Chapters 10-18, 28, 29, 31, 40 **General time schedule:** February 27 to March 16, 2022: Lectures, practical/lab, data evaluation, and preparation of oral presentations. Project presentations: March 17, 2023 at 10:00 a.m. **Note:** The module contains hands-on laboratory work conducted by small groups of students and is taught in research laboratories. The module does not contain computer-based practicals/research as a main component. **Registration deadline: January 13, 2023.** **Introduction to the module: February 27, 2023 at 10:00 a.m**., CECAD (4th floor, AG Kononenko)