

Faculty of Metallurgy and Technology / ENVIRONMENTAL PROTECTION / ENGINEERING OF WATER PROTECTION

Course:	ENGINEERING OF WATER PROTECTION			
Course ID	Course status	Semester	ECTS credits	Lessons (Lessons+Exercises+Laboratory)
5896	Mandatory	4	8	3+0+2
Programs	ENVIRONMENTAL PROTECTION			
Prerequisites	There is no conditioning to other subjects.			
Aims	Through the course the student acquires basic knowledge about water resources, physical-chemical and biological processes in water systems, wastewater treatment processes, water protection processes.			
Learning outcomes	By the end of this course, the student will be able to: 1. Explain the basic quality indicators of different types of water. 2. Understands physico-chemical and biological processes in natural waters. 3. Apply certain measures to protect the aquatic ecosystem from pollutants. 4. Choose the technology for wastewater treatment, based on theoretical knowledge of the basic physico-chemical and biological processes of water treatment. 5. Apply the legislation in the field of water.			
Lecturer / Teaching assistant	Milena Tadić, Assoc. Prof.			
Methodology	Lectures , laboratory exercises, seminar work, consultations.			
Plan and program of work				
Preparing week	Preparation and registration of the semester			
I week lectures	The properties of water. Classification of water. Indicators of water quality.			
I week exercises	Taking water samples for physico-chemical analysis.			
II week lectures	The quality and characteristics of the watercourse. Self-cleaning power of the water stream. The pollution of natural waters.			
II week exercises	Water filtration.			
III week lectures	Use of water for certain purposes. Process water as a raw material or a medium for implementation technological processes.			
III week exercises	Coagulation of water.			
IV week lectures	Natural water pollution. Natural and anthropogenic sources of pollutants in water. Basic physico-chemical and biological processes in water systems.			
IV week exercises	Laboratory analysis of water quality.			
V week lectures	Wastewater. Types and characteristics of wastewater.			
V week exercises	Determination of water hardness.			
VI week lectures	Wastewater drainage systems. Influence of wastewater on changes in water quality.			
VI week exercises	Determination of KMnO ₄ in water.			
VII week lectures	Conditions for discharge of wastewater into natural waters and municipal sewage.			
VII week exercises	First midterm exam.			
VIII week lectures	Makeup first midterm exam.			
VIII week exercises	Determination of the chloride and carbon dioxide in the water.			
IX week lectures	Wastewater treatment plants. Control of the efficiency of the treatment plant wastewater.			
IX week exercises	Preparation of deionized water. Ion exchanger.			
X week lectures	Overview of wastewater treatment procedures. Pre-treatment, primary, secondary and tertiary wastewater treatment.			
X week exercises	Calculations.			
XI week lectures	Mechanical wastewater treatment processes.			
XI week exercises	Presentation of seminar work.			
XII week lectures	Chemical wastewater treatment processes.			
XII week exercises	Presentation of seminar work.			

XIII week lectures	Biological wastewater treatment processes. Determining the required degree of wastewater treatment.					
XIII week exercises	Visit the Wastewater treatment plant in Podgorica.					
XIV week lectures	Water quality monitoring.					
XIV week exercises	Second midterm exam.					
XV week lectures	Legislation in the field of water protection. Basic strategies for water quality protection.					
XV week exercises	Makeup second midterm exam.					
Student workload	Weekly: 8 ECTS x 40/30 hour = 10 h 40 min The total load for the semester = 240 h					
Per week			Per semester			
8 credits x 40/30=10 hours and 40 minuts 3 sat(a) theoretical classes 2 sat(a) practical classes 0 excercises 5 hour(s) i 40 minuts of independent work, including consultations			Classes and final exam: 10 hour(s) i 40 minuts x 16 =170 hour(s) i 40 minuts Necessary preparation before the beginning of the semester (administration, registration, certification): 10 hour(s) i 40 minuts x 2 =21 hour(s) i 20 minuts Total workload for the subject: 8 x 30=240 hour(s) Additional work for exam preparation in the preparing exam period, including taking the remedial exam from 0 to 30 hours (remaining time from the first two items to the total load for the item) 48 hour(s) i 0 minuts Workload structure: 170 hour(s) i 40 minuts (courses), 21 hour(s) i 20 minuts (preparation), 48 hour(s) i 0 minuts (additional work)			
Student obligations			Students are required to attend lectures, laboratory exercises present a seminar paper, do midterm exams and final exam.			
Consultations			12:00-13:00, Friday			
Literature			1. N. P. Cheremisinoff, Handbook of Water and Wastewater Treatment Technologies, Elsevier, Butterworth - Heinemann, 2002. 2. Weiner R., Matthews R., Environmental Engineering, Fourth Edidion, Butterworth-Heinemann, USA, 2003.			
Examination methods			- Activity during exercises: (0 - 5 points), - Seminar work: (0 - 5 points), - First midterm exam: (0 - 20 points), - Second midterm exam: (0 - 20 points), - Final exam : (0 - 50 points), A passing grade is obtained if at least 50 points are accumulated cumulatively.			
Special remarks			/			
Comment			/			
Grade:	F	E	D	C	B	A
Number of points	less than 50 points	greater than or equal to 50 points and less than 60 points	greater than or equal to 60 points and less than 70 points	greater than or equal to 70 points and less than 80 points	greater than or equal to 80 points and less than 90 points	greater than or equal to 90 points