



POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION

1.1 Course name	Soil ecology			
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	30
1.4 Course code	4112		Exercises	30
1.5 Course abbreviation	SE		Seminars	
1.6 Semester	IV		E-learning	
1.7 ECTS	5	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, Ph.D, 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	The aim of the course is to introduce students to integrative soil representation. In doing so, students will be provided with basic knowledge of all biological, chemical and ecological processes, the circulation of substances and organisms in the soil. Students will be introduced to the most important groups of microorganisms and their morphological and physiological characteristics as well as soil fauna (microfauna, mesofauna, macrofauna) which in interaction with soil microorganisms participates in the decomposition of soil organic matter and the creation of humus on which soil fertility depends .
3.2 Prerequisites	There are no conditions
3.3 Course outcomes	After successfully completing the course, students will be able to: <ul style="list-style-type: none"> 11 Present the structure of the soil, the circulation of matter in the soil as well as the basic physico-chemical and thermodynamic processes in the soil. 12 To connect the importance of microorganisms in the soil and their role in the decomposition of organic residues, humus formation and obtaining nutrients for plants. 13 Present the biological component of the soil and evaluate the groups of microorganisms and soil fauna (micro fauna, mesofauna, macrofauna) and their morphological and physiological characteristics. 14 Valorise basic interactions of organisms in soil 15 Assess environmental factors and their impact on microorganisms
3.4 Course content	

3.5 Types of coursework	x	Lectures	x	Exercises		Blended e-learning		Individual activities	X	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)	2,0	Class attendance	0,25	Seminars				Essay																																																																	
	0,25	Class activity		Project				Report/paper																																																																	
	1,00	Midterm exams	0,5	Laboratory exercises				Continuous knowledge check																																																																	
		Written exam		Experimental work																																																																					
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3.8 Assessment and evaluation of students' work during classes and at the final exam	<table border="1"> <thead> <tr> <th>Activity specification</th> <th>Percent %</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td colspan="3" style="text-align: center;">Assessment during instruction</td> </tr> <tr> <td>Attendance</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Class activity</td> <td>5%</td> <td>5</td> </tr> <tr> <td>Seminar/ project/ essay</td> <td>30%</td> <td>30</td> </tr> <tr> <td>Midterm exam 1</td> <td>30%</td> <td>30</td> </tr> <tr> <td>Midterm exam 2</td> <td>30%</td> <td>30</td> </tr> <tr> <td colspan="3" style="text-align: center;"><i>Exam assessment for the students who failed to fulfil all the obligatory requirements during the semester</i></td> </tr> <tr> <td>Written exam</td> <td>60%</td> <td>60</td> </tr> <tr> <td>Total:</td> <td>100%</td> <td>100</td> </tr> </tbody> </table>										Activity specification	Percent %	Points	Assessment during instruction			Attendance	5%	5	Class activity	5%	5	Seminar/ project/ essay	30%	30	Midterm exam 1	30%	30	Midterm exam 2	30%	30	<i>Exam assessment for the students who failed to fulfil all the obligatory requirements during the semester</i>			Written exam	60%	60	Total:	100%	100																																	
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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 not-related</td> <td>5</td> <td>5</td> <td></td> <td>10</td> <td></td> <td>20</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 not-related	5	5		10		20	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																																																																								

	<p>after prior preparation with the teacher. Throughout the semester, the student 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. 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>Duraković, S., Redžepović, S.: Uvod u opću mikrobiologiju. Kugler, 2002., odabrana poglavlja</td> </tr> <tr> <td></td> <td>Lavelle, P., Spain, A.V. 2002. Soil ecology, Springer, New York, selected chapters</td> </tr> </table>	1.	Duraković, S., Redžepović, S.: Uvod u opću mikrobiologiju. Kugler, 2002., odabrana poglavlja		Lavelle, P., Spain, A.V. 2002. Soil ecology, Springer, New York, selected chapters
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3.14 Additional reading	<table border="1"> <tr> <td>1.</td> <td>Vukadinović., V. ; Vukadinović, V. : Soil, fertilization and yield, Osijek, 2016, selected chapters</td> </tr> <tr> <td>2.</td> <td>European commission DG ENV 2010. Soil biodiversity: functions, threats and tools for policy makers – final report</td> </tr> </table>	1.	Vukadinović., V. ; Vukadinović, V. : Soil, fertilization and yield, Osijek, 2016, selected chapters	2.	European commission DG ENV 2010. Soil biodiversity: functions, threats and tools for policy makers – final report
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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</p>				

	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.
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	<p>Interpret information, ideas, problems and solutions to professional and general audiences</p> <p>Advocate an ethical approach to work and to associates in project teams</p> <p>Critically evaluate arguments, assumptions and data in order to form opinions and contribute to solving the problem</p> <p>Solve engineering problems of sustainable development using mathematics, physics, chemistry and biology</p> <p>Analyze the collected data in the field of sustainable development</p> <p>Interdisciplinary to solve engineering problems of sustainable development</p> <p>Formulate simple problems in the field of environmental protection in order to solve them by applying the principles of sustainable development</p> <p>Assess potential risks to the environment and cooperate in the preparation of environmental studies and studies on the impact of the project on the environment</p> <p>Organize effective work in the laboratory, independently or as part of an interdisciplinary team</p>

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.	Introductory part, overview of teaching units of the curriculum Introduction to soil microbiology - the role, significance and diversity of soil microorganisms, historical development of soil microbiology, basic methods of studying soil microorganisms.	Presentation, pp presentation	It defines the basic methods of studying microorganisms in the soil	I1 I2
2.	Microbiology of natural environments; Microorganisms in the pedosphere, Microorganisms in the biosphere.	Presentation, pp presentation	Identify microorganisms in the pedosphere and biosphere	I1 I2
3.	The role of microorganisms in the decomposition of organic residues.	Presentation, pp presentation	Explain the role of microorganisms in	I3

	Organic residues in the soil. Humifiers, Influence of environmental factors on humification. Transformations of organic residues and humus synthesis. Types of humus, Degradation of humus substances in soil.		the decomposition of organic matter	
4.	Microorganisms and the circulation of matter in nature - the role of microorganisms in the carbon cycle in nature.	Presentation, pp presentation	Explain the role of microorganisms in the circulation of matter in nature	13 14
5.	Microbiological processes in the nitrogen cycle in nature Microbiological processes in preserving soil fertility	Presentation, pp presentation	Interpret the process of nitrogen circulation in nature	13 14
6.	Morphological and developmental characteristics of the main representatives of soil fauna; Division of fauna and morphological characteristics of the most important representatives of soil fauna - nematodes, snails, mites, spiders, centipedes and insects. Biology of the main representatives of soil fauna	Presentation, pp presentation	Explain the division of fauna and morphological characteristics of the most important representatives of soil fauna	14 15
7.	Ecology of the main representatives of soil fauna; Influence of biotic and abiotic factors on the composition and abundance of soil fauna, influence of agrotechnical measures and plant protection measures on the composition and abundance of soil fauna.	Presentation, pp presentation	Explain the influence of biotic and abiotic factors on the composition and abundance of soil fauna	14 15
8.	Colloquium 1			11,12,13,14
9.	Soil structure, soil formation, soil microclimate, and soil biogenic structures.	Presentation, pp presentation	Define the microclimate and soil structure	14 15
10.	Substance circulation and thermodynamic equilibrium of soil. Basic physicochemical and thermodynamic processes in soil.	Presentation, pp presentation	Explain physicochemical and thermodynamic processes in soil.	13 14 15
11.	Specificity and diversity of soil life (biology, ecology, research methods), interactions of organisms and soil processes.	Presentation, pp presentation	Connect the interactions of organisms and processes in the soil.	14 15

12.	Rhizosphere processes and applications in agriculture and soil protection.	Presentation, pp presentation	Explain the role of rhizosphere processes in soil	14 15
13.	Degradation, the impact of climate change on soil.	Presentation, pp presentation	Link climate change and soil degradation	1 1
14.	Impacts of eutrophication on environmental changes - impact on habitat, flora and fauna, Indicators of eutrophication in the ecological system.	Presentation, pp presentation	Discuss the problem of eutrophication in the ecological system	15
15.	Colloquium 2			14,5,6
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.	Introduction to soil microbiology - the role, significance and diversity of soil microorganisms, historical development of soil microbiology, basic methods of studying soil microorganisms.	Discovery learning, group, guided	Define the role of microorganisms in soil, the role of soil and methods of studying microorganisms in soil	11 12
2.	Exercise 1 Soil fauna sampling	Laboratory exercises	Isolate microorganisms in the pedosphere	11 12
3.	Exercise 2 Microbiology of natural environments; Microorganisms in the pedosphere	Laboratory exercises, Litter bag method	Understand the process of humus synthesis, define the types of humus and the decomposition of humus substances in the soil	13
4.	Exercise 3 The role of microorganisms in the decomposition of organic residues. Organic residues in the soil. Humifiers, Influence of environmental factors on humification. Transformations of organic residues and humus synthesis. Types of humus, Degradation of humic substances in soil.	Discovery learning, guided (scientific article and show)	Explain the role of microorganisms in the carbon cycle in nature.	13 14

5.	Microorganisms and the circulation of matter in nature - the role of microorganisms in the carbon cycle in nature.	Discovery learning, DHMZ	Interpret microbiological processes in the nitrogen cycle in nature	13 14
6.	Microbiological processes in the nitrogen cycle in nature	discussion	discuss	14 15
7.	Exercise 4, analysis of pedofauna - the most important representatives of the soil fauna - nematodes, snails, mites, spiders, centipedes and insects	Laboratory exercises	Describe and present examples of methods for studying soil fauna and describe representatives of individual groups	14 15
8.	Exercise 5, analysis of pedofauna - the most important representatives of the soil fauna - nematodes, snails, mites, spiders, centipedes and insects	Guest lecturer, discussion,	Describe and present examples of methods for studying soil fauna and describe representatives of individual groups	14 15
9.	Soil structure, soil formation, soil microclimate, and soil biogenic structures.	Discovery learning, independently, scientific literature		14 15
10.	Substance circulation and thermodynamic equilibrium of soil. Basic physicochemical and thermodynamic processes in soil.	Discovery learning, independently, scientific literature		14 15
11.	Specificity and diversity of soil life (biology, ecology, research methods), interactions of organisms and soil processes.	discussion		14 15 1
12.	Guest lecturer	Guest lecturer Examples, discussion		13-5
13.	Influence of texture on root biomass	Laboratory exercises	Explain and comment on the results of laboratory exercises	15 16
14.	seminars	discussion	discuss	11-6
15.	seminars	discussion	discuss	11-6