Course name: *Hydrological extreme events*

ECTS	4.0
Course status	*facultative*
Course final assessment /evaluation of outcomes	*Graded credit*
Prerequisite	*knowledge and skills in mathematics, meteorology and climatology*

Main field of study: *Engineering and Water Management*

Educational profile	*General academic*
Code of studies and education level	*bachelor*
Semester of studies	*Winter / summer*
Language of instruction	*English*

Course offered by:

Name of faculty offering the course	*Faculty of Environmental Engineering and Land Surveying*
Name of department offering the course	*Department of Sanitary Engineering and Water Management*
Course coordinator	*Dr. Eng. Agnieszka Cupak, Ph.D.*

Learning outcomes:

Symbol of outcome	Description of the learning outcome	Reference to main field of study outcomes	Area symbol*
KNOWLEDGE - student knows and understands:			
HEE_K1	hydrological extreme events, its causes in a catchment (floods, low flows). Be able to determine the threshold flow of minimum and maximum. Can identify methods and mathematical models used in hydrological forecasting.	IGW1_W04 IGW1_W11	T
SKILLS - student is able to:			
HEE_S1	calculate hydrological characteristics related to extreme events (floods and low flows) and interpret the results obtained.	IGW1_U01 IGW1_U02	T
SOCIAL COMPETENCIES - student is ready to:			
HEE_C1	creative solving of unusual problems in management of water resources in the river basin.	IGW1_K04	T

Teaching contents:

Lectures:		15 hours
Topics	Definitions, classification and parameters of floods, low flows and droughts. Conditions of rainfall-runoff formation in small catchments.	
	Causes and development of low flows.	
	Characteristics and forecasting of extreme events (terms, definitions). Methods of hydrological forecasting. Use of mathematical modelling in hydrological forecasting.	
	Determination of threshold flow of maximum and low flows. Severity measures of low flows.	

	Excess and shortage of water in the riverbed. Mitigation of floods and droughts.
Accomplished learning outcomes	*HEE_K1; HEE_C1*
Means of verification, rules and criteria of assessment	*Single-choice test, positive assessment should be given at least 50% of correct answers to given questions: <50% - insufficient (2.0); 50-60% - sufficient (3.0); 61-70% - satisfactory plus (3,5); 71-80% - good (4.0); 81-90% - good plus (4,5); 91-100% - very good (5.0).* *The share of the lecture grade in the final grade is 50%.*

Classes:	15 hours
Topics	Floods - quantitative characteristics of floods. Determination of threshold low flow. Severity measures of low flows.

Accomplished learning outcomes	*HEE_S1*
Means of verification, rules and criteria of assessment	*Passing 2 reports on exercises - a grade from exercises is an arithmetic average of formative grades* *The share of the grade for the project exercises in the final grade of the subject is 50%.*

References:

Basic	*1. Ven Te Chow, Maidment D., Mayhs L. W. 2013. Applied hydrology. McGraw-Hill.* *2. Maidment D. V. 1993. Handbook of Hydrology. McGraw-Hill.*
Supplementary	*1. Ferrier R. C., Jenkins A. 2010. Handbook of Catchment Management. Wiley-Blackwell.*

Structure of learning outcomes:

Area of academic study: R - Agricultural, forestry and veterinary sciences	0.0	ECTS **
Area of academic study: T - technical sciences	4.0	ECTS**

Structure of student activity:

Contact hours	35	hrs.	1.4	ECTS**
Including: lectures	15	hrs.		
classes and seminars	15	hrs.		
consultations	2	hrs.		
participation in research	0	hrs.		
obligatory traineeships	0	hrs.		
participation in examination	3	hrs.		
e-learning	0	hrs.	0.0	ECTS**
student own work	65	hrs.	2.6	ECTS**

*Areas of academic study in the fields of: A - the arts; H - humanities; M - medical, sport and health sciences; N - natural sciences; P - biological sciences; R - agricultural, forestry and veterinary sciences; S - social studies; T - engineering and technology

** stated with an accuracy to 0.1 ECTS, where 1 ECTS = 25-30 hours of classes