

Code: MFSE1201	Course title: CLINICAL BIOCHEMISTRY		
Level: clinical	Study year: VI	Semester: XII	ECTS: 2
Status: obligatory	Total contact hours: 30		
Prerequisites:	According to the study regulation		
Lecturers: Professors and associates involved in the implementation of the course in accordance with the plan of the teaching process			
1. Overall aims	The overall aim of the Clinical Biochemistry Course is to increase knowledge on biochemical analysis selection and interpretation in various clinical conditions.		
2. Course contents	<p>The following topics will be covered within the Modules:</p> <p>Module 1. Analytical techniques, instruments and process of automatization Objective: to introduce students to analytical techniques, instruments and automation in a modern biochemistry laboratory.</p> <p>Module 2. Laboratory diagnostics in emergencies Objective: to introduce students to categories of urgent laboratory tests.</p> <p>Module 3. Laboratory panel in various diseases Objective: to familiarize students with analytical assemblies in the diagnosis of diseases of the cardiovascular, bone and hepatobiliary system.</p> <p>Module 4. Biochemical analysis in tumor diagnostics Objective: to introduce students to the basics of tumor diagnostics - the specificity and sensitivity of tumor markers.</p> <p>Module 5. Oligoelements in hematological diseases Objective: to familiarize students with the role and significance of changes in the metabolism of iron and copper in the diagnosis of hematological diseases.</p> <p>Module 6. Physical examination and chemical analysis of urine Objective: to introduce students to routine urinalysis, with emphasis on physical properties and biochemical composition of urine, and specificities of changes in individual clinical states.</p>		
3. Learning outcomes (Knowledge, skills and competences)	<p>Students will acquire knowledge necessary for understanding principles of laboratory diagnostic methods in clinical biochemistry.</p> <p><i>Through the lectures the students will gain following knowledge and competences:</i></p> <ol style="list-style-type: none">1. Learn how to choose and interpret different biochemical analyses of various clinical conditions including heart and skeletal muscle, liver, bones, and hematological diseases.2. Discover importance of analytical and pre-analytical factors that influence laboratory values.3. Increase knowledge about reference values of biochemical parameters and influencing factors.4. Adopt the principles that different biochemical techniques may yield		

	<p>nonspecific or inconclusive results. Adopt the principles of biochemical analysis profiles for detailed organ system investigations</p> <p><i>Through the practical laboratory work students will acquire following skills:</i></p> <ul style="list-style-type: none">- To select, perform and interpret laboratory tests for liver function assessment- To select, perform and interpret laboratory tests for myocardial infarction assessment- To select, perform and interpret laboratory tests for bone remodeling assessment- To select, perform and interpret laboratory tests in various hematological conditions- To select, perform and interpret laboratory tests for renal function assessment- To perform complete analysis of urine- To recognize the influence of various physiological and seasonal variations on the results of different biochemical tests																								
4. Teaching methods	<p>Lectures: 10 hours</p> <p>Practical work: 20 hours</p>																								
5. Method of knowledge assessment and examination	<p>Continuous assessment of the knowledge and skills (Midterm examination) will be carried out through Partial exam and Practical exam.</p> <p>Examination:</p> <ul style="list-style-type: none">– Practical exam (colloquium) consisted of multiple choice questions (MCQ)– Partial exam consisted of multiple choice questions (MCQ) <p>Practical examination</p> <p>Practical exam takes up to 60% of maximum points. Assessment of practical knowledge and skills will be carried out through practical exam consisted of 30 MCQ. It is necessary to answer 16 questions correctly in order to pass the test. Each question receives 2 points. Maximum score is 60 points and minimum score is 32.</p> <p>Partial (Theoretical) examination</p> <p>Partial exam takes up to 40% of maximum points. Assessment of theoretical knowledge and skills will be carried out through partial exam consisted of 20 MCQ. It is necessary to answer 11 questions correctly in order to pass the test.</p> <table><tr><th>Correct answers (number)</th><th>Correct answers (%)</th><th>Points</th></tr><tr><td>20</td><td>100</td><td>40</td></tr><tr><td>19</td><td>95</td><td>38</td></tr><tr><td>18</td><td>90</td><td>36</td></tr><tr><td>17</td><td>85</td><td>34</td></tr><tr><td>16</td><td>80</td><td>32</td></tr><tr><td>15</td><td>75</td><td>30</td></tr><tr><td>14</td><td>70</td><td>28</td></tr></table>	Correct answers (number)	Correct answers (%)	Points	20	100	40	19	95	38	18	90	36	17	85	34	16	80	32	15	75	30	14	70	28
Correct answers (number)	Correct answers (%)	Points																							
20	100	40																							
19	95	38																							
18	90	36																							
17	85	34																							
16	80	32																							
15	75	30																							
14	70	28																							

	<table><tr><td>13</td><td>65</td><td>26</td></tr><tr><td>12</td><td>60</td><td>24</td></tr><tr><td>11</td><td>55</td><td>23</td></tr></table>	13	65	26	12	60	24	11	55	23												
13	65	26																				
12	60	24																				
11	55	23																				
	<p>Student is not obliged to take the Regular exam if minimum points are attained during Midterm exam for both practical and theoretical parts.</p> <p>Regular examination term (Final exam) Student is obliged to take regular exam if minimum points are not attained during Midterm exams for both practical and theoretical parts of the course. Regular exam should be taken also if a student is not satisfied with the grade received on the Midterm examination. Practical exam will be taken before theoretical exam as obligatory condition for theoretical exam. Student will take the practical exam in the same form as during Midterm examination, i.e. test with 30 MCQ. Student will take the theoretical exam in the same form as during Midterm examination, i.e. test with 20 MCQ. The grading system of is the same as during Midterm examination. Passed Practical exam during Regular examination term is valid until the end of the ongoing academic year.</p> <p>Re-sit examination term / September examination term Previously defined criteria will be applied also in Re-sit and September examination terms.</p> <p>Grading system and grading points Final grade is reported according to points attained during both forms of the knowledge assessment (practical and theoretical exams).</p> <table><tr><th>Grade</th><th>Total score (points)</th><th>Grade description</th></tr><tr><td>10 (A)</td><td>95-100</td><td>Outstanding results without errors or with minor errors</td></tr><tr><td>9 (B)</td><td>85-94</td><td>Above average, with some mistakes</td></tr><tr><td>8 (C)</td><td>75-84</td><td>Average, with noticeable mistakes</td></tr><tr><td>7 (D)</td><td>65-74</td><td>Generally good, but with significant mistakes</td></tr><tr><td>6 (E)</td><td>55-64</td><td>Meets the minimum criteria</td></tr><tr><td>5 (F, FX)</td><td><55</td><td>Does not meet the minimum criteria</td></tr></table>	Grade	Total score (points)	Grade description	10 (A)	95-100	Outstanding results without errors or with minor errors	9 (B)	85-94	Above average, with some mistakes	8 (C)	75-84	Average, with noticeable mistakes	7 (D)	65-74	Generally good, but with significant mistakes	6 (E)	55-64	Meets the minimum criteria	5 (F, FX)	<55	Does not meet the minimum criteria
Grade	Total score (points)	Grade description																				
10 (A)	95-100	Outstanding results without errors or with minor errors																				
9 (B)	85-94	Above average, with some mistakes																				
8 (C)	75-84	Average, with noticeable mistakes																				
7 (D)	65-74	Generally good, but with significant mistakes																				
6 (E)	55-64	Meets the minimum criteria																				
5 (F, FX)	<55	Does not meet the minimum criteria																				
6. Literature	<p>Required:</p> <p>1. Teaching materials written by Medical Biochemistry personnel.</p> <p>Recomended:</p> <p>1. Gaw A, Cowan RA, Murphy MJ, O'Reilly DSJ, Srivastava R. Clinical Biochemistry. Churchil Livingstone; 2013.</p>																					
7. Notice	<p>Lectures and practices are performed according to implementation plan at the Departement of Biochemistry and Physiology. All parts of course program is obligatory. Fixing absences from classes should be in accordance with legal regulations.</p> <p>Consultations for the students - every day from 13-14 h.</p> <p>e-mail address of responsible teacher: emina.kiseljakovic@mf.unsa.ba</p>																					

COURSE PLAN: CLINICAL BIOCHEMISTRY

Week 1.	Teaching method and topics	Hours
Monday	<p>Lecture: General principles of screening; screening for general health status; pre-operative examination; compounds specific for certain organ systems</p> <p>Practical work: Laboratory techniques and their procedures, specificities of certain biological specimens (serum, plasma, urine, cerebrospinal liquor, feces, fluids from different body cavities). Laboratory diagnostics in emergency conditions.</p>	<p>3</p> <p>4</p>
Tuesday	<p>Lecture: Rules for work in medical-biochemistry laboratory: pre-analytical, analytical and post-analytical factors, specimens to be analyzed, measures and units of measures, analytical techniques, instruments and processes of automatization, quality assurance, methods for determination of compounds in biological specimen, reference range</p> <p>Practical work: Hematological laboratory diagnostics – analyzers in hematology (work on analyzers and results interpretation). Processes of coagulation and hemostasis. Hematological status (in physiological and pathological conditions).</p>	<p>2</p> <p>4</p>
Wednesday	<p>Lecture: Standardization in laboratory diagnostics. Laboratory diagnostics in emergency conditions.</p> <p>Practical work: Analytical sets for assessment of myocardial and skeletal musculature function; biochemical diagnostics in bone disorders. Basic laboratory tests for assessment of liver function. Determination of enzyme activity and protein concentration in serum for assessment of cardiomyocyte integrity (CK, troponin, myoglobin, FABP). Determination of enzyme activity for bone tissue: alkaline and acid phosphatase; bone tissues hormones.</p>	<p>2</p> <p>4</p>
Thursday	<p>Lecture: Biochemical principles in tumor diagnostics: tumor markers, analytical procedures for determination of tumor markers. Metabolic syndrome. Laboratory test outside laboratory – point-of-care testing.</p> <p>Practical work: Oligoelements and their importance in hematopoiesis, physiological and pathological conditions: determination of copper in serum by spectrophotometry. Determination of iron and total iron binding capacity (TIBC) in serum by spectrophotometry. Calculation of unsaturated iron binding capacity (UIBC).</p>	<p>3</p> <p>4</p>
Friday	<p>Practical work: Standard methods in urinalysis (practical work with specimen, interpretation of results, examples from laboratory practice)</p> <p>Midterm examination term</p>	<p>2</p> <p>2</p>
1 week after completion of class	Regular examination term	
2 weeks after regular examination term	Re-sit examination term	