NAME OF THE COURSE	Molecular Biology					
Code	PMB019	Year of study	2			
Course teacher	Professor Jasna Puizina	Credits (ECTS)	5			
Associate teachers	Asistant Professor Ivica Šamanić, Assistant Professor Željana Fredotović	Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	Mandatory	Percentage of application of e-learning	10%			

COURSE DESCRIPTION	
Course objectives	Acquiring basic knowledge about the structure and function of biologically important macromolecules, primarily nucleic acids and proteins. During the lecture students will be get acquainted with the basic molecular processes in the cell such as: replication, transcription, translation, mutation, recombination, DNA repair control of gene expresion. Students will get acquainted with the main techniques of work in molecular biology. Special emphasis will be placed on recombinant DNA technology and its application in medicine, biology and biotechnology. In practical exercises, students will develop independent skills performing basic experimental procedures in molecular biology.
Course enrolment requirements and entry competences required for the course	None.
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	After successfully passing the exam, the student will be able to: 1. describe basic knowledge of the molecular structure of prokaryotic and eukaryotic cells 2. to connect the organization of biomolecules and cellular structures with their function 3. understand the importance and application of fundamental model organisms in molecular biology 4. use some of the simplest bioinformatics methods and online databases data 5. use basic molecular-biological methods (isolation and characterization DNA, PCR, gel electrophoresis) 6. use the basic method of gene cloning (work with plasmids, restriction enzymes, bacteria *E. coli*). 7. explain and describe the basic processes of DNA metabolism: replication, mutations, recombination repair and rearrangement 8. explain and describe the processes of synthesis and processing of RNA and proteins 9. explain the different mechanisms of regulation of gene activity in prokaryotes and eukaryote 10. explain the mechanisms of cell cycle control in eukaryotes and distinguish different ways of cellular signaling 11. recognize the importance of molecular-biological processes in various diseases
Course content broken down in detail by weekly class schedule (syllabus)	Lectures 1. Introduction, model organisms, online databases 2. Importance of weak chemical bonds, chemical and physical structure of nucleic acids and proteins 3. Replication and transcription in prokaryotes and eukaryotes 4. Genetic code and protein synthesis in prokaryotes and eukaryotes 5. Recombinant DNA technology 6. Gene transfer, nucleic acid and protein electrophoresis 7. DNA fragment amplification by polymerase chain reaction, PCR, RT-PCR, qPCR, nucleic acid sequencing

	8. Methods of detection of nucleic acids and proteins 9. Production of transgenic animals and plants 10. Mutagenesis, introduction of mutations and interfering with gene expression 11. DNA mutations 12. DNA repair 13. DNA recombination and rearrangement 14. Gene expression control in prokaryotes and eukaryotes 15. Aging, telomeres, telomerase Exercises 1. Preparation of solutions, buffers and nutrient media 2. Isolation of genomic DNA from plant tissue 3. Nucleic acid electrophoresis on agarose gel 4. Polymerase chain reaction (PCR) - amplification of DNA fragments 5. Purification of DNA molecules from agarose gel fragment 6. Cloning a PCR fragment in a plasmid vector 7. Transformation of chemically competent *Escherichia coli* cells 8. Selection of successfully transformed bacterial clones 9. Isolation of plasmid DNA from bacterial cells 10. Digestion of DNA by restriction enzymes 11. DNA sequencing 12. Recombinant DNA technology – quizzes and problems solving
Format of instruction	☒ lectures ☐ seminars and workshops ☒ exercises ☐ *on line* in entirety ☒ partial e-learning ☐ field work ☒ independent assignments ☒ multimedia ☒ laboratory ☐ work with mentor ☐ (other)
Student responsibilities	The student is required to regularly attend all forms of teaching (lectures and practical exercises) and to pass written exams from both parts (lectures and exercises). Class attendance will be recorded. The obligation of students is 100% of attending classes from practicum and 70% from lectures. Students are required to bring a lab coat, a script, notebook, stationery and calculator for practical classes

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research		Practical training	1
	Experimental work		Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests		Oral exam		(Other)	
	Written exam	2	Project		(Other)	

Grading and evaluating student work in class and at the final exam	Max.100 points = 70 points (lectures) + 30 points (exercises) 90% - 100% grade 5 (excellent) 78% - 89% grade 4 (very good) 66% - 77% grade 3 (good) 55% - 65% grade 2 (sufficient) < 55% grade 1 (insufficient).

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	1. Cooper, G.M., Hausman, R.E., 2015: Stanica - molekularni pristup. Peto izdanje, Medicinska naklada, Zagreb 2010.	A few	-

	2. Puizina, J. 2020: Molekularna biologiju	-	Web - teaching material
	2. Puizina, J. 2019: Praktikum iz molekularne biologije	-	Internal script on web
Optional literature (at the time of submission of study programme proposal)	1. Cooper, G.M., Hausman, R.E., The Cell: A Molecular Approach. Oxford University Press, Siauer Associates, New York, 2019. 2. Metode u molekularnoj biologiji. 2007. Andreja Ambriovič Ristov (ur). Institut Ruđer Bošković. 3. Alberts, B., D. Bray, J. Lewis, M. Raff, K. Roberts & J. Watson: Molecular Biology of the Cell. Fourth ed. Garland Publishing, New York, 2004. 4. Lodish, H., Baltimore, D., Berk, A., Zipursky, S.L., Matsudaira, P., Darnell, J: Molecular Cell Biology. (Fifth ed.). Scientific American Books, W.H.Freeman & Co. New York, 2003		
Quality assurance methods that ensure the acquisition of exit competences	Student survey, consultations with students.		
Other (as the proposer wishes to add)			