Study Programme : Ph.D. in Biology

Degree level: Master degree

Course Title: Phytoindication

Professor: dr Slobodanka Pajević

Required/Elective Course: Elective course

Number of ECTS: 6

Prerequisites:

Course Objective: The aim of the course is to introduce students with specific and significant role of plants in phytoremediation and phytoindication of polluted sites.

Course Outcome: Upon completion of this course students will be able to recognise different sources of contamination of the environment, and to understand mechanisms of pollutant uptake by plants and their phytotoxic effects. A special attention has been payed to tolerance mechanisms in plant species. Students will understand important role of plants in conservation of the environment, and be able to apply their knowledge.

Course Content:

Theoretical part Role of plants in phytoindication. Biological spectrum, ecological indexes and phytocenological elements as bioindicators. Organic and inorganic contamination. Indicators. Contamination of air, soil and water. Uptake of pollutants by plants and their phytotoxicity. Plant tolerance to different contaminants. Adaptations. Characteristics of plants suitable for phytoremediation: woody plants, herbaceous plants, aquatic and semiaquatic plants. Metal accumulators – hyperaccumulaors and accumulators. Remediation: application, limitations (characteristics of roots, growth rate, pollutant concentration), economic and technical aspects, conservation of ecosystems. Phytoremediation mechanisms. Phytoextraction. Phytodegradation. Rhizofiltration. Rhizodegradation. Phytostabilization. Phytovolatilization. Phytoremediation techniques. Phytoengineering and phytosanation. Worldwide and European experiences.

Practical part

Cultivation of plants with addition of excessive amounts of pollutants (heavy metals, organic pollutants). Determination of pollutants in plant tissues. Bioconcentration degree of certain pollutants. Collection of plant samples in the field. Activity of specific enzymes in relation to concentration of pollutants.

Reading List:

Phytoremediation: Transformation and Control of Contaminants, ed. S.C., McCutcheon, J.L., Schnoor, New York: Wiley (2003).

Phytoremediation and Rhizoremediation, Mackova, Martina; Dowling, David; Macek, Tomas (Eds.)
2006, VI, 300 p. ISBN: 978-1-4020-4952-1

Ward, O.P., Singh, A. Applied Bioremediation and Phytoremediation. Springer, 2004

Phytoremediation of Toxic Metals: Using Plants to Clean Up the Environment (Hardcover) Ilya Raskin, Burt D. Ensley (Editors)Kvesitadze, G., Khatisashvili, G., Sadunishvili, T., Ramsden, J.J. Biochemical Mechanisms of Detoxification in Higher Plants : Basis of Phytoremediation. 2006

Mathew, A. Phytoremediation of heavy metal contaminated soil, 2006

Heavy Metal Stress in Plants : From Biomolecules to Ecosystems, M.N.V. Prasad (Editor), 2004

Phytoremediation (Advances in Biochemical Engineering / Biotechnology). David Tsao (Editor) , 2003

Phytoremediation of Contaminated Soil and Water. Ed. N., Terry, G., Banuelos, Boca Raton: Lewis (2000).

Total hours:				
Lectures: 2	Practicals:	Other: 2	Student research work: 5	

Methods of instruction: Lectures and lab work

Assessment (maximum number of points 100)

Requirements	**points**	**Final exam**	**points**
Active participation in lectures	10	Practical exam	*40*
Active participation in practicals		Oral exam	
Test(s) or	50		
Pre-exam testing			

Remark: