

MED 1005 - MUSCULOSKELETAL SYSTEM

Course Name	Code	Semester	Type of course	Theory (hours)	Work in group (hours)	ECTS
Musculoskeletal system	MED 1005	I	Mandatory	28	58	6
Faculty, the educational program and education level	Faculty of Medicine, one-cycle Educational Program “Medicine”					
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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	None					
The purpose (s) of tutorial course/modules	The aim of this course is to teach human musculoskeletal/locomotive system, to give the detail information, anatomic structure, features and functions of the bones, muscles, joints of the human. Introduction in macro- and microscopic anatomy, radiologic anatomy. The main principles and methods of anatomical laboratory activity.					
Teaching and learning methods	<p>Lecture - Face-to-Face; direct verbal interactive contact.</p> <p>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; Musculoskeletal organs structures visualization;</p> <p>Laboratory work (anatomical, cytological /histological laboratories)- learning of microscopic prepares of Musculoskeletal 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 Musculoskeletal organs will be learn (X-rays, USI, CT);</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 style="text-align: center;">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 ability to apply received knowledge.</p> <p>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.</p>

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 poor deductions.

4 scores - Student demonstrates general overview of the topics. Terminology is not developed. Information sufficiently linked with the topic, demonstrates irrelevant understanding of the literature.

3 points – Student demonstrates general/superficial and inconsistent knowledge of the subject. No sufficient knowledge of the literature.

2 scores - Student demonstrates general comments, 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 5scores):

5 scores: laboratory method is properly planned; student applies laboratory tools and equipment precisely; Student is able to record 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 difficult 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;

	<p>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 – 1 scores.</p> <p>Discussion assessment criteria (10 score- max.)</p> <p>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.</p> <p>Midterm Exam – 20 scores</p> <p>Written test - 40 questions, (0,5 score for each) –20 scores total; Minimal score of midterm assessment (for final exam admission) – is 11.</p> <p>Final Exam -40</p> <p>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:</p> <p>Positive rate:</p> <p>(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,</p> <p>Negative rate:</p> <p>(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>
<p>The basic literature</p>	<p>Anatomy</p> <p>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; (bones, joints and muscles forms, classification, structure); 3. Richard L.Drake, A.Wayne Vogl, Adam W.M.Mitchel, Richard Tibbitts, Paul Richardson-Cray's of Anatomy, Churchill Livingstone Elsevier, III, 2009;</p>

	<p>Physiology 1. Guyton and Hall Textbook of Medical Physiology, Saunders Elsevier, XII-th edition, 2011.</p> <p>Histology & Cells Biology Abraham L.Keirszenbaum, Laura L.Tres - Histology and Cell Biology, Elsevier Saunders, 2012; Chapter 4, 5, 7. (connective tissue (bones, ligaments and muscles) microscopic structures, bone and muscle's genesis)</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>
The auxiliary literature	<p>Anatomy (bones, joints and muscles forms, classification, structure) 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 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 (bones, joints and muscles features and functions) 1.Kim E.Barret, Susan M.Barman Scott Boitano, Heddwen L.Brooks - Ganong's Review of Medical Physiology, McGrawHill Lange, 2012; Section I 2. Stefan Silbernagl, Agamemnon Dispopoulos - Color Atlas of Physiology, Thieme, 2009; 3. Robin R.Preston, Thad E.Wilson Edited by: Richard A.Harvey - Physiology Lippincott's Illustrated Rewiews, Wolters Cluwer Health Lippincott Williams&Wilkins, 2013; (bones, joints and muscles features and functions);</p> <p>Histology & Cells Biology (connective tissue (bones, ligaments and muscles) microscopic structures, bone and muscle's genesis) 1.Leslie P.Gartner James L.Hiatt - Color Atlas of Histology, Lippincott Williams&Wilkins, 2012, Chapter 3, 4, 6 2. Bruce Alberts, Alexander Johnson, Julian Levis, Martin Raff keith 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)
1	Introduction to Human Anatomy. Approaches to studying anatomy: regional, systemic, clinical anatomy. Anatomicomedical terminology. Anatomical planes, directions and movements. (p.1-12). Classical and current instrumental methods of human anatomy and physiology study. Cadaver fixation and preparation methods.	2	2	4

2	<p>General Information about human locomotive apparatus: muscular, skeletal systems and joints' types.</p> <p>General information about bones: forms and structures, features. Connective (bone and cartilage) tissue. Macroscopic and microscopic laboratory approaches, methods, prepares. Introduction to Radiology and Radiologic Anatomy.</p>	2	2	4
3	<p>Bones of Upper Limb: Clavicle, Scapula, Humerus, Bones of Forearms: radius, ulna, Bones of Hand (carpal, metacarpal bones and phalanges) (p.673-679)</p>	2		4
4	<p>Bones of Lower Limb: Coccyx: Ilium, Ischium, Pubis; Pelvis; Femur, Tibia and Fibula. Bones of Foot.(512-525). Pelvic Girdle: Hip bone (ilium, ischium, pubis) and Sacrum (328-338). Images of Upper and Lower limbs bones (X-Ray, CT, MRI)</p>	2		4
5	<p>Vertebral Column. Structure, forms and function of vertebrae. (440-460)</p> <p>Skeleton of Thoracic wall: ribs, thoracic vertebrae, sternum. (72-79)</p> <p>Images of vertebral column, sacral bone, coccyx, sternum and ribs</p>	2		4
6	<p>Cranial Structure and General Overview of Cranial bones: occipital bone, parietal bone, frontal bone, temporal bone maxilla, mandible, zygomatic bone, lacrimal bone, nasal bone, inferior nasal concha, sphenoid bone, palatine bone, vomer, ethmoid bone, hyoid bone (822-836).Skull and Face as a Whole: General Review Images of the Skull Bones</p>	2		4
	Midterm			2
7	<p>Human skeleton bones' joints: types of joints and their classification. Articulations' structure, variety and biomechanical properties. Articulations' additional apparatus: synovia, cartilaginous discus, meniscus, tendons and ligaments. Cranium, trunk and extremities bones joints (observation).</p> <p>Joints of Upper Limb: shoulder joint, elbow(cubital) joint, radioulnar articulation (distal+proximal), wrist joints, finger joints (793- 812) Upper Extremity Joints Arthrography.</p> <p>Joints of Lower limb: hip joint, knee joint, tibiofibular joint, ankle joint, foot joint.9626-656). Joint and ligaments of pelvic girdle.(330-334)</p> <p>Lower Extremity Joints, Arthrography.</p>	4		4
8	<p>Joints of Vertebral Column, Costovertebral Joint, Sternocostal Joint, Sternoclavicular Joint, Acromioclavicular Joint, Thorax antoaxial joint, the Intervertebral Joint (464-470)</p>	2		4
9	<p>Human body muscles structure, types, variety and their classifications in according to their forms. Skeletal muscular tissue. Muscles and fasciae. Muscles formation and activity. Muscles classification in according to their locations. Muscles and fasciae of head (masseter and facial muscles), neck, trunk (back, thorax and abdomen) and extremities (observation). Superficial and deep muscles. Neurophysiological mechanism of skeletal muscle junction, excitation, contraction. Conditioned reflex</p>	4	2	4

	(scheme and examples). Myography			
10	Muscles of thoracic wall (86). Muscles of abdominal wall and inguinal canal (186). Muscles of back: Spinohumeral muscles, spinocostal muscles. Deep muscles of the back, lateral and medial group (482-492).	2		4
11	Deep muscles of the neck (Art. atlantooccipitalis) Superficial muscles of the neck (Art. atlantoaxialis mediana and lateralis) Muscles of the Upper limb (731, 773) Anterior compartment of the arm (flexor muscles) Posterior compartment of the arm (extensor muscles) Muscles of the Lower limb (563, 610) Facial Muscles: The Mimic and Mastications Muscles, Parotid Region, Infratemporal and Pterygopalatine fossa	2		4
12	Images of the Upper and Lower Extremity Muscles Images of the Face Muscles Magnetic Resonance (MR) Imaging Single Photon Emission Computed Tomography (SPECT) Images of the Neck Muscles (Larynx) Practical exam.	2		4
	Final Exam			2

Learning Outcomes

Criteria	Competences
Knowledge and Understanding	<p>Student has the deep and consistent knowledge of the following issues, regarding the human body:</p> <ol style="list-style-type: none"> skeletal system: bones forms, structures and features and anatomical location (osteology); joints forms, structures and features and anatomical location (syndesmology, arthrology); muscular system: muscles forms, structures and features and anatomical location (myology); musculoskeletal system's connective tissue structure and features (cytology, histology and embryology) neurophysiological basis of muscular functioning; the basis of radiology anatomy.
Applying knowledge	<ol style="list-style-type: none"> Student will be able to: Mastering and applying in practice macro- and microscopic prepares preparation methods and technics. Provide independent research on the base of anatomical and histological laboratory using the modern methods and approaches. Strengthen the theoretical knowledge about human musculoskeletal system using the anatomical atlases, models, illustrations and other visual aids;

	<p>d) Strengthening of the human musculoskeletal system theoretical knowledge on the basis of trainings in radiological department of hospital. (X-Ray, CT, MRI) Musculoskeletal anatomy and physiology mastering on the base of radiological diagnostic department is the groundwork of correct diagnosing;</p> <p>e) The received knowledge has to be activated and widely applied for other biological and medical disciplines</p> <p>f) Apply the musculoskeletal system knowledge as the base of radiologic diagnostics.</p>
Judgment Ability	<p>Student is able to collect and interpret properly the incomplete and abstract data of the human basic tissues and musculoskeletal system anatomy, embryology, histology and physiology, with the following drawing of the valid conclusions.</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 an clinical 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. <p>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.</p>