



POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION

1.1 Course name	Soil protection			
1.2 Study program/s	Undergraduate professional study Sustainable Development			
1.3 Course status (O,E)	O	1.6 Mode of instruction (number of hours)	Lectures	15
1.4 Course code	4073		Exercises	30
1.5 Course abbreviation	SP		Seminars	
1.6 Semester	VI		E-learning	
1.7 ECTS	4	1.7 Place and time of instruction	Premises of the Polytechnic of Međimurje in Čakovec, according to the schedule published on the website	

2. TEACHING STAFF

2.1 Course leader/s-title	Silvija Zeman, senior lecturer	contact	szeman@mev.hr
		contact	
2.2 Assistant/s- title		contact	
		contact	
2.3 Instruction held by- title		contact	

3. COURSE DESCRIPTION

3.1 Course goals	Students will be introduced to the basic properties of soil, types of damage and pollution, sources of pollution, remediation methods, soil protection in geotechnical interventions.			
3.2 Prerequisites	To take the course, it is necessary to pass the course Sustainable Soil Management			
3.3 Course outcomes	<p>After successfully completing the course, students will be able to:</p> <p>I1 Present the most important roles of soil. R6</p> <p>I2 Connect the basic physical, chemical and biological characteristics of the soil. R6</p> <p>I3 Present the most important levels of soil pollution, and groups of major pollutants - sources of pollution, consequences for soil users in agriculture, urban planning, spatial planning, construction, mining and other related professions. R6</p> <p>I4 Propose and combine ways, forms and types of remediation of contaminated soil, but especially know how to use preventive measures soil protection. R6</p> <p>I5 Link the importance of soil, the processes that lead to soil damage and pollution, and the need to protect it. R6</p> <p>I6 Propose a method of remediation of contaminated soil and propose a geotechnical intervention to protect the soil and the environment</p>			
3.4 Course content				
3.5 Types of coursework	x	Lectures	x	Exercises
				Blended e-learning
				Individual activities
				Laboratory

	x	Seminars and workshops		Distant learning		Field classes		Multimedia and network		Mentorship																																																																						
		Other																																																																														
3.6 Language of instruction	Croatian / English																																																																															
3.7 Monitoring students' work (enter the number of ECTS credits for each activity so that the total number of ECTS credits is equal to the total ECTS value of the course, 1 ECTS = 30 hours)	0,5	Class attendance	1,00	Seminars				Essay																																																																								
	0,5	Class activity		Project				Report/paper																																																																								
	1,00	Midterm exams		Practical task				Continuous knowledge check																																																																								
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3.9 Assessment criteria – analysis per learning outcomes	<table border="1"> <thead> <tr> <th colspan="7">Ways of evaluating learning outcomes</th> </tr> <tr> <th></th> <th>Attendance</th> <th>Activity</th> <th>Mid-term exam 1</th> <th>Mid-term exam 2</th> <th>Practical work</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td>Outcome 1</td> <td></td> <td></td> <td>5</td> <td></td> <td>5</td> <td>10</td> </tr> <tr> <td>Outcome 2</td> <td></td> <td></td> <td>10</td> <td>10</td> <td>5</td> <td>25</td> </tr> <tr> <td>Outcome 3</td> <td></td> <td></td> <td>5</td> <td>5</td> <td>5</td> <td>15</td> </tr> <tr> <td>Outcome 4</td> <td></td> <td></td> <td>5</td> <td>10</td> <td>5</td> <td>20</td> </tr> <tr> <td>Outcome 5</td> <td></td> <td></td> <td></td> <td>10</td> <td></td> <td>10</td> </tr> <tr> <td>Outcome 6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>10</td> </tr> <tr> <td>Outcome not-related</td> <td>5</td> <td>5</td> <td></td> <td></td> <td></td> <td>10</td> </tr> <tr> <td>Total</td> <td>5</td> <td>5</td> <td>25</td> <td>45</td> <td>20</td> <td>100</td> </tr> </tbody> </table> <p>Grading of outcomes (in order to pass the mid-term exam/exam the student must achieve at least 50% points for each learning outcome)</p> <p>Points Grade</p> <p>89 – 100 excellent (5)</p> <p>76 – 88 very good (4)</p> <p>63 – 75 good (3)</p> <p>50 – 62 pass (2)</p> <p>0 – 49 fail (1)</p>										Ways of evaluating learning outcomes								Attendance	Activity	Mid-term exam 1	Mid-term exam 2	Practical work	Total	Outcome 1			5		5	10	Outcome 2			10	10	5	25	Outcome 3			5	5	5	15	Outcome 4			5	10	5	20	Outcome 5				10		10	Outcome 6						10	Outcome not-related	5	5				10	Total	5	5	25	45	20	100
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3.10 Specific features related with taking the course	If a student collects 50% of the points of each outcome, he / she directly takes the exam, provided that he / she has done practical work (exercises). A student cannot access the exam period if he / she has not achieved a min for each exercise. 60% correct answers. Practical work-exercises are made according to the instructions published on the Merlin system and are submitted by placing on the Merlin. Checking the completed exercises is done in the exercise classes after prior preparation with the teacher. Throughout the semester, the student																																																																															

	<p>is required to perform six exercises independently. Practical work (completed exercises) is taught until the last week of lectures. During the exam, it is possible to orally check the knowledge from practical work (exercises).</p> <p>If a student does not achieve a sufficient number of points on the midterm exam, he / she cannot take the next midterm exam.</p> <p>Once achieved points in intermediate exams for each learning outcome are no longer deleted unless the student decides to correct the result for each learning outcome, whereby the points won until then are deleted and newly achieved points for that learning outcome are entered.</p> <p>The final grade is obtained on the exam period and is the sum of points earned during classes.</p> <p>Students who did not take the colloquium access the written part of the exam where all learning outcomes are checked, and are required to have completed exercises before taking the exam.</p>				
3.11 Students obligations	<p>Full-time students are required to attend at least 70% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. Part-time students are required to attend at least 30% of the total number of hours of lectures and exercises in order to exercise the right to take the exam.</p> <p>If the student has not fulfilled all the obligations set by the course, he is obliged to attend the lectures again and meet the conditions for taking the exam.</p> <p>Attendance can be offset by online tuition, organised webinars and added assignments given by teachers. One lesson lasts 45 minutes, and several hours form a teaching unit. Absence from one teaching unit is counted as one absence. Delays and apologies are recorded separately. In that case, if the student missed more than 50% of classes, and has a justifiable reason/apology, the request should be submitted to the Department Council, which then decides on the justification of student absences with the obligatory opinion of the course leader.</p>				
3.12 Written assignments	<p>Seminar papers must be computer written and may have a maximum of 12 text cards (Times New Roman, font 12) from introduction to conclusion, together with pictures, appendices to tables, etc. Seminar papers must have an adequate title page, content, marked pages and literature. The seminar paper should be divided into chapters and contain a list of references and a list of figures and tables and graphs and finally a summary / conclusion of 250 words. The student guarantees the authenticity of the work with his signature.</p>				
3.13 Required reading	<table border="1"> <tr> <td>1.</td> <td>Kisić, I., 2012: Sanacija onečišćenog tla. Agronomski fakultet Sveučilišta u Zagrebu, Zagreb</td> </tr> <tr> <td>2.</td> <td>Lecture notes</td> </tr> </table>	1.	Kisić, I., 2012: Sanacija onečišćenog tla. Agronomski fakultet Sveučilišta u Zagrebu, Zagreb	2.	Lecture notes
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3.14 Additional reading	<table border="1"> <tr> <td>1.</td> <td>Mirsal I.A., 2008: Soil Pollution – Origin, Monitoring & Remediation, Springer</td> </tr> </table>	1.	Mirsal I.A., 2008: Soil Pollution – Origin, Monitoring & Remediation, Springer		
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4 ADDITIONAL COURSE INFORMATION					
4.1 Quality control	<p>The quality of the program, teaching process, teaching skills and level of mastery of the material will be established by conducting a written evaluation based on questionnaires, and in other standardised ways and in accordance with the by-laws of the Polytechnic of Međimurje in Čakovec.</p>				
4.2 Contact the teacher	<p>Students can contact the teacher during the office hours and during classes, while for short questions and explanations they can contact him/her any day during working hours by coming in person or by landline. It is also possible to ask questions by e-mail, which will be answered in 48 hours at the latest. It is desirable for students to come as often as possible for any possible questions during the teacher's office hours.</p>				

4.3 Information about the course	It is the obligation of each student to be regularly informed about the course. All notifications about the classes or possible postponement of classes will be posted on the bulletin board and on the website of the Polytechnic at least 24 hours in advance.
4.4 Course contribution to the study program	Work on environmental protection facilities, work in design and consulting companies dealing with water protection, waste management and studies related to environmental impact, work in industry with water and air protection devices, on the organization of environmental protection, plant management and system construction public drainage, environmental protection procedures and regulations in the field of construction, mechanical engineering, wood, textile industry, etc., work in institutions dealing with water and soil quality testing. Ethical and moral approach to work, critical evaluation of arguments, assumptions and data in order to create opinions and contribute to the solution of problems, knowledge of contemporary issues of the profession and society.

5. ANALYSIS OF COURSE TOPICS (the number of hours is equal to the number of lectures and exercises of the course)

LECTURES				
Hours	Topic and description	Method	Learning outcomes	Course outcome
		<ul style="list-style-type: none"> • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes... 		
1.	Introduction to the course and a detailed syllabus Soil classification in Croatia. Basic pedological map of the Republic of Croatia.	Presentation, pp presentation	Classify Croatian soils	12
2.	Processes leading to soil damage; Soil erosion, Loss of humus, Soil compaction, Soil cover, Soil conversion, Acidification, Salinization, Desertification, Pollution	Presentation, pp presentation	Interpret the processes that lead to soil damage	11 13
3.	Types of pollution; Heavy metals, Polycyclic aromatic hydrocarbons, Persistent organic pollutants, Pesticides and other dangerous substances	Presentation, pp presentation	describe and distinguish types of pollutants	13
4.	Limit values for soil pollutants, Assessment of soil contamination status - sampling Locations of soil load and pollution in Croatia	Presentation, pp presentation	Comment on limit values and localities of soil pollution	14
5.	Contaminated soil remediation technologies; Bioremediation using microorganisms,	Presentation, pp presentation	Choose soil remediation technology	14 15

	Phytoremediation, Herbal Purifiers, Phytoextraction, Phytostabilization			
6.	Technologies for remediation (remediation) of contaminated soils Phytovolatilization, Bioventilation, Promotion of bioremediation by injection oxygen, oxidants (hydrogen peroxide), and by adding fertilizers, Mycoremediation, Natural soil self-purification.	Presentation, pp presentation	Choose soil remediation technology	14 15
7.	Modeling the transfer of pollutants through the soil	Case study	Apply the process of modeling pollutants through the soil	13 14
8.	Polluted soil remediation technologies Electroremediation, Soil flooding, Soil leaching in situ, Pollutant leaching or removal hot water or steam, Pumping and treatment, Solidification and stabilization of soil, Excavation and disposal of contaminated soil, Soil mixing, Covering and encapsulation of contaminated soil.	Presentation, pp presentation	Choose soil remediation technology	14 15
9.	Polluted soil remediation technologies Thermal soil remediation; Incineration, Vitrification, Solar soil detoxification, Ex situ soil remediation - application of different procedures depending on the type of pollutant.	Presentation, pp presentation	Choose soil remediation technology	14 15
10.	Soil and environmental protection during geotechnical interventions Erosion protection, biological construction, revitalization of built water systems, reservoirs, piezometers for monitoring water level and quality	Presentation, pp presentation	Predict the impact of geotechnical interventions on soil and groundwater	16
11.	The role of plants in geotechnical engineering Examples of remediation of contaminated soils and groundwater in Croatia Site selection for a landfill;	Presentation, pp presentation	Predict the impact of soil pollutants on groundwater	13 17
12.	Influence of management methods on soil quality; influence of hydromelioration on changes in	Presentation, pp presentation	Predict the impact of soil management	16

	soil characteristics,, the impact of agrotechnical measures of tillage and fertilization on soil quality		methods on soil quality	
13.	Soil protection General principles and priorities for sustainable soil management and protection, Legal regulations of the Republic of Croatia related to soil issues, Institutions of the Republic of Croatia dealing with soil protection	Presentation, pp presentation	Interpret soil regulations	16
14.	Measures and procedures to be taken in case of incidental soil pollution, Databases related to soil in the Republic of Croatia, Significant projects related to soil in the Republic of Croatia.	Presentation, pp presentation	Classify and apply measures and procedures to be taken in the event of incidental soil contamination	114
15.	The connection in the preservation of nature soil-water-air-man	Presentation, pp presentation	Discuss the ground-water-air-man relationship	16
EXERCISES/ SEMINARS				
Hours	Topic and description	Method <ul style="list-style-type: none"> • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes... 	Learning outcomes	Course outcome
1.	Soil classification in Croatia. Basic pedological map of the Republic of Croatia.	Examples, discussion Discovery-guided learning (study of scientific literature) seminars	Interpret the pedological map	12
2.	Processes leading to soil damage; Soil erosion, Loss of humus, Soil compaction, Soil cover, Soil conversion, Acidification, Salinization, Desertification, Pollution	Examples, discussion	Interpret the example	11 12
3.	Types of pollution; Heavy metals, Polycyclic aromatic hydrocarbons, Persistent organic pollutants, Pesticides and other dangerous substances	Discovery-guided learning (study of scientific literature) seminars	Group and identify pollutants	13
4.	Limit values for soil pollutants Loads of soil load and pollution in Croatia	Examples, discussion	Interpret limit values	14
5.	Contaminated soil remediation technologies; Bioremediation using microorganisms,	Examples, discussion Discovery-guided learning (study of scientific literature) seminars	Interpret the example	14 15

	Phytoremediation, Herbal Purifiers, Phytoextraction, Phytostabilization			
6.	Technologies for remediation (remediation) of contaminated soils Phytovolatilization, Bioventilation, Promotion of bioremediation by injection oxygen, oxidants (hydrogen peroxide), and by adding fertilizers,	Examples, discussion Discovery-guided learning (study of scientific literature) seminars	Interpret the example	14 15
7.	Colloquium 1			11,12,13,14
8.	Microremediation soil self-cleaning	Examples, discussion Discovery-guided learning (study of scientific literature)	Interpret the example	14 15
9.	Polluted soil remediation technologies Electroremediation, Soil flooding, Soil leaching in situ, Pollutant leaching or removal hot water or steam, Pumping and treatment, Solidification and stabilization of soil, Excavation and disposal of contaminated soil, Soil mixing, Covering and encapsulation of contaminated soil.	Examples, discussion Discovery-guided learning (study of scientific literature) seminars	Interpret the example	16
10.	Polluted soil remediation technologies Thermal soil remediation; Incineration, Vitrification, Solar soil detoxification, Ex situ soil remediation - application of different procedures depending on the type of pollutant.	Examples, discussion Discovery-guided learning (study of scientific literature) seminars	Interpret the example	15
11.	the impact of agrotechnical measures of tillage and fertilization on soil quality	Examples, discussion Discovery-guided learning (study of scientific literature) seminars	Interpret the example	15 16
12.	Legal regulations of the Republic of Croatia related to soil issues Significant soil-related projects in the Republic of Croatia.	examples	Present issues related to soil legislation in the Republic of Croatia	15 16
13.	soil protection, guest lecturer	ppt, discussion	Comment on ground-related issues	15 16
14.	Field teaching, performing the remediation process	Terenska nastava	Comment on ground-related issues ²	16
15.	Colloquium 2			14,15,16

