

Study programme(s): Doctoral Academic Studies in Environmental Protection			
Level: PhD studies			
Course title: Fate of specific pollutants in selected water treatment processes		Subject code:	DZZS-713
Lecturer(s): Dr Ivana Ivančev-Tumbas			
Status: elective			
ECTS: 15			
Requirements: -			
Learning objectives Students will get the knowledge related to behaviour of specific pollutants in selected water treatment processes (adsorption on geosorbents and activated carbons, coagulation, membrane filtration, disinfection, different hybrid processes that combine two or more treatment options).			
Learning outcomes Upon completion of this module students will be able <ul style="list-style-type: none"> • to describe mechanisms of removal of specific pollutants by selected water treatment processes • to explain factors that affect process efficiency for removal of pollutants • to apply simple models (e.g. for adsorption and pollutant transport through porous medium) in prediction of process efficiency 			
Syllabus <i>Theoretical instruction-</i> specific pollutants in water treatment- pharmaceuticals, organic solvents, industrial chemicals, personal care products, pesticides, toxic metals and metaloids. Physico-chemical characteristics of substances that affect water treatment process efficiency. Difusion, sorption and transport through porous medium. Interactions with process materials. Removal mechanisms by adsorption onto various sorbents, by colagulation, by membrane filtration, by disinfection. Influence of natural organic matter on process efficiency. Hybrid processes in water treatment and behaviour of specific pollutants in water treatment. <i>Practical instruction-</i> literature review. Calculation of relevant adsorption (equilibrium and kinetic) parameters. Design of lab tests for determination of selected water treatment process efficiency for removal of specific pollutants. Work with programmes ISO, BATCH, AdsAna, KIN, LDF, Transmod.			
Literature 1. I. Ivančev-Tumbas (2008) Organski ksenobiotici u preradi vode za piće, PMF Novi Sad, ISBN 978-86-7031-176-3 (Organic xenobiotics in drinking water treatment, Monograph in Serbian). Additional literature: 1. Degremot, Suez (2007) Water Treatment Handbook, 7th edition 2. Selected chapters from E. Worch, Adsorption Technology in Water Treatment, Fundamentals, Processes, and modeling, De Gruyter, 2012, ISBN 978-3-11-024022-1 3. <u>Ivančev-Tumbas I.</u> (2014) The fate and importance of organics in drinking water treatment: a review, Environmental Science and Pollution Research, <i>Environm. Sci. & Poll. Res.</i> 2014, 21, 11794-11810. 4. The other selected scientific/review papers in the field of water specific pollutants , software documentation.			
Weekly teaching load 150 (75+75)	Lectures: 5 (75)	Exercises :	5 (75)
Teaching methodology Lectures, consultations as part of research work related to selected topic, development of the lab test plan			
Grading method (maximal number of points 100)			
Pre-exam obligations	points	Final exam	points
Plan for laboratory test developed	30	Oral exam	70