

MED 1006 – Nervous System

Course Name	Code	Semester	Type of course	Theory (hours)	Group Work (hours)	ECTS
Nervous System	MED 1006	II	Mandatory	28	58	6
Faculty, the educational program and education level	Faculty of Medicine, one-cycle Educational Program “Medicine”					
Author (s)	<p>Rusudan Vadatchkoria - Associated Professor, Doctor of Biology Mob.tel.: (+995) 551262542; e-mail: RusudanVadatchkoria@gmail.com;</p> <p>Mustafa Kemal Demir –invited teacher Mob.tel.: (053) 35531246; e-mail: mustafakemal.demir@bahcesehir.edu.tr</p> <p>Marina Kunchulia – invited teacher Mob.tel.: 593 42 48 49; e-mail: m.kunchulia@agruni.edu.ge;</p> <p>Shorena Tukvadze – invited teacher Mob.tel.: 599 21 71 00; e-mail: shtukvadze@yahoo.com</p> <p>Murat Tsintsadze - invited teacher, mob.tel.: 599 00 64 26; tsintsadze.murat@yahoo.com</p> Consultation day – individually					
Educational course format	Lecture, Group work, laboratory lessons					
Educational course loading	<p>Total: 180 hours Contact hours: 90 h, that includes:</p> <ol style="list-style-type: none"> 1. Lecture – 28 h 2. Group work – 52 h 3. Laboratory lessons – 6 h 4. Midterms – 2 h 5. Final exam -2 h <p>Independent work – 90 h</p>					
Prerequisites	MED 1003 - Cell, Tissue and Organs System					
The purpose (s) of tutorial course/modules	This course aims to provide knowledge about development of the nervous system, micro- and macro-structure and the functions of the nervous system.					

<p>Teaching methods</p>	<p>Lecture - Face-to-Face; direct verbal interactive contact. PowerPoint slides for the lecture will be provided for each lecture as a PDF file, one slide per page, to facilitate notes taking.</p> <p>Demonstration –anatomical atlases, models including plastinated cadavers, illustrations, slides and other visual aids; nervous organs structures visualization;</p> <p>Laboratory work (anatomical, cytological /histological laboratories)- learning of microscopic prepares of nervous organs, microscopic prepares preparation performing the cross-section of fixed cadaver or parts of cadaver; Analyses and synthesis – obtained prepares visualization, comparing, detailed discussion of observed structures, learning and assessment of prepares quality;</p> <p>Work in group - theoretical knowledge will be analysed and supported by working with anatomical models, including plastinated cadavers, illustrations and other vision aids. On the base of the diagnostic/radiology area of clinic the imagines of nervous organs will be learn (EEG, CT, MRI);</p> <p>Discussion – questions and answers, answers analysis supported with visual aids.</p> <p>Abstract preparation and presentation - Students choose material from offered problematic topics or independently, search for appropriate material, will work with the books and present about 10 printed pages in PowerPoint format in auditorium for estimation.</p> <p>Brief-inquire –short questions and answers;</p> <p>Work with anatomical literature: atlases, anatomical manuals and internet information technology sources;</p> <p>Consultation –individual support work with students (weekly)</p>
<p>Assessment criteria</p>	<p>Maximum score- 100:</p> <ol style="list-style-type: none"> 1. Midterm assessment -60 scores, that includes: <ol style="list-style-type: none"> 1.1. Attendance -10 scores (K=0.36); 1.2. Work in group – 30 scores: <ol style="list-style-type: none"> 1.2.1 Group work Activity =10 scores; 1.2.2. Laboratory work -5 scores; 1.2.3.Abstract preparation and presentation – 10 scores; 1.2.4. Discussion – 5 scores; 1.3.Midterm exam – 20 scores. <p>The final scores for group work activity is calculated by the arithmetic average and correspondently to Appendix 1- Scores calculation Program</p> <p>Group Work are Assessed Based on the Following Criteria (maximum 10 scores)</p> <p>10 scores- Student is able to present complete and thorough knowledge of the subject, a substantial amount of detailed and relevant information; to demonstrate considerable depth of understanding of the studied main and additional literature, to bring forward a balanced view of the main arguments on the issues.</p> <p>9 scores - Student is able to bring forward a consistent number of deductions on most of the topics tackled; to make appropriate comments on the different perspectives for the most of issues, to demonstrate knowledge of the main literature within the subject and the ability to apply received knowledge.</p> <p>8 scores - Student is able to bring forward a consistent knowledge, has properly developed terminology; to demonstrate knowledge of the main literature within the subject and the</p>

ability to apply received knowledge.

7 scores - Student is able to present some factual information sufficiently linked with the topic, to demonstrate a good understanding of the topics selected; to make a good attempt to bring forward a balanced view of some arguments on the issues. Terminology is partially developed.

6 scores - Student is able to make some good comments on the different perspectives on some of the issues; makes poor deductions on most of the topics tackled, analyses some causes and results of human interactivity related to the issues.

5 scores - Student is able to demonstrate inconsistent comments on the different perspectives on some of the issues, Student has middle level of knowledge, terminology is developed partially, makes weak conclusions.

4 scores - Student demonstrates general overview of the topics. Information generally are linked with the subject, but terminology is not developed sufficiently, student demonstrates irrelevant understanding of the literature.

3 points - Student demonstrates general/superficial and inconsistent knowledge of the subject, has insufficient knowledge of the literature.

2 scores - Student demonstrates general comments, but has no knowledge of the terminology, no consistency.

1 score - Student demonstrates insufficient answer, does not know terminology, does not follow to chronologic manner of the answer, mostly wrong, no knowledge of literature.

0 score - Student demonstrates not even elementary knowledge of the subject.

Laboratory work assessment criteria (max 5 scores):

5 scores: laboratory method is properly planned; student applies laboratory tools and equipment precisely; Student is able to record data accurately, to determine mistake and knows the way to correct them; Is able to analyze applied method and interpret the results. Laboratory work is performed accurately and thoroughly.

4 scores: laboratory method is properly planned; student applies laboratory tools and equipment precisely; is able to record accurately, determine mistakes and correct them. However, he lacks the skills to analyze results. Laboratory work is performed with minor faults.

3 scores: laboratory method is properly planned; student cannot demonstrate relevant knowledge of laboratory tools and applied equipment; makes minor mistakes in the tools using procedure; makes records, but is not able to notice the mistakes; thus, has some difficulty to correct them. Laboratory work is performed with minor faults.

2 scores: laboratory method is planned with minor faults; student cannot demonstrate relevant knowledge in laboratory tools and equipment application; makes minor mistakes in the tools using; student makes records, but is not able to notice the mistakes; thus, is difficult to find any ways to correct mistakes. Laboratory work is performed with essential faults.

1 scores: Laboratory work is planned with essential faults; student is almost unfamiliar with laboratory tools and equipment application; makes records, but is not able to notice the mistakes; thus, is hard to find ways to correct. Laboratory work is performed with essential faults.

0 score: Student is absolutely unfamiliar with laboratory methods, tools and equipment. The assignment is not performed.

Abstract preparation and presentation's criteria (10 scores max.):

1. Actuality of appointed problem – 1 score;

2. Academic content - 1 score;
3. Literature data's observation in the frame of subject -1scores;
4. Correspondence between the research methods and research purpose -1 scores;
5. Coherence of argumentation- 1 scores;
6. Correctness of conclusion and the connection with the main text - 1 score;
7. The presented matter's visual and technical aspects - 1 score;
8. Debating and listening culture - 1 score;
9. Accuracy and reliability of indicated references and literature sources – 1 scores;
10. Proper language and speaking style – 1scores.

Discussion assessment criteria (10 score- max.)

1. Argumentativeness of represented factual material -2 scores;
2. Complexity of represented factual material -2 scores;
3. Discussion activity – 2 scores;
4. Debating and listening culture - 2 scores;
5. Keeping within the time-limit – 2 scores.

Midterm Exam – 20 scores

Written test - 40 questions, (0,5 score for each) –20 scores total;

Minimal score of midterm assessment (for final exam admission) – is 11.

Final Exam -40

Is held in the written test form (test consists of 80 questions, each question is rated as 0,5 score) total 40 scores.

The final exam would accounted as passed in case of maximum 70% or more (40X70 / 100 = 28 scores).

Credit will be given to the student if he has collected at minimum 51 scores out of 100.

Student's assessment has to be done in the following way:

Positive rate:

- (A) Excellent- 91 or more scores;
- (B) Very Good- 81-90 scores;
- (C) Good- 71-80 scores;
- (D) Satisfactory- 61-70 scores;
- (E) Enough- 51-60 scores; (FX) Failure - 41-50 scores,

Negative rate:

(FX) Failure - 41-50 scores, which means that a student needs to work more and an independent and considerable further work is required to pass the exam once again to be re-awarded;

(F) Fail - 40 scores or less, which means that the student's diligence is not sufficient and student has to learn the subject all over again.

Student can pass the additional exam during the same semester.

The time interval between the final and the additional exams should be not less than 10 days

<p>The basic literature</p>	<p>Anatomy 1.Editor –in-chief Susan Standring, Cray’s Anatomy. The anatomical Basis of Clinical Practice, Churchill Livingstone Elsevier, XIV-th edition, 2014; 2. Keith L.Moore, Arthur F.Dalley. Anne M.R.Agur -Clinically Oriented Anatomy, Wolters Cluwer Health Lippincott Williams&Wilkins, 2008; (nervous system structure) (p.46-57)</p> <p>Physiology 1. Guyton and Hall Textbook of Medical Physiology, Saunders Elsevier, XII-th edition, 2011. 2. Fox, Stuart Ira. Human physiology / Stuart Ira Fox. — 12th edition. 2011; Chapter 7, 8, 6. 3.Robin R.Preston, Thad E.Wilson Edited by: Richard A.Harvey - Physiology Lippincott's Illustrated Rewiews, Wolters Cluwer Health Lippincott Williams&Wilkins, 2013; (physiology of nervous system), Chapter 5, 6, 7, 11.</p> <p>Histology & Cells Biology Abraham L.Keirszenbaum, Laura L.Tres - Histology and Cell Biology, Elsevier Saunders, 2012; Chapter 8;</p> <p>Embriology 1.Keith Moore L; Persaud T.V.N;Mark G Torchia. The Developing Human Clinically Oriented Embryology. Elsevier Saunders. IX ed. 2013;</p> <p>Radiology Learning Radiology: Recognizing the Basics (With Student Consult Online Access), 2e William Herring. Saunders; 2 edition, April 14, 2011</p>
<p>The auxiliary literature</p>	<p>Anatomy 1. Michail Schuenke, Erik Schulte, Udo Schumacher -Atlas of Anatomy (Neck and Internal Organs), Thieme, 2006 2. Richard S. Snell - Clinical Anatomy (An Illustrated review with Questions and explanations, Lippincott Williams&Wilkins, 2003; Chapter 3. Richard L.Drake, A.Wayne Vogl, Adam W.M.Mitchel, Richard Tibbitts, Paul Richardson-Cray's Atlas of Anatomy, Churchill Livingstone Elsevier, 2008</p> <p>Physiology 1.Kim E.Barret, Susan M.Barman Scott Boitano, Heddwen L.Brooks - Ganong's Review of Medical Physiology, McGrawHill Lange, 2012; Section II, Chapter 12-15 2. Stefan Silbernagl, Agamemnon Dispopoulos - Color Atlas of Physiology, Thieme, 2009; Chapter 12, p. 317-340</p> <p>Histology & Cells Biology 1.Leslie P.Gartner James L.Hiatt - Color Atlas of Histology, Lippincott Williams&Wilkins, 2012, Chapter 7. 2. Bruce Alberts, Alexander Johnson, Julian Levis, Martin Raffkeith Roberts Peter Walter - Molecular Biology of the Cell, Garland Science Taylor & Francis Group, 2008</p>

The tutorial/training course content

#/#	Subjects	Lecture (hour)	Labor (h)	Work in group (hour)
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1	General observation of human nervous system structure; Embryologic development of the nervous system; Neurons, nerves, neuroglia structures.	2	1	4
2	Neurotransmission: neurotransmitters, synaptic vesicles, release, receptors, signal termination. Neuroglia and nerves physiologic features. Synaptic plasticity.	2		4
3	The brain anatomical structure and features: brainstem, cerebellum, diencephalon, telencephalon (basal ganglia and cerebral cortex). Cerebrospinal fluid features and function. The brain's meninges anatomy (dura mater, arachnoid mater, pia mater). Ventricles of brain. Sectional anatomy of the forebrain. Cerebral hemispheres and vascular supply.	2	1	4
4	Diencephalon: thalamus and epithalamis, hypothalamus and pituitary gland anatomy and function; Regulation of the autonomic system. Regulation of the pituitary glands. Regulation of circadian rhythms. Visualizing the brain. Electroencephalogram. Sleep. Basal nuclei. Cerebral lateralization.	2	1	4
5	Limbic system, prefrontal cortex. Limbic system and emotion. Memory. Brain regions in memory. Synaptic changes in memory. Neural stem cells in learning and memory. Emotion and memory.	2	1	4
6	Anatomy and physiology of midbrain and hindbrain., Myelencephalon and reticular activation system.	2		4
	Midterm			2
7	The spinal cord structure. Spinal cord's meninges. The layers of the meninges.	2	1	4
8	Anatomy of Cranial (I-VII) and spinal nerves.	2		4
9	Autonomic nervous system: sympathetic and parasympathetic nerves. Visceral effector organs. Sympathetic and parasympathetic divisions of the autonomic nervous system.	4	1	4
10	Functions of the autonomic nervous system. Homeostasis. Adrenergic and cholinergic synaptic transmission. Response to adrenergic stimulation. Responses to cholinergic stimulation. Other autonomic transmitters. Organs with dual innervation. Organs without dual innervation. Control of the autonomic nervous system by higher brain centers.	2		4
11	Sensory physiology. Characteristics of sensory receptors. Categories of sensory receptors. Functional categories. Tonic and phasic receptors. Law of specific nerve energies. Generator (receptor) potential. Reflex arc. Cutaneous sensations. Neural pathways for somesthetic sensations. Receptive fields and sensory acuity. Lateral inhibition.	2		4
12	Neural control of skeletal muscles. Muscle spindle apparatus. Alpha and gamma motoneurons. Coactivation of alpha and gamma motoneurons. Skeletal muscle reflexes.	4		4

	The monosynaptic stretch reflex. Golgi tendon organs. Reciprocal innervation and the crossed-extensor reflex. Upper motor neuron control of skeletal muscles. EEG, CT, MRT imaging. Practical Exam.			
	Final Exam			2

Learning Outcomes

Criteria	Competences
Knowledge and Understanding	<p>Student has the deep and consistent knowledge of the following issues, regarding human nervous system:</p> <ol style="list-style-type: none"> Embryology development of human nervous system; Histology (microscopic structure) of nervous tissue of the spinal cord and brain, motor complex and pyramid system; Anatomy (macrostructure) of the central and peripheral nervous system organs (spinal cord, brain and peripheral nerves), Functional principles of human nervous system; Anatomical and physiological relationship between nervous, vascular, endocrine and other system organs; Principles of human body nervous control.
Applying of knowledge	<p>Student will be able;</p> <ul style="list-style-type: none"> Determine the nervous cells picture of histological prepares; Determine the EEG, CT and MRT images of nervous system's organs structures; Activate the received knowledge and widely apply for other biological and medical subjects. Apply the theoretical knowledge of nervous system for the nervous disorders diagnostics
Judgment Ability	<p>Student is able to collect and interpret properly the incomplete and abstract data of the human nervous system anatomy, embryology, histology and physiology, with the following drawing of the valid conclusions. Student has critical approach and is able solving problem independently.</p> <p>Student will have the completed imagination about human organism as a complex system, where each components are in the logical structural and functional interaction with each together.</p> <p>On the base of the theoretical and practical knowledge the scientific thinking and logical reasoning skills will be developed to allow the student working out the appropriate strategy in the concrete academic situation</p>
Communication Skills	<p>Student will be able to:</p> <ul style="list-style-type: none"> manage the different form of academic and scientific information from different sources (classic and electronic library, the Internet) to work fast and look for the relevant information effectively. These found materials will be planned, processed, analyzed, and to make the best use for the

report with the proper conclusions as in in writing, as well as in verbal form.

- work in group, watching, listening, summarizing, asking and answering questions abilities, is able to participate in the discussion.

During the education process the professional and friendly relationship will be formed with the older (professors / teachers) and younger (this and other groups students) colleagues, communication with any person regardless of their social, cultural, religious or ethnic affiliation.