<table>
<tr><td colspan="2">NAME OF THE COURSE</td><td colspan="5">Practical Skills in Molecular Genetics</td></tr>
<tr><td>Code</td><td>PPB282</td><td>Year of study</td><td colspan="4">3. undergraduate and 1. graduate</td></tr>
<tr><td>Course teacher</td><td>Assist. Prof. Željana Fredotović, PhD</td><td>Credits (ECTS)</td><td colspan="4">2,0</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2"></td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td></td><td></td><td>30</td><td></td></tr>
<tr><td>Status of the course</td><td>elective</td><td>Percentage of application of e-learning</td><td colspan="4">30</td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Teach students basic molecular genetics methods. Introduce students with the role of molecular genetics in biology, medicine and biotechnology.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">None</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">Student will be able to:
1. apply theoretical knowledge on bioinformatic datebases,
2. design primers for polymerase chain reaction (PCR)
3. perform polymerase chain reaction and gel elctrophoresis after PCR amplification
4. perform RNA isolation and analysis
5. synthesize cDNA
6. compare the application of conventional and real-time PCR
7. interpret and analyse results of PCR reaction
8. work on fluorescence microscope</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6">Lectures:
1. Determination of cytoplasmic genotype of Allium x cornutum

Exercises:
1. PART1_Primer Blast- primer design (2 hours). Students will learn to design primers according to the DNA sequence. They will learn to calculate the Tm melting temperature, possibility for primer dimer formation and percentage of GC pair base
2. PCR amplification of chloroplast genes (2 hours). Students will know to describe the polymerase chain reaction process, they will be able to amplificate the cytoplasmic gene matK
3. Agarose gel electrophoresis of PCR products following DNA amplification (2 hours). Students will be able to explain the principle of gel electrophoresis, calculate accurate volume of all the buffers and agarose and will know to prepare the agarose gel by themselves, put the samples on gel and interpret the results.
4. DNA gel extraction and purification (2 hours). Student will learn to purify DNA fragments using the commercial kit.
5. PART 2_Single cell gel electrophoresis assay. Preparation of solutions and microscope slides (4 hours). Students will know how to handle with the laboratory equipment. They will know how to calculate the accurate concentrations of solutions. They will be able to prepare the microscopic slides precoated in agarose.
6. Cell isolation and treatment (2 hours). Students will know how to put the cells on precoated microscopic slides</td></tr>
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	7. Electrophoresis and staining of microgel slides (2 hours). Students will be able to explain the electrophoresis process on microscopic slides. They will be able to prepare the electrophoretic chamber for the electrophoresis and to calculate the accurate power and voltage. 8. Evaluation of DNA damage (2 hours). Students will have to understand the role of fluorescent dye (DAPI) that we use for staining the microscopic slides. They will able to use the epifluorescence microscope and know how to interpret the results. 9. PART 3_Gene expression analysis using real-time PCR. Isolation and cultivation of peripheral blood leukocytes (2 hours). Students will be able to explain the procedure of isolation and cultivation of leukocytes. 10. RNA isolation and electrophoresis (2 hours). Students will learn how to isolate and analyse RNA from leukocytes and to determine the RNA purity and concentration. Perform the electrophoresis of RNA samples 11. Reverse trancription polymerase chain reaction (RT-PCR), electrophoresis and purification of amplified genes (4 hours). Student will learn the basics of reverse transcription of RNA and formation of cDNA, amplification of cDNA samples, analyse the samples on gel electrophoresis, purification of DNA fragments as they learned in exercise 4. 12. Quantitative real-time polymerase chain reaction (real-time PCR) (2 hours). Student will know the basics of real-time pcr method, they will also know why we use fluorescent dye for labelling the cDNA (SYBR Green). They will be able to perform the amplification reaction by themselves and interpret the results. They will be able calculate the fold change to every analysed gene.
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	Students must attend all lab exercises. They must carry the lab coat, script, pencil and calculator.

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		Research		Practical training	
	Experimental work	1	Report		(Other)	
	Essay		Seminar essay		(Other)	
	Tests		Oral exam	1	(Other)	
	Written exam		Project		(Other)	

Grading and evaluating student work in class and at the final exam	Evaluation of homework and final oral exam.

Required literature (available in the library and via other media)	**Title**	**Number of copies in the library**	**Availability via other media**
	Metode u molekularnoj biologiji. 2007. Andreja Ambriović Ristov (ur). Institut Ruđer Bošković.	1	
	Puizina, J. 2005: Practical exercises in molecular biology, internal script		Web material

	Fredotović, Ž. 2016 Practical Skills in Molecular Genetics, internal script		Web material
Optional literature (at the time of submission of study programme proposal)			
Quality assurance methods that ensure the acquisition of exit competences	Student questionnaire		
Other (as the proposer wishes to add)			