

**MED 3015 - Biophysics**

Course Name	Code	Semester	Type of course	Theory (hours)	Group work (hours)	ECTS
Biophysics	MED 3015	V	Elective	12	14	2
Faculty, the educational program and education level	Faculty of Medicine, one-cycle Educational Program "Medicine"					
Author (s)	<b>Nugzar Gomidze</b> – invited teacher Mob.tel.: 577 17 97 27; e-mail: gomidze@yahoo.com Consultation day: individually					
Educational course format	Lecture Group work					
Educational course Loading	<b>Total:</b> 60 hours <b>Contact hours:</b> 30 h, among them <ol style="list-style-type: none"> <li>1. Lecture – 12h</li> <li>2. Team work – 14h</li> <li>3. Midterms – 2 h</li> <li>4. Final exam -2 h</li> </ol> <b>Independent work</b> –30 h					
Prerequisites	None					
The purpose (s) of tutorial course/modules	The course introduces general principles of biophysics, as well as some ways of application of the relevant methods in medicine. The students will learn some physical and biophysical phenomena and respective laws that are widely applied in the existing devices for diagnostics. The students will better understand the mechanisms driving the processes in human body. The course will develop in students the skills of critical analysis and will acquaint them with methods of scientific research of the living systems.					
Teaching and learning methods	<b>Lecture - Face-to-Face</b> - Lecture notes and readings <b>Demonstration</b> - illustrations, slides and other visual aids; <b>Discussion</b> – questions and answers, answers analysis supported with visual aids; <b>Analyses and synthesis</b> of different medical cases; <b>Practical work</b> on the clinic base : <b>Brief-inquire</b> -short questions and answers. <b>Work with additional literature</b> –independent work with additional literature to deep knowledge about new achievement in this field of area.					

<b>Assessment criteria</b>	<p><b>Maximum score- 100:</b></p> <ol style="list-style-type: none"> <li>1. <b>Midterm assessment -60 scores</b>, that includes: <ul style="list-style-type: none"> <li>• Attendance on each lecture - 1 score (1X10 = 10 scores)</li> <li>• Activity in group work – <b>10 score:</b></li> <li>• Discussion – 10 scores;</li> <li>• Abstract preparation – 10 scores</li> <li>• <b>Midterm Exam –20 scores</b></li> </ul> </li> </ol> <p><b>Group Work are Assessed Based on the Following Criteria</b> (maximum 10 point)</p> <p><b>10 points</b> - Student has been able to present complete and thorough knowledge of the subject, a substantial amount of detailed and relevant information. Demonstrate considerable depth of understanding of the studied main and additional literature. Bring forward a balanced view of the main arguments on the issues.</p> <p><b>9 points</b> - Student has been able to bring forward a consistent number of deductions on most of the topics tackled. make very good comments on the different perspectives on most of the issues. Demonstrates knowledge of the main readers.</p> <p><b>8 points</b> - Student has been able to bring forward a consistent knowledge, Has properly developed terminology. Demonstrates knowledge of the main readers.</p> <p><b>7 points</b> - Student has been able to present some factual information sufficiently linked with the topic. demonstrate a good understanding of the topics selected. make a good attempt to bring forward a balanced view of some arguments on the issues. Terminology is partially developed.</p> <p><b>6 points</b> - Student has been able to make some good comments on the different perspectives on some of the issues. Make poor deductions on most of the topics tackled. analyse some causes and results of human interactivity related to the issues.</p> <p><b>5 points</b> - Student has been able to demonstrate inconsistent comments on the different perspectives on some of the issues. Terminology is partially developed. Present mediocre level of knowledge. Make poor deductions.</p> <p><b>4 points</b> - Student demonstrates general overview of the topics. Terminology is not developed. Information sufficiently linked with the topic. Demonstrate irrelevant understanding of the literature.</p> <p><b>3 points</b> – Student demonstrates general/superficial and inconsistent knowledge of the subject. No sufficient knowledge of the literature.</p> <p><b>2 points</b> - Student demonstrates general comments, no knowledge of the terminology, no consistency.</p> <p><b>1 point</b> – Student demonstrates insufficient answer, not terminology awareness, chronologic manner of the answer, mostly wrong, no knowledge of literature.</p> <p><b>0 point:</b> Student demonstrates not even elementary knowledge of the topics</p> <p><b>Discussion assessment criteria (10 score- max.)</b></p> <ol style="list-style-type: none"> <li>1. Critical thinking-2 scores;</li> <li>2. Debating culture -2 scores;</li> <li>3. Argumentativeness ability – 2 scores;</li> <li>4. Time management - 2 scores;</li> <li>5. Academic and visual side of presented material – 2 scores.</li> </ol> <p><b>Abstract preparation criteria (10 scores - max.):</b></p> <ol style="list-style-type: none"> <li>1. Actuality of appointed problem – 2 scores;</li> </ol>
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	<p>2. Research review of the appointed problem - 2 score;</p> <p>3. Correctness of conclusion and the connection with the main text - 2 score;</p> <p>4. Culture of writing – 2 scores;</p> <p>5. Written materials visual and technical side – 1 score;</p> <p>6. Accuracy and reliability of indicated references and literature sources – 1 scores;</p> <p><b>Midterm exam</b> is a test (multiple choice) that contains 40 questions, each rated 0.5 score; total 20 score as max.</p> <p>The student is allowed to pass the final exam, if he accumulates not less than 11 scores for the mid-term evaluations (considering that he will get the maximum score at the final exam ).</p> <p><b>Final exam - 40 scores</b></p> <p>Final exam is a combination of tests -40 scores (the test includes 80 closed questions, each one rates 0.5 scores).</p> <p>The final exam is considered to be passed if the student accumulates at least <b>70% or more</b> out of the maximum assessment of the exam (40X70/100=28 scores).</p> <p>Credit will be awarded if the student accumulates at least 51 scores out of 100 scores;</p> <p>The students' assessment has to be done in the following way:</p> <p><b>Positive rate:</b></p> <p>(A) Excellent- 91 or more points;</p> <p>(B) Very Good- 81-90 points;</p> <p>(C) Good- 71-80 points;</p> <p>(D) Satisfactory- 61-70 point;</p> <p>(E) Enough- 51-60 points;</p> <p><b>Negative rate:</b></p> <p>(FX) Failure - 41-50 points, 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;</p> <p>(F) Fail - 40 points or less, which means that the student's diligence is not sufficient and student has to learn the subject all over again.</p> <p>The student can pass the additional exam during the same semester. The time interval between the final and additional exams should be not less than 10 days.</p>
<p><b>The basic literature</b></p>	<p>1. Meyer B.Jackson. <b>Molecular and Cellular Biophysics</b>. Cambridge University Press. 2006</p>
<p><b>The auxiliary literature</b></p>	<p>2. R. Glaser. Biophysics; Springer-Verlag Berlin Heidelberg, New York. 2001</p> <p>3. Paul Davidovits Phisics in Biology and Medicine.</p>

**The tutorial/training course content**

№	Subjects	Lecture (hour)	Work in group (hour)
1	Nature and subject of biophysics; Molecular structure of biological systems: Intramolecular bonds ; Molecular excitation and energy transfer	1	1
2	Thermal molecular movement; Order and probability; Entropy and information; Biological structures: General aspects; Distribution of molecular energy and velocity at equilibrium	1	1
3	Energy of activation; Theory of absolute reaction rate; The water structure, Effects of hydration	1	1
4	Intermolecular interactions; Interfacial phenomena and membranes	1	1
5	Mechanical properties of biological membranes; The Electrostatic structure of the membrane	1	1
6	Fundamental concepts of thermodynamics); The aqueous and ionic equilibrium of the living cell	1	1
	<b>Midterm Exam</b>		2
7	Electrochemical equilibrium – the Nernst equation; the Donnan equilibrium; The Diffusion potential; Ion transport in biological membranes	1	2
8	The cell as accumulator of electrochemical energy; The action potential; Electric fields in cells and organism	1	1
9	Single cells in external electric fields ; Mechanical properties of biological materials	1	1
10	The biomechanics of the human body; Biomechanics of blood circulation.	1	1
11	The biophysics of hearing; Biophysics of sonar systems; the effects of ultrasound and infrasound; Static and electromagnetic fields.	1	1
12	Electromagnetic fields in the human environment and their biological effects; Ionizing radiation and dosimetry. Radiation chemistry, radiobiological reactions and radiation protection	1	2
	<b>Final Exam</b>		2

## Learning Outcomes

Criteria	Competences
<b>Knowledge and Understanding</b>	The students will acquire the necessary knowledge and skills allowing them to describe the vital processes in the living objects; they will be able to understand further application of research methods in medicine and will have enough skills to use their knowledge in practice.
<b>Applying knowledge</b>	The students will further develop the following skills: skills in abstract thinking, analysis and synthesis; skills in independent search, receiving, treating and analyzing information; skills in permanent learning and improving knowledge; skills in verbal and written communication; skills in participation in discussions with the use of the field terminology; skills in logical sequencing of the materials prepared for seminars and proper delivery to the audience; skills in using arguments and in critical assessment; skills in understanding the interrelationship between different elements in the system.