

<b>Study program: Environmental protection</b>			
<b>Type and level of study:</b> Master academic studies			
<b>Course Title:</b> Biotechnology in environmental protection I			
<b>Teachers:</b> Dejana Panković			
<b>Status:</b> Obligatory			
<b>ECTS:</b> 7			
<b>Prerequisite:</b> None			
<b>The goal of course</b> Main goal of the subject is student introduction and acquiring knowledge on biotechnology methods application in environmental protection, with emphasis on detection and remediation methods.			
<b>The outcome of the subject</b> Student training for the practical application of modern biotechnological methods and adoption of multi-disciplinary approach for solving the fundamental problems in environmental protection.			
<b>Syllabus</b> <i>Theoretical study</i> 1. Introduction to Biotechnology (Definition and classification of biotechnology, basic genome concepts and its manipulation); 2. Gene modification and gene manipulation (analysis and nucleic acid amplification; enzymes as tools, general concepts of PCR as a diagnostic method); 3. Cultivation of Genetically resistant plants against diseases (diseases of plants, measures for controlling plant diseases, application of biotechnology to increase the resistance of plants to diseases); 4. Case Study-Increasing resistance to downy mildew in sunflower (sunflower and sunflower diseases, Downy mildew, genes for resistance to downy mildew, use of molecular markers in sunflower breeding for resistance to downy mildew; genetic map Pl6 loci) 5. Remediation (introduction to remediation; remediation, bioremediation, organic and inorganic pollutants; phytoremediation: phytostabilization, phytoextraction, phytostimulation, phytodegradation, phytovolatilization, technology of phytoremediation) 6. Phytoremediation (use of sunflower and maize in the remediation of cadmium) 7. Biotechnological methods for the detection of pollution (bioassay, molecular biology in environmental monitoring is, biosensors) 8. Yeast as a model system to protect the environment (basic characteristics of yeast cells; life cycle of yeast, yeasts as biosensors for monitoring toxic compounds, application of yeasts in remediation) <i>Practical classes –</i> <b>1.</b> Introduction to laboratory work, pipeting, buffers, pH indicators, pH; <b>2.</b> DNA extraction with DNeasy Plant Mini Kit (Qiagen). Determination of isolated DNA concentration on Nano view spectrophotometer; PCR-identification of genes responsible for resistance to diseases; digestion of PCR amplicons with restriction enzymes and electrophoresis <b>3.</b> DNA extraction from soil and pure cultures of fungi; Determination of isolated DNA concentration on Nano view spectrophotometer; PCR-identification of Trichoderma isolates and examination of their variability based on ITS sequences. <b>4.</b> Growing of sunflower and maize in water culture at different cadmium concentrations; Determination of cadmium adopted from nutrient solution by ICP; <b>5.</b> Determination of antifungal activity of different concentrations of xenobiotics by the yeast ( <i>Saccharomyces cerevisiae</i> )			
<b>Literature</b> 1. Čurčić Nataša, Panković Dejana (2011) Gajenje genetički otpornih biljaka prema bolestima u cilju zaštite životne sredine. Monografija, 101 str., ISSN / ISBN 978-86-87785-34-2, COBISS SR-ID 267537671, Univerzitet Educons, Štampa Atelje Sremska Kamenica. 2. Simonovic Ana (2011) Biotehnologija i genetičko inženjerstvo biljaka, 401 str., NNK internacional Beograd 3. SAVIĆ Pavičević Dušanka, Matić Gordana (2011) Molekularna biologija 1, 364 str. NNK internacional, Beograd. 4. Environmental Biotechnology 2nd Edition, A Biosystems Approach, 2015, Daniel Vallero, eBook ISBN: 9780124078970, Academic Press, 1-746.			
<b>Number of lectures:</b>			Other Classes
Lectures:	Practices:	Other forms of teaching:	
Student research work:			
<b>Teaching methods:</b> Lectures, exercises, consultations, small group work, pair work, individual work, with the use of audio-visual aids			
Score (maximum 100 points)			
<b>Pre-commitments</b>	<b>Poens</b>	<b>The final exam</b>	Poens
Activity during lectures	10	Written exam	40
Practical classes	10	Oral examination	
Colloquia	40 (2*20)		
Seminars			
<i>Total</i>	60		