(Table 5.2.) Course unit description

Study program: Ecology and environmental protection

Type and level of studies: Undergraduate studies

Course unit: BIOREMEDIATION

Teacher in charge: Ivana Radojević, PhD; Snežana Branković, PhD

Language of instruction: English

ECTS: 5

Prerequisites: /

Semester: Summer semester (VIII)

Course unit objective

Introducing students to the principles and techniques of bioremediation relevant to the preservation and improvement of ecosystems. Getting to know the application of microorganisms and plants in bioremediation, as well as the accompanying physiological processes on the basis of which this application is possible. Acquaintance with examples of good practice using bioremediation techniques.

Learning outcomes of Course unit

Students are qualified to evaluate and use water and soil bioremediation methods.

Course unit contents

Theoretical classes:

Sources of environmental pollution. Types of pollutants. Interactions of different groups of pollutants with microorganisms and plants. Metabolic specificities of microorganisms and plant species and their forms in bioremediation. The application potential of microorganisms and plants in bioremediation. The role of transgenic organisms in bioremediation. The bioremediation categories. Biological processes of wastewater treatment - removal of organic and inorganic pollution (biooxidation, nitrification, denitrification, EBPR processes). New methods of wastewater treatment. SBR system. Methods of monitoring the quality of microbial biomass (presence, diversity). Microbiological cultures - flocs, granules, biofilm. Bioaugmentation. Bioreactors. Processes and environmental influences. Calculations. Phytoremediation: economic and technological requirements. Methods of testing the potential of plant species in phytoremediation and the possibility of finding technical solutions for their wide application. Application of aquatic and terrestrial plants in different phytoremediation techniques. Development of bioremediation techniques through the application of modern research. Examples of good practice in the application of bioremediation techniques. The importance of technical solutions in the application of bioremediation.

Practical classes:

Fieldwork: directed visits to the facilities where different bioremediation techniques using microorganisms and plants have been applied.

Literature

- Prasad R., Aranda E. (2018) Approaches in Bioremediation. The New Era of Environmental Microbiology and Nanobiotechnology. Springer International Publishing.
- Singh O., Ward P. (2004) Applied Bioremediation and Phytoremediation. Springer-Verlag Berlin Heidelberg.
- Narasimha Var Prasad M., Hasanuzzaman M. (2020) Handbook of Bioremediation. Physiological, Molecular and Biotechnological Interventions. Elsevier Science.
- Bernardino Velázquez-Fernández J., Muñiz-Hernández S. (2014) Bioremediation Processes, Challenges, and Future Prospects. Nova Science Publishers, New York.

Number of active teaching hours				Other classes:
Lectures: 2	Practice: 1	Other forms of classes: 1	Independent work: 1	

Teaching methods

Lectures, presentations, seminar paper(s), independent student work, tours of plants where bioremediation techniques are applied, field work, internet, oral exam.

Examination methods (maximum 100 points)

Exam prerequisites	No. of points	Final exam	No. of points
Practical classes	10	Written examination	10
Homework	10	Oral examination	30
Seminars	20	Other	
Project	20		

Grading system

Grade	No. of points	Description
10	>= 91	Excellent
9	81-90	Exceptionally good
8	71-80	Very good
7	61-70	Good
6	51-60	Passing

5	<=50	Failing