STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Hydraulics and Hydrology**		Code **1010101131010131219**
Field of study **Civil Engineering First-cycle Studies**	Profile of study (general academic, practical) **(brak)**	Year /Semester **2 / 3**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **15** Classes: **15** Laboratory: **-** Project/seminars: **-**		No. of credits **2**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **100 2%** **100 2%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge of the mathematics (algebraic equations, geometry, stereometry, integral and differential calculus) and physics (mechanics, thermodynamics)
2	**Skills**	Student should be capable to apply knowledge to solve practical problems
3	**Social competencies**	Student should be aware of results of taken decisions

Assumptions and objectives of the course:

Presentation of basics of fluid mechanics and hydrology

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows rules of hydrostatic pressure calculatuions and laws describing the pressure distribution in fluid (lect.) - [K_W01, K_W09]
2. Student knows equations of steady, uniform flow in open channels, pipelines and porous media (lect.) - [K_W01, K_W10, K_W13]
3. Student knows rules of calculations of design storms and flows for dimensioning of drainage and hydraulic structures (lect.) - [K_W01, K_W06, K_W17]

Skills:

1. Student can compute the hydrostatic pressure value (class) - [K_U02, K_U08]
2. Student can compute the open channels and pipelines parameters (class) - [K_U02, K_U08]
3. Student can evaluate design storms and flows parameters (class) - [K_U02, K_U08]

Social competencies:

1. Student is aware of the necessity of critical review of calculation results (class) - [K_K02, K_K09]
2. Student is aware of the necessity of risk evaluation in drainage and hydraulic structures designing (lect.) - [K_K02, K_K10]

Assessment methods of study outcomes

Lectures - written test (15 -20 questions, duration up to 30 min) (effects W1, W2, W3, K2)

Exercises - written test (3-4 problems, duration up to 60 min) and activity (effects U1, U2, U3, K1)

Course description

Physical properties of fluids, real and ideal fluids, forces in fluids. Statics of fluids - basic equation of fluid equilibrium and its application, fluid instruments for pressure measurement, hydrostatic pressure on flat and curved surfaces, hydrodanamic pressure, diagram of pressure. Basic notion of fluid motion. Dynamics of ideal fluid: Bernoulli?s equation and it's interpretation. Motion of real fluid: Reynolds?s experiment, laminar and turbulent flow. Hydraulics of pipelines: linear and local head losses, diagram of piezometric head pressure, hydraulic calculation of single pipeline, siphon, calculation of long pipelines, system of pipe, reservoirs. Fluid motion in pressureless pipelines: steady state flow in open channels, sewage channels, critical flow. Flows in porous media: Darcy?s law, hydraulic conductivity coefficient, inflow to drainage ditch, wells. Hydrological cycle, rainfall-runoff transformation, rainfall characteristics, design storms and flows, IDF-curves.

Basic bibliography:

1. Mitosek M.: Mechanika płynów w inżynierii środowiska, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1997

2. Orzechowski Z., Prywer J., Zarzycki R.: Mechanika płynów w inżynierii środowiska, Wydawnictwa Naukowo-Techniczne, Warszawa 1997

3. Pociask-Karteczka J.: Zlewnia. Właściwości i procesy, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków 2006

Additional bibliography:

1. Ciesielski J.: Zbiór zadań z mechaniki płynów dla kierunku Inżynieria Środowiska (cz. 1), Wydawnictwo Politechniki Poznańskiej, 1986

2. Lambor J.: Hydrologia inżynierska, Wydawnictwo Arkady, Warszawa 1970

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures (contact hours)	15
2. Participation in excersises (contact hours)	15
3. Prepration for excersises (work at home)	10
4. Preparation for test (work at home)	8
5. Presence on the tests (contact hours)	2

Student’s workload

Source of workload	hours	ECTS
Total workload	50	2
Contact hours	32	1
Practical activities	0	0