BASIC NEUROSCIENCE
2° YEAR STUDENTS
UNIVERSITY OF SPLIT SCHOOL OF MEDICINE

All data are valid for the academic year 2025/2026

PROFESSORS AND ASSOCIATES

• Professor **Zoran Đogaš**, MD, PhD; **Head of Department of Neuroscience**
e-mail: zoran.dogas@mefst.hr, tel. 557-905

• Professor **Maja Valić**, MD, PhD; **Head of educational department**
e-mail: maja.valic@mefst.hr, tel. 557-860

• Professor **Renata Pecotić**, MD, PhD; **Head of laboratory for Basic Neuroscience**
e-mail: renata.pecotic@mefst.hr, tel. 557-857

• Assoc. Professor **Ivana Pavlinac Dodig,** MD, PhD
e-mail: ivana.pavlinac@mefst.hr, tel. 557-862

• Assistant Professor **Linda Lušić Kalcina,** MS, PhD;
e-mail: linda.lusic@mefst.hr

• **Katarina Madirazza**, MSc, PhD; postdoc
e-mail: kmadiraz@mefst.hr

• Research Associate **Maja Rogić Vidaković, MSLP, MSc, PhD; Head of Laboratory for Human and Experimental Neurophysiology**
e-mail:maja.rogic@mefst.hr

→ Neuroscience is one of the basic medical sciences studying morphology and function of a healthy nervous system, with an emphasis on the mechanisms responsible for achieving its role as a central organism control and management system. This course will introduce students to and enable them to approach problems in this area using scientific methods. The aim of the Basic neuroscience course is to teach a student how to use the acquired knowledge on physics, chemistry, biochemistry, biology, anatomy, histology and physiology in acquiring knowledge on the normal function of the nervous system to the extent necessary for further successful studying.

→ The Basic neuroscience course lectures will be held during the 4th semester *with a total duration of* 115 hours.

→ Neuroscience is tested in the form of written exam that consists of 100 multiple answer questions with only one answer being correct. Each correct answer carries one point.

→ Topics to be covered through lectures, seminars and practical lessons, including an indication of the prescribed literature, will be announced on the beginning of the course. Attendance of all forms of instruction is MANDATORY (except the attendance of individual consultations), and all students are obligated to study the prescribed material IN ADVANCE for seminars and practical lessons, using the main textbook and/or the additional literature.

→ The course Basic neuroscience is consisted of:

•LECTURES • SEMINARS • PRACTICAL LABORATORY WORK • INDIVIDUAL TEACHING CONSULTATIONS

CURICCULUM - The course content is divided into five units:

A Neuroanatomy

LECTURES
CNS research methods. Development of the CNS.
Peripheral nervous system and the spinal cord
Diencephalon and telenchephalon

SEMINARES
The structure of gray and white matter of the spinal cord, brainstem and cerebellum, diencephalon and telencephalon
Neuroanatomy, summary

PRACTICAL WORK
Review of the CNS structures
Appearance and distribution of gray and white matter of the spinal cord and brainstem
Clinical-anatomic syndromes of the spinal cord

B Basics of neuron electrophysiology

LECTURES
Neuron is a basic structural-functional unit of CNS
The biophysical basics of excitability
Neurotransmitters in health and disease
Serotonin

SEMINARS
The cell membrane, ion channels, passive and active neuron properties
Structure and function of the synapse and the cellular basis of behavior (neuron sequences, pathways, circles, networks, systems)
Neurotransmitters, neuropeptides and their receptors
Electrophysiology of neurons, summary

PRACTICAL WORK
Resting, action, and synaptic potentials
Signalization

C Sensory system

LECTURES
General organization of the sensory systems. Taste and smell
Physiology of the eye and phototransduction

SEMINARS
Pain, heat and cold – anterolateral sensory system. Touch, pressure, and kinesthesia - the dorsal column system
Ear - organ of hearing and balance. Auditory and vestibular system
Organization of the retina, primary visual pathway and primary visual cortex
Perception of colours, shapes, depth and movement; and the organization of the associative visual fields
Sensory system, summary

PRACTICAL WORK
Physiology of sensation

D Motor system

LECTURES
General structure of the motor systems

SEMINARES
Role of motor cortex in voluntary movements. Eye movement and eye gaze direction system
Spinal motor mechanisms and reflexes
Role of the descending pathways from the brainstem in maintaining posture and muscle tone; spinal shock
Motor functions of the cerebellum and the basal ganglia
Motor system, summary

PRACTICAL WORK
Muscle and electromyography

E General brain functions

LECTURES
General brain function and sleep
Control of breathing during wakefulness and during sleep
Brain lateralization
Basic research and clinical importance

SEMINARS
Neuroanatomy and psychology of speech and language
General brain functions; EEG, evoked potentials
Stages of wakefulness and alertness; sleep
Organization and structure functions of the limbic system
Neurobiology of emotion and sexuality
Neurobiology of attention and associative functions of the prefrontal and posterior parietal cortex
Anatomy and psychology of learning and memory
Cellular mechanisms of learning and memory
General brain function, summary
Clinical seminar

PRACTICAL WORK
TMS
EEG and evoked potential
Polysomnography
Polysomnography report
Reflexes and reaction time
Animal neurophysiological research *in vivo*

• LECTURES:

Lecture program for the academic year 2025/2026

Lecture	*Topic*	*Hours*	*Lecturer*
P-1	Introductory lecture	1	Đogaš
P-2	Neuron is a basic structural-functional unit of the CNS	2	Đogaš
P-3	Peripheral nervous system and the spinal cord	2	Pavlinac Dodig
P-4	Development of the CNS and processes of development reorganization and plasticity	1	Pavlinac Dodig
P-5	Diencephalon and telenchephalon	2	Pavlinac Dodig
P-6	Biophysical basics of excitability	2	Đogaš
P-7	Neurotransmitters in health and disease	2	Đogaš
P-8	Serotonin	2	Valić
P-9	General organization of the sensory systems (Ch 15, 18). Taste and smell	2	Đogaš
P-10	Physiology of the eye and phototransduction	1	Đogaš
P-11	General structure of the motor systems	1	Đogaš
P-12	General brain function and sleep	2	Đogaš
P-13	Control of breathing during wakefulness and during sleep	1	Pecotić
P-14	Basic research and clinical importance	1	Valić
P-15	Brain lateralization	1	Pecotić
	TOTAL:	23 hours	

• SEMINARS:

Seminar program for the academic year 2025/2026

Seminar	***Subject***	***Hours***
S1	The structure of gray and white matter of the spinal cord (Ch 8)	(2 hours)
S2	The structure of gray and white matter of the brainstem and cerebellum (Ch 9, 10, 11, 13)	(2 hours)
S3	The structure of gray and white matter of the diencephalon (Ch 12)	(2 hours)
S4	Telencephalon (Ch 12, 24)	(2 hours)
S5	Neuroanatomy, summary	(1 hour)
S6	Cell membrane, ion channels, passive and active neuron properties (Ch 5)	(2 hours)
S7	Structure and function of the synapse and the cellular basis of behavior (neuron sequences, pathways, circles, networks, systems) (Ch 6)	(3 hours)
S8	Neurotransmitters, neuropeptides and their receptor (Ch 7)	(3 hours)
S9	Electrophysiology of neurons, summary (Ch 5-7)	(2 hours)
S10	Pain, heat and cold – anterolateral sensory system Touch, pressure, and kinesthesia - the dorsal column system (Ch 14)	(2 hours)
S11	Ear - organ of hearing and balance. Auditory and vestibular system (Ch 16)	(2 hours)
S12	Organization of the retina, primary visual pathway and primary visual cortex (Ch 15)	(2 hours)
S13	Perception of colors, shapes, depth and movement; and the organization of associative visual fields (Ch 25: p519-525)	(1 hour)
S14	Sensory system, summary	(2 hours)
S15	Role of motor cortex in voluntary movements Eye movement and eye gaze direction system (Ch 18, 13:p259-68)	(2 hours)
S16	Spinal motor mechanisms and reflexes (Ch 8)	(1 hour)
S17	Role of the descending pathways from the brainstem in maintaining posture and muscle tone; spinal shock (Ch 8, 9, 16:p329, 18:p364-5, 25:p525-7)	(1 hour)
S18	Motor functions of the cerebellum and the basal ganglia (Ch 19, 20)	(2 hours)
S19	Motor system, summary	(1 hour)
S20	Neuroanatomy and neurophysiology of eloquent brain areas (motor, speech, language) (supplementary materials)	(2 hours)
S21	General brain functions; EEG, evoked potentials	(2 hours)
S22	Stages of wakefulness and alertness; sleep	(2 hours)
S23	Organization and structure functions of the limbic system (Ch 24)	(1 hour)

S24	Neurobiology of emotion and sexuality	(2 hours)
S25	Neurobiology of attention and associative functions of the prefrontal and posterior parietal cortex	(2 hours)
S26	Anatomy and psychology of learning and memory	(2 hours)
S27	Cellular mechanisms of learning and memory	(2 hours)
S28	General brain function, summary	(1 hours)
S29	Clinical seminar	(2 hours)
	TOTAL:	53 hours

The prescribed material must be studied in advance.

The materials are chapters of the textbook by

- Allan Siegel and Hreday N. Sapru: Essential Neuroscience, 4th Edition.

The text for exercise is an Interactive Tutorial by John Huguenard and David A. McCormick: **Electrophysiology of the Neuron,** Windows Version

All absences and minuses have to be compensated through a colloquium at least 2 days before the exam.

Students not taking the exam in the first examination period, to compensate their absences and minuses, have to take a colloquium in a 10 days period after the end of the Basic neuroscience course.

• PRACTICAL LESSONS:

Program of the practical laboratory work for the academic year 2025/2026

Practical	*Hours*	*Title*
Neuroanatomy		
V1	2	Review of the CNS structures
V2	2	Appearance and distribution of gray and white matter of the spinal cord
V3	2	Appearance and distribution of gray and white matter of the brainstem
V4	2	Clinical-anatomic syndromes of the spinal cord
Neuron electrophysiology		
V5	3	Resting potential
V6	2	Action potential
V7	2	Synaptic potential
V8	3	Signalization
Motor and Sensory system		
V9	3	Physiology of sensation
V10	2	Muscle and electromyography
General brain functions		
V11	1	TMS (Transcranial Magnetic Stimulation)
V12	2	EEG and evoked potential
*V13	4	***SleepLab*** Polysomnography
*V14	3	***SleepLab*** Polysomnography report
V15	3	Reflexes and reaction time
*V16	3	Animal neurophysiological research *in vivo*
TOTAL:	39 hours	

Practical lessons marked with a star * (V13, V14 and V16) are organized in multiple groups.

TEXTBOOK AND INSTRUCTIONAL MATERIALS

OBLIGATORY TEXTBOOK AND PRACTICUM FOR PRACTICAL LESSONS

- Siegel, A. and Sapru, H.: ESSENTIAL NEUROSCIENCE, 4th Edition, Wolters Kluwer/ Lippincott Williams & Wilkins
- John Huguenard and David A. McCormick: **Electrophysiology of the Neuron,** Windows Version, A Companion to *Neurobiology* by Gordon Shepard

ADDITIONAL LITERATURE

- Purves et al Neuroscience 5th edition published by Sinauer Associates
- Kandel, E.R., Schwartz, J.H. and Jessel, T.M.: PRINCIPLES OF NEURAL SCIENCE, 4th edition, McGraw-Hill; New York, SAD, 2000.
- Zigmond, MJ et all.: Fundamental Neuroscience, Academic Press; San Diego, SAD, 1999.
- Guyton, A.C. and Hall: MEDICAL PHYSIOLOGY, 11th edition. 2006.

Basic Neuroscience exam, 1st term, will be on March 30th and 31st, 2026.

Department of Neuroscience
School of medicine
University of Split
21 000 Split, Šoltanska 2
phone 021/ 557-858
fax. 021/ 557-955