GENERAL INFORMATION		
Course	**Neurophysiology**	
Course coordinator	**Asst. Prof. Darija Šnajder Mujkić, dr. med.**	
Assistant/Associate	Prof. Branimir Hackenberger Kutuzović, PhD Zvonimir Popović, MD Marko Sablić, MD	
Study Programme	**Integrated undergraduate and graduate university study of Medicine in German language**	
Status of the course	Mandatory	
Year of study, semester	2nd year, 4th semester	
Grading scale and workload	ECTS	**4**
	Hours (L+S+E)	**50** (15+20+15)

COURSE DESCRIPTION

Course objectives

Acquiring the ability to connect the behavioural functions of the organism with cellular electrical phenomena, molecular mechanisms of transfer on membranes, signalling processes on the membrane and neurotransmitter systems.

Enrolment requirements and entry competencies

Passed Medical Biology, Medical Biochemistry and Neuroanatomy.

Learning outcomes at the Programme level

1.1., 2.1., 2.2., 2.3., 3.4., 3.5., 4.2.

Learning outcomes (5-10)

Knowledge

After listening and learning the subject, the student will be able to:

1. Describe the way information is transmitted between neurons, classify and explain the basic properties and mechanism of action of neurotransmitters, describe the structure of receptors and discuss their role in information transmission
2. Explain the difference in the synthesis, transmission and action of low molecular weight neurotransmitters and neuropeptides
3. List the main neurotransmitter systems and describe their anatomical position and function
4. Explain the types and mechanisms of short-term and long-term synaptic plasticity using examples

5. Describe the molecular mechanisms that participate in the development of the brain and the disorders to which their failures lead
6. Differentiate between peripheral and central regeneration mechanisms
7. List the neural circuits and neurotransmitter systems that participate in the regulation of sleep and wakefulness, and list the stages of sleep
8. Name the neural circuits and neurotransmitter systems that participate in the processes of memory and forgetting
9. Explain the role of the hypothalamus in the regulation of autonomic nervous functions (satiety, thirst, reproductive functions) and the regulation of the circadian rhythm
10. List the parts and functions of the hypothalamus-pituitary-adrenal axis and explain the stress response
11. Explain the mechanisms that affect the sexual differentiation of the brain
12. State the mechanisms that lead to brain ageing

Skills

1. Apply knowledge from theoretical classes and demonstrate skills in solving electrophysiological problems on the computer
2. Apply knowledge from theoretical classes and demonstrate the skills of recording bioelectrical (e.g. EEG and EMG) potentials from the human body
3. Differentiate between recordings of the electrical activity of the brain and pictorial representations of the structure and activity of the human brain in clinical application

Course content

Ionic composition of cytoplasm and extracellular space. Ion channels and pumps. Molecular basis of electrical excitability of membranes. Resting membrane potential, action potential, receptor potential and synaptic potential. Neurotransmitters, neuropeptides and their receptors. Intracellular signalling mechanisms. Short-term and long-term synaptic plasticity. Molecular mechanisms of developmental processes (genes and signalling mechanisms). Neurotropic and neurotrophic factors. The potential of central and peripheral regeneration of the nervous system. Hypothalamic systems of neurons that monitor pituitary function and their connection with autonomic nervous functions. Stress response. Sexual differentiation of the brain. Wakefulness and sleep. Ageing of the brain.

Mode of teaching	☒lectures ☒seminars and workshops ☒exercises ☐distance education ☐field teaching	☐independent tasks ☐multimedia and network ☐laboratory ☐mentoring work ☐other

Student obligations

Students are expected to attend all class sessions, as well as to take all the examinations. The successful performance of seminars and exercises requires prior preparation of the student.

Monitoring student work

Attending classes	x	Class activity	x	Seminar work		Experimental work	
Written exam	x	Oral exam	x	Essay		Research	
Project		Continuous knowledge verification	x	Paper		Practical work	x

Portfolio							

Grading and evaluation of student work during classes and of the final examination

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Class attendance Seminars Exercises	1	Mastering the learning material, acquiring theoretical and practical knowledge provided by the course	Attendance at classes Seminar work Entrance colloquium, preparation of exercises, writing the laboratory exercise diary	Attendance list Presentation Diary, entrance colloquium	5	10
Testing	1	Testing the theoretical knowledge	Learning for the written exam	Written exam	15	30
	1	Testing the practical knowledge	Preparation for the practical exam	Practical exam	10	15
	1	Testing the overall knowledge and its integration	Learning and preparation for the oral exam	Oral exam	20	45
Total	**4**				**50**	**100**

The student must attend at least 70 % of all forms of teaching (exercises, seminars and lectures), take partial tests after each seminar, pass the laboratory part of the exam, the written final test and the oral exam. A student who justifiably misses a seminar and/or exercise must make up for the missed material by taking a quiz.
The final grade represents the sum of the grade points achieved during the class and on the final exam.

Calculation of final grade:
Based on the total sum of the points awarded during the course and the final exam, the final grade is determined according to the following distribution:
A – excellent (5): 80-100 grade points; B – very good (4): 70-79,99 grade points; C – good (3): 60-69,99 grade points; D – sufficient (2): 50-59,99 grade points

Required reading

1. Bear, Connors, Paradiso. Neurowissenschaften, Springer Spektrum

Additional reading

1. Dale Purves, George J. Augustine, David Fitzpatrick, William C. Hall, Anthony-Samuel

LaMantia, and Leonard E. White. Neuroscience 5ed., published by Sinauer Associates.

Number of copies of required literature in relation to the number of students currently attending classes in the course

Title	*Number of copies*	*Number of students*
Bear, Connors, Paradiso. Neurowissenschaften, Springer Spektrum	The purchased license for online textbook will be used. All students enrolled in the study program will have access to the materials.	

Course evaluation procedures

Anonymous, quantitative, standardized student survey providing feedback on the course as well as on the work of course coordinators and their assistants/associates is being conducted by the QA Office of the Faculty of medicine Osijek.