COURSE DESCRIPTION CARD

<table>
<tr><td colspan="10">Faculty of Civil Engineering and Environmental Sciences</td></tr>
<tr><td>Field of study</td><td colspan="6"></td><td colspan="2">Degree level and programme type</td><td></td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6"></td><td colspan="2">Study profile</td><td>Academic profile</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Hydraulics and hydrology</td><td colspan="2">Course code</td><td>IS-FCEE-00167S</td></tr>
<tr><td colspan="2">Course type</td><td>Erasmus</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>summer</td></tr>
<tr><td>15</td><td></td><td></td><td>15</td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>3</td></tr>
<tr><td>Entry requirements</td><td colspan="9">Mathematics I, Physics I, Engineering geology and petrography</td></tr>
<tr><td>Course objectives</td><td colspan="9">Knowledge and understanding the basics of: statics and dynamics of liquids and gases, static and dynamic interaction of liquids and gas on buildings and their elements, ground water flow, design of pipe systems and open channels, basis of hydrology and water management.</td></tr>
<tr><td>Course content</td><td colspan="9">Lectures: Physical and mechanical properties of liquids and gases. Liquid pressure on straight, inclined and curved walls. Fluid pressure. Equilibrium of bodies completely or partially submerged in liquid. Laminar and turbulent movement. Bernoulli's equation for ideal and real liquids. The principle of keeping the moments at the flow of liquids and gases in pipes. Ground water flow. Open channels. Protection and sealing of open channels. Light of bridges and culverts. Water cycle in nature. Watercourse and catchment. Catchment water balance. Basics of hydrometry and hydrography. Water management.
Project: Examples of fluid pressure on vertical, inclined and curved walls. Calculations of energy grade line (EGL) and hydraulic grade line (HGL) at liquids flow in the pipes. Design principles for simple and complex open channels. Exemplary project of a ring drainage of a small building.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">Problem lecture, informative lecture, project exercises</td></tr>
<tr><td>Assessment method</td><td colspan="9">Lecture - colloquium, Project - execution and defence of three projects</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="7">Knows the basic physical and mechanical properties of liquids and gases as well as static and dynamic effect of liquids on structural elements.</td><td colspan="2">K_B1_W01
K_B1_W03</td></tr>
<tr><td>LO2</td><td colspan="7">Knows and understands the laws of fluid movement in pipes and open channels.</td><td colspan="2">K_B1_W05
K_B1_U01</td></tr>
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LO3	Knows and understands the issues of water circulation in nature and ground water flow in the soil.	K_B1_W01
LO4	Knows the basic issues of hydrology and hydrometry and water management.	K_B1_W01
LO5	Is able to present diagrams of liquid pressure on vertical, inclined and curved walls.	K_B1_W01 K_B1_U01
LO6	Is able to calculate the parameters of liquid movement in pipes and open channels.	K_B1_W01 K_B1_U01 K_B1_U05
LO7	Is able to design the elements of horizontal drainage.	K_B1_W01 K_B1_U01 K_B1_U05
LO8	He is ready to the critical evaluation his knowledge and possibilities of its continuous widen.	K_B1_U15 K_B1_K01
Symbol of learning outcome	**Methods of assessing the learning outcomes**	**Type of tuition during which the outcome is assessed**
LO1	written colloquium	L
LO2	written colloquium, project tasks	L, P
LO3	written colloquium, project tasks	L, P
LO4	written colloquium	L
LO5	project tasks	P
LO6	written colloquium, project tasks	L, P
LO7	written colloquium, project tasks	L, P
LO8	defense of project tasks	P
Student workload (in hours)		**No. of hours**
Calculation	lecture attendance	15
	participation in projects classes	15
	preparation and execution of the projects	20
	preparation for and participation in colloquium /tests	20
	preparation for defense and projects defense	5
	participation in student-teacher sessions related to the project classes	5
	TOTAL:	**80**

Quantitative indicators	**HOURS**	**No. of ECTS credits**
Student workload – activities that require direct teacher participation	40	1,5
Student workload – practical activities	65	2,5

Basic references	1. Bedinet P.B., Huber W.C.: Hydrology and floodplain analysis. Addison-Wesley Publishing Company, USA, 1988. 2. Featherstone R.E., Nalluri C.: Civil Engineering Hydraulics. Wiley-Blackwell, 2007. 3. Mott R.L.: Applied Fluid Mechanics. Pearson Education Limited, 2016.

	4. Marriott M. J., Featherstone R.E., Nalluri C.: Civil engineering hydraulics, 5th edition, John Willey & Sons, Ltd., UK, 2009.	
Supplementary references	1. Knight D.W., Mc Gahey C., Lamb R., Samuels P.G.: Practical Channel Hydraulics. Taylor & Francis Group, 2010. 2. Sokołowski J., Żbikowski A.: Odwodnienia budowlane i osiedlowe. Wyd. SGGW, Warszawa, 1993 (in Polish). 3. Kubrak J.: Hydraulika techniczna. Wyd. SGGW, Warszawa, 1998 (in Polish)	
Organisational unit conducting the course	**Department of Geotechnics and Structural Mechanics**	**Date of issuing the programme**
Author of the programme	**Zenon Szypcio, DSc, PhD, Eng** **Katarzyna Dołżyk – Szypcio, PhD, Eng**	**08.03.2021**

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