1. COURSE DECRIPTION – GENERAL INFORMATION			
1.1. Course teacher	Professor Jerka Dumić, PhD	1.6. Year of study	3rd
1.2. Name of the course	**Analytical Biochemistry**	1.7. Credit value (ECTS)	5
1.3. Associate teachers	Professor Gordan Lauc, PhD Associate Professor Sanja Dabelić, PhD Associate Professor Gordana Maravić Vlahoviček, PhD Assistant Professor Sandra Šupraha Goreta, PhD Assistant Professor Olga Gornik, PhD Toma Keser, MPharm	1.8. Type of instruction (number of hours L+S+E+e-learning)	30+0+30
1.4. Study programme (undergraduate, graduate, integrated)	Integrated study of Medical biochemistry	1.9. Expected enrolment in the course	25
1.5. Status of the course	Compulsory	1.10. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	2nd (possibility of e-learning according to the student's personal affinity to use teaching materials and problem based examples for knowledge improvement)

2. COURSE DESCRIPTION	
2.1. Course objectives	Students will learn about theoretical background, advantages and disadvantages of analytical methods and procedures and their application in biomedicine.
2.2. Enrolment requirements and required entry competences for the course	Passed exams of the courses Analytical Chemistry II and Biochemistry.
2.3. Learning outcomes at the level of the study programme to which the course contributes	• Development and implementation of the solutions of practical problems of laboratory diagnostics using the observational, analytical and critical skills. • Optimization, validation and accomplishment of laboratory analyses in different areas of health care. • Evaluation of novel and improvement of existing analytical methods • Conducting procedures of calibration and traceability.

	• Evaluation methods and equipment as well as all forms of quality control systems applying the principles of good laboratory practice, and relevant European and ISO directives.
2.4. Expected learning outcomes at the level of the course (4-10 learning outcomes)	After successfully completing the course, students will be able to: 1. Explain the performance principle of the specific analytical method; 2. Define the possibilities and limitations of the specific analytical method; 3. Select a suitable analytical method for the analysis of the particular biological sample with respect to the information that is necessary to collect on it; 4. Design of the analytical procedure using biochemical method (sample preparation, selection of standard sample, the demand for purity of the reagents, etc.); 5. Conduct an analysis of the biological sample using modern biochemical method; 6. Interpret the results of the analysis of biological sample.
2.5. Course content broken down in detail by weekly class schedule (syllabus)	LECTURES AND SEMINARS: • Sources and preparation of biological material. Cell and tissue cultures. Sedimentation methods. • Electrophoretic methods (electrophoresis, capillary electrophoresis, 2D electrophoresis, isoelectric focusing, isotachophoresis). • Immunoassays (Immunochemical methods). • Methods of analysis of particles (flow cytometry). • Spectroscopic methods (spectrophotometry, luminescent methods (fluorescence, chemiluminescence, time-resolved fluorescence, fluorescence polarization), atomic absorption spectroscopy, flame emission spectroscopy, infrared spectroscopy, circular dichroism. • Chromatographic methods and advanced separation techniques. • Mass spectrometry. • Principles and application of radioisotope methods. Advanced enzymatic techniques. Microcalorimetry. • Crystallographic method. Surface plasmon resonance (SPR Nuclear magnetic resonance (NMR) spectroscopy (NMR). Electron Paramagnetic Resonance (EPR) spectroscopy. • Determination of the primary structure of macromolecules. • Modern method of nucleic acids analyses. • Microchip technologies. Nanotechnologies. Biosensors. Molecular modelling. Bioinformatic analysis. • Rational approach to planning and design of experiments. Analysis of the application of certain methods in the primary scientific literature. Analysis and presentation of results. EXERCISES: • Cell cultures. • Determination of the protein concentration. Gel filtration of haemoglobin. The isolation of IgG from human serum.

	• SDS-polyacrylamide gel electrophoresis. Western blot. • High performance liquid chromatography (HPLC) and High performance anion-exchange chromatography (HPAEC). • Flow cytometry. • Analysis of gene expression I (RNA isolation, determination concentration and purity of RNA, reverse transcription). • Analysis of gene expression II (quantitative real-time polymerase chain reaction, qRT-PCR). • Single-stranded DNA conformational polymorphism (SSCP) analysis (DNA isolation, polymerase chain reaction - PCR, polyacrylamide gel electrophoresis and detection).					
2.6. Type of instruction	**lectures** **seminars** and workshops **exercises** online in entirety mixed e-learning field work		**independent study** **multimedia and the internet** **laboratory** work with the mentor (other)		2.7. Comments: e-learning - is not included in standard hours, but is used in teaching and contains problems with solutions, links to different pages, video and audio materials, etc.	
2.8. Student responsibilities	The students are required to attend classes that take place in the form of lectures and practical classes (exercises). The students are required to attend practical classes prepared for teaching in a way that have studied description and protocol of the exercises described in the script Biochemical Laboratory II. - Analytical and preparative biochemistry. The students, for the achievement of credits and grades in specified courses, are required to take the written and oral exam and pass them both successfully.					
2.9. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)	Class attendance	1.0	Research		Practical training	
	Experimental work	1.0	Report			
	Essay		Seminar essay		(Other--describe)	
	Tests		Oral exam	2.5	(Other—describe)	
	Written exam	0.5	Project		(Other—describe)	
2.10. Grading and evaluation of student work over the course of instruction and at a final exam	The students are evaluated according to the performance in the written (30%) and oral (70%) exam, which can be accessed only after the completion of lectures and neatly made practical teaching. On the final exam students are required to demonstrate knowledge of all areas covered by the program of the course, at the level of skilled information management and synthesis of materials.					
2.11. Required literature (available at the library and via other media)	**Title**					
	J. Dumić i sur. Analitička biokemija Powerpoint presentations (within the e-learning)					
	V. A. Gault i N. H. McClenaghan Understanding Bioanalytical Chemistry: Principles and Applications (2009) Wiley-Blackwell 1st ed. ISBN: 978-0-470-02906-0					
	J. Dumić i sur. Biokemijski praktikum II. - Analitička i preparativna biokemija. Scripta biocemica (2008) Farmaceutsko-biokemijski fakultet, Zagreb, ISBN 953-6256-46-0					
2.12. Optional literature						

2.13. Methods of monitoring quality that ensure acquisition of exit competences	Outcomes 1-7 are checked by written and oral exam.