

## COURSE DESCRIPTION CARD

Faculty of Civil Engineering and Environmental Sciences										
Field of study								Degree level and programme type		
Specialization/ diploma path								Study profile	academic profile	
Course name	Simulating water flow and reactive solute transport							Course code	IS-FCEE-00204W	
								Course type	Erasmus	
Forms and number of hours of tuition	L	C	LC	P	SW	FW	S	Semester	winter	
					30			No. of ECTS credits	4	
Entry requirements	<i>does not concern</i>									
Course objectives	Student can create, run, and view results for a simulation of flow and reactive solute transport through variably saturated porous media.									
Course content	<p><u>Specialization workshop:</u> Building a computer model for examination of water and contaminant movement through various different hydrologic regimes. Use of this tool for hypothesis testing (for example, for looking at the influence that the shape, position, and hydraulic characteristics of a layer of low permeability have on the movement of a contaminant infiltrating from the soil surface). Learning the basics of soil physics and subsurface contaminant transport. Showing the applications of the model for studies of ground-water recharge, surface-water-ground-water exchange, and contaminant transport from waste disposal sites.</p>									
Teaching methods	specialization workshop									
Assessment method	specialization workshop: final report with calculations									
Symbol of learning outcome	Learning outcomes							Reference to the learning outcomes for the field of study		
L01	Student knows the phenomena and processes simulated in the solute transport model.							IS1_W07		
L02	Student can find the appropriate data needed to build the model.							IS1_U04		
L03	Student is able to interpret the results of model tests.							IS1_U14		

Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed	
L01	final report with calculations	SW	
L02	final report with calculations	SW	
L03	final report with calculations	SW	
Student workload (in hours)		No. of hours	
Calculation	participation in specialization workshop	30	
	participation in consultations	5	
	preparation of both calculations and final report	45	
		<b>TOTAL:</b>	<b>80</b>
Quantitative indicators		HOURS	No. of ECTS credits
<b>Student workload – activities that require direct teacher participation</b>		35 h	1,5
<b>Student workload – practical activities</b>		75 h	3,0
<b>Basic references</b>	<p>Haile, Sosina S. 2013. VS2DRT: Variable saturated two dimensional reactive transport modeling in the vadose zone. Freiberg Online Geoscience 34: 1–152.</p> <p>Healy R.W., Ronan A.D., 1996. Documentation of computer program VS2DH for simulation of energy transport in variably saturated porous media -- modification of the U.S. Geological Survey's computer program VS2DT: U.S. Geological Survey Water-Resources Investigations Report; 96-4230, 36 p.</p> <p>Hsieh P.A., Wingle W., Healy R.W., 2000. VS2DI--A graphical software package for simulating fluid flow and solute or energy transport in variably saturated porous media: U.S. Geological Survey Water-Resources Investigations Report; 99-4130, 16 p.</p> <p>Parkhurst D.L., Wissmeier L., 2015. PhreeqcRM: A reaction module for transport simulators based on the geochemical model PHREEQC. Advances in Water Resources; 83: 176–189.</p>		
<b>Supplementary references</b>	Han D., 2010. Concise Hydrology. eBooks at bookboon.com		
<b>Organisational unit conducting the course</b>	<b>Department of Agri-Food Engineering and Environmental Management</b>	<b>Date of issuing the programme</b>	
<b>Author of the programme</b>	<b>dr Piotr Kondratiuk</b>	<b>25.02.2020</b>	

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar