

Course name: Soil chemistry and microbiology

ECTS	5
Course status	<i>facultative</i>
Course final assessment /evaluation of outcomes	<i>exam</i>
Prerequisite	<i>biology and chemistry at high school level</i>

Main field of study:

Agriculture and Horticulture, Biology and Biotechnology (Erasmus+)

Educational profile	<i>general academic</i>
Code of studies and education level	bachelor/engineer (SI) or master of science (SM)
Semester of studies	<i>winter</i>
Language of instruction	<i>English</i>

Course offered by:

Name of faculty offering the course	Faculty of Biotechnology and Horticulture
Name of department offering the course	Department of Plant Biology and Biotechnology
Course coordinator	dr hab. inż. Agnieszka Lis-Krzyścin

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE – student knows and understands:			
SCM_W1	the range of solid soil phase and composition of the soil set, identify the common primary and secondary minerals	EPB2_W03	R
SCM_W2	the distinction between ion exchange, adsorption, dissolution, and precipitation reactions	EPB2_W03	R
SCM_W3	the soil and environmental biogeochemical processes important for soil development and nutrients source	EPB2_W03	R
SCM_W4	the indigenous microbiota of soils of different types, including bacteria and microscopic fungi	EPB2_W01 EPB2_W02 EPB2_W03	R
SCM_W5	the role of soil microbiota in environmental element cycling and soil formation	EPB2_W01 EPB2_W02 EPB2_W03	R
SCM_W6	the basic interactions between microorganisms and soil minerals, and plants	EPB2_W01 EPB2_W02 EPB2_W03	R
SKILLS – student is able to:			
SCM_U1	distinguish between types of soils, describe their properties	EPB2_U01 EPB2_U06	R
SCM_U2	determine carbon and humus content in soil (annealing and Tiurin methods)	EPB2_U01 EPB2_U06	R
SCM_U3	analyse the CEC	EPB2_U01 EPB2_U06	R
SCM_U4	distinguish between microorganisms inhabiting unpolluted and contaminated soils	EPB2_U01 EPB2_U05	R
SCM_U5	describe the most important soil microorganisms beneficial for plant growth	EPB2_U01 EPB2_U05	R
SOCIAL COMPETENCIES – student is ready to:			
SCM_K1	work individually and in a team, respect their own and the work of others	EPB2_K02	R
SCM_K2	take responsibility for state and development of the natural environment	EPB2_K04	R

SCM_K3	take responsibility for the safety of their own work, work of others, and of the entrusted equipment	EPB2_K05	R
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Teaching contents

Lectures		20	hours
Topics	Soil mineralogy. Weathering processes in soils. Phyllosilicates. Soil colloids. Chemistry of soil organic matter. Sorption in soils, ion exchange. Soil acidity. Microbiota of soils – preliminary characterization The role of microorganisms in biogeochemical element cycling, soil formation and properties Interactions between soil microorganisms, microorganisms and plants, and with soil minerals. Plant growth-promoting bacteria and fungi Soil microbial pathogens Microbiology of contaminated soils		
Accomplished learning outcomes		SCM_W1-W6, SCM_K1	
Means of verification, rules and criteria of assessment		test, presentation (70% share in the final assessment)	
Classes		10	hours
Topics	Determination of carbon and humus contents in soils Analyze of CEC Isolation, frequency determination and preliminary characterization of autochthonous microorganisms from different soil samples.		
Accomplished learning outcomes		SCM_U1-U5, SCM_K1-K3	
Means of verification, rules and criteria of assessment		class reports (30% share in the final assessment), essay on a selected topic	

References:

Basic	Strawn D.G., Bohn H. L., O'Connor G. A. 2020. <i>Soil Chemistry</i> . Wiley-Blackwell. ISBN-10 1119515181 Sparks D. L., Singh B., Siebecker M.G. 2023. <i>Environmental Soil Chemistry</i> . Academic Press. ISBN-10 0443140340 Torsvik V., Ovreas L. 2002. <i>Microbial diversity and function in soil: from genes to ecosystems</i> . <i>Curr. Opin. Microb.</i> 5: 240-245
Supplementary	Huang, P.M. 2004. <i>Soil mineral - organic matter – microorganism interaction: fundamentals and impacts</i> . <i>AdvAgron.</i> 82: 391-472 Essington M. E. 2021. <i>Soil and Water Chemistry</i> . CRC Press. ISBN-10 1032098694 Tilak K.V.B.R., Ranganayaki N., Pal K.K., De R., Saxena A.K., Shekhar Nautiyal C., Mittal S., Tripathi A.K., Hohri B.N. 2005. <i>Diversity of plant growth and soil health supporting bacteria</i> . <i>Curr. Sci.</i> 89: 136-150

Structure of learning outcomes

Area of academic study: agriculture and horticulture	5.0 ECTS**
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Structure of student activity

Contact hours	35	hrs.	1.4	ECTS**
Including:				
lectures	20	hrs.		
classes and seminars	10	hrs.		
consultations	3	hrs.		
participation in research	...	hrs.		
obligatory traineeships	...	hrs.		
participation in examination	2	hrs.		
e-learning	...	hrs.	...	ECTS**
student own work	90	hrs.	3.6	ECTS**

*areas of academic study in the fields of: P – biological sciences; R – agriculture and horticulture
** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25 - 30 hours of classes