

<b>CLINICAL COURSE VI: CLINICAL BIOCHEMISTRY II</b>	
<b>GENERAL INFORMATIONS</b>	
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Assistant/Associate	Doc.dr.sc. Vatroslav Šerić, MMedBiochem, PhD Marija Milić, MMedBiochem, PhD Jelena Omazić, MMedBiochem Tihana Pavošević, MMedBiochem
Study Programme	Undergraduate University Study of Medical Laboratory Diagnostics
Status of the course	mandatory
Year of study, semester	3 <sup>rd</sup> year, 6 <sup>th</sup> semester
ECTS	<b>6</b>
Workload (hours)	Lectures:10 ; Seminars:10; Clinical laboratory exercises:60
Expected number of students	30-35
<b>COURSE DESCRIPTION</b>	
<b>Course objectives</b>	
<p>The Clinical Biochemistry 2 course is one of a series of courses in which the material of medical biochemistry is taught. Medical/clinical biochemistry has advanced significantly in a relatively short time and developed into a special professional and scientific discipline. The role of the medical-biochemical laboratory in the healthcare system is to provide biochemical information as part of the overall process of diagnosing the disease (patient treatment). The information must be accurate, precise, appropriate and issued on time. The aim of this course is to prepare students to provide such biochemical information.</p>	
<b>Enrolment requirements and entry competencies</b>	
Passed all exams of previous years of study	
<b>Learning outcomes at the Programme level</b>	
<b>1.2, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.1, 3.2</b>	
<b>Learning outcomes at the course level</b>	
<p>After completing lectures, seminars and exercises, independent study and passing the exam, students will be able to:</p> <ol style="list-style-type: none"> <li>1. choose and implement appropriate laboratory tests for testing endocrine gland diseases, autoimmune diseases, metabolic diseases, gastrointestinal tract disorders, pancreatic disorders, vitamin deficiency testing.</li> <li>2. interpret the obtained findings with regard to the etiology of the disease and the technical aspects of the laboratory test.</li> <li>3. recommend additional laboratory tests to the clinician in order to achieve a timely and accurate diagnosis.</li> <li>4. evaluate the clinical value of laboratory parameters in special physiological conditions (pregnancy, pediatric and geriatric patients).</li> <li>5. determine, in case of doubt about the inaccuracy of the findings, whether it is a pre-analytical, analytical and post-analytical error.</li> </ol>	
<b>Course content</b>	
<p><b>Lectures:</b> Principles of hormone regulation, Hormone receptors, Biosynthesis and degradation of hormones, Division of hormones, Disorders of hormone secretion, Steroid hormones, Hormones of the adrenal cortex-corticosteroids (biosynthesis, metabolism, secretion regulation, secretion disorders, laboratory findings, determination methods), Catecholamines (biosynthesis, metabolism, clinical significance, methods of determination of catecholamines and metabolites), Male sex hormones-</p>	

androgens: biosynthesis, metabolism, secretion regulation, clinical significance, determination methods. Progesterone: biosynthesis, metabolism, regulation of secretion, clinical significance of tests. Female sex hormones – estrogens: biosynthesis, metabolism, regulation of secretion, clinical meaning, methods of determination. Protein and polypeptide hormones. Growth hormone. Insulin-like growth factors. Corticotropin. Thyrotropin. Gonadotropins. Prolactin. ADH and oxytocin. Insulin. Parathormone. Thyroid hormones. Biosynthesis, metabolism and physiological action of thyroid hormones. Hypothyroidism. Hyperthyroidism.

Role in the body, synthesis, sources of vitamins, consequences of deficiency or excess, division. Fat-soluble vitamins - A, D, E, K (chemical structure, synthesis, absorption, function, hypovitaminosis, hypervitaminosis, methods of determination). Water-soluble vitamins - B1, B2, B6, B12, B9, B3, B5, H, C (chemical structure, synthesis, absorption, function, hypovitaminosis, hypervitaminosis).

Diseases of the stomach and intestines. Structure of the stomach, secretion and composition of gastric juice. Gastrin. Structure and function of the intestine. Tests for testing bowel function (secretinin, cholecystokinin, VIP, GIP, chromogranin A, TGA, EMA, AGA, ARA). Pancreatic function: Exocrine and endocrine function of the pancreas, Pancreatic juice (composition, secretion stimulators). Lab. tests for pancreatic diseases. Lab. diagnosis and monitoring of diabetes. Examining the exocrine function of the pancreas: invasive and non-invasive tests. Examination of the chair. Bone diseases: Function of the bone system. Markers of bone formation. Markers of bone breakdown. Metabolic bone diseases.

Hereditary metabolic disorders: recognition and organization of laboratory diagnostics. Lab. tests in metabolic crisis. Special metabolic tests. Biological material for conducting confirmation tests. Pathophysiological division of hereditary metabolic diseases.

#### **Seminars:**

Laboratory tests during pregnancy: Physiological changes during pregnancy. Reference values of various parameters in pregnancy by trimester. Searches to determine and monitor pregnancy. Laboratory tests in the diagnosis of diseases specific to pregnancy: gestational diabetes, preeclampsia and eclampsia, anemia. Thrombophilia and pregnancy. Investigations to determine thrombophilia.

Specificities of laboratory diagnostics in pediatrics; pre-analytical requirements, reference values, examples of findings.

Specificities of laboratory diagnostics in the geriatric population: reference values, physiological changes associated with aging, signs of aging.

Free radicals and antioxidants: Properties of oxygen and reactive oxygen species. Antioxidant defense of the organism: cytoprotective enzymes and antioxidants. Oxidative stress and its significance in pathological conditions. Autoimmune diseases: Pathophysiological mechanism of autoimmune diseases. Division of autoimmune diseases. Frequency of autoimmune diseases. Clinical symptoms of Lupus erythematoses, rheumatic arthritis, systemic sclerosis, primary biliary cirrhosis, Sjogren's syndrome. Overlap syndromes. Criteria for diagnosing autoimmune diseases.

#### **Exercises:**

Determination of steroid hormones. Determination of protein hormones. Measurement of catecholamines. Methods of determination of thyroid hormones. Other tests to test thyroid function.

Methods of determination of vitamins. Determination of fecal calprotectin. Amniotic fluid analysis. Ejaculate analysis. Non-invasive prenatal tests. Laboratory tests for the diagnosis of metabolic disorders. Laboratory diagnostics of bone diseases.

#### **Mode of teaching**

Lectures, Problem solving seminars, Clinical laboratory exercises

#### **Student obligations**

Attendance at all forms of classes is mandatory and student must be prepared for seminars and exercises. Absence from the seminars and exercises must be compensated. It is forbidden to use a mobile phone during classes and exams.

**Monitoring student work (Connectivity of learning outcomes, teaching methods and grading)**

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Attending classes	2	1-5	Class attendance	Attendance record	8	20
Seminars		1-5	Preparation of seminar	Seminar presentation		
Exercises		1-5	entrance exams, performing exercises, keeping work diary	work diary, entrance exam		
Final exam	4	1-5	Studying for the final exam	Written exam	26	40
				Oral exam	26	40
<b>Total</b>	<b>6</b>				<b>60</b>	<b>100</b>

*Evaluation of the final written exam:*

Percentage of correct answers (%)	Ocjenski bodovi
60.00-64.99	26
65.00-69.99	28
70.00-74.99	30
75.00-79.99	32
80.00-84.99	34
85.00-89.99	36
90.00-94.99	38
95.00-100	40

*Calculation of final grade:*

Grade points earned in the final exam are added to the grade points earned during the course. Grading in the ECTS system is done by absolute distribution, i.e. based on total achievement and is compared to the numerical system in the following manner: A - excellent (5): 80-100 grade points; B - very good (4): 70-79.99 grade points; C - good (3): 60-69.99 grade points; D - sufficient (2): 50-59.99 grade points.

**Required reading (available in the library and through other media)**

Title	Number of copies in the library	Availability through other media
Čvorišćec D, Čepelak I. Štrausova medicinska biokemija. Medicinska naklada, Zagreb, 2009.	7	
Wagner Kostadinović J. i sur. Priručnik za vježbe iz Kliničke biokemije 2. Medicinski fakultet Osijek, 2021.	10	

**Additional reading**

1. Topić E, Primorac D, Janković S, Štefanović M. Medicinska biokemija i laboratorijska medicina u kliničkoj praksi. Medicinska naklada, Zagreb, 2018.
2. The latest scientific papers.

**Course evaluation procedures**

Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Medicine Osijek.