GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Urban catchment hydrology, PG_00059948						
Field of study	Environmental Engineering						
Date of commencement of studies	February 2026		Academic year of realisation of subject	2025/2026			
Education level	second-cycle studies		Subject group	Optional subject group Subject group related to scientific research in the field of study			
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	1		ECTS credits	4.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Department of Geotechnical and Hydraulic Engineering -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Katarzyna Weinerowska-Bords				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	15.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours	Self-study		SUM
	Number of study hours	60		5.0	48.0		113
Subject objectives	Recognizing and understanding the problems of the impact of urbanization on hydrological processes and the formation of runoff from the catchment. Ability to select and apply computational methods and tools. Undertanding the relationship between the type, scale and rank of the problem and the method of solution and the required accuracy of calculations. Understanding of non-technical aspects affecting the work of an engineer. Developing the skills of critical evaluation of analyzes Sensitization to engineering mindfulness.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
K7_W06	Student has in-depth knowledge of the correct selection of parameters and methods of calculating the flow in the network of open channels. He knows the engineering tool supporting calculations of unsteady flow in a network of channels or stormwater sewers/collectors.	[SW1] Assessment of factual knowledge
K7_W09	Student has in-depth knowledge of the mathematical description of processes conditioning the outflow of urbanized basins. Student knows simplified and more complex methods for determining the outflow from the catchment. Recognizes and understands the non-technical aspects of engineering activities in determining the outflow of rainwater from the urbanized basin.	[SW1] Assessment of factual knowledge
K7_U06	Student can determine the amount of rainwater in catchment runoff. Student can assess the capacity of existing channels. Student can select and adjust computational methods to runoff calculation in the analyzed case. Evaluates the influence of the choice of the method and computational simplifications on the efficiency and accuracy of the solution.	[SU1] Assessment of task fulfilment [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
K7_U03	Student is able to prepare reports on the analyzes of the amount of stormwater requiring management in the catchment area. Student is able to select and present the key results of calculations, interpret them and draw conclusions.	[SU2] Assessment of ability to analyse information [SU5] Assessment of ability to present the results of task

Subject contents

Course content – lecture

Lecture: Hydrological cycle in a natural and urbanized catchment. Processes determining the formation of runoff from the catchment. Urbanized catchment and its specificity. Definition of the "rain-runoff" model and classification of models used in calculations supporting design. Physical and geographical characteristics of the catchment and their influence on the formation of the outflow from the catchment. Rain as the basic factor determining runoff from the catchment. Precipitation formulas. The concentration time of runoff from a catchment - definition, methods of determination and role in runoff calculations. Global and integrated catchment runoff modeling. Synthetic hyetograms. Methods of determination of effective precipitation. Conceptual and hydrodynamic models of surface runoff and channel flow. Fundamentals of applying HEC-HMS software. Tutorials: practical aspects of determining the parameters and calculating runoff from the catchment. Exercises in determining selected catchment characteristics. Calculation of the runoff concentration time from the catchment, selection of the authoritative rain, the use of global models to determine the culminating value of the runoff intensity and the amount of rainwater to be managed in the catchment. Project: catchment analysis and calculations of the amount of rainwater using two types of models - global and integrated. Practical applying HEC-HMS software. Comparison of results. Discussion of the impact of simplifications on the obtained calculation results.

Prerequisites and co-requisites

Basic knowledge of hydrology and simple methods of calculating the design discharge in a stormwater drainage system is required.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project - tasks and reports	100.0%	17.5%
Final exam (lectures, theory)	60.0%	30.0%
Tutorials - final test	60.0%	25.0%
Tutorials (excercises)	70.0%	10.0%
Project - final test	60.0%	17.5%

Recommended reading	Basic literature	1. Weinerowska-Bords K. : Hydrologia obszarów miejskich opowiedziana inaczej. Wydawnictwo Politechniki Gdańskiej, Gdańsk (2022) 2. Weinerowska-Bords K. : Wpływ uproszczeń na obliczanie spływu deszczowego w zlewni zurbanizowanej. Wydawnictwo Politechniki Gdańskiej, Gdańsk (2010) 3. Hydrologic Modeling System HEC-HMS. Technical Reference Manual https://www.hec.usace.army.mil/software/hec-hms/documentation.aspx 4. Hydrologic Modeling System HEC-HMS. Users Manual (2022) https://www.hec.usace.army.mil/software/hec-hms/documentation.aspx
	Supplementary literature	5. Szymkiewicz R., Gąsiorowski D. :Podstawy hydrologii dynamicznej. Wydawnictwa Naukowo-Techniczne, Warszawa (2010)6. Banasik K. : Wyznaczanie wezbrań powodziowych w małych zlewniach zurbanizowanych, Wydawnictwo SGGW, Warszawa (2009)7. Kotowski A. : Podstawy bezpiecznego wymiarowania odwodnień terenów. Wydawnictwo Seidel-Przywecki, Warszawa (2011)8. Edel R. : Odwodnienie dróg. Wyd. Komunikacji i Łączności, Warszawa (2009)9. Ozga-Zieliński B. (red): Modele probabilistyczne opadów maksymalnych o określonym czasie trwania i prawdopodobieństwie przewyższenia projekt PMAXTP. Seria Publikacji naukowo-Badawczych IMGW-PIB, Warszawa (2022).10. Kotowski A., Kaźmierczak B., Dancewicz A. :Modelowanie opadów do wymiarowania kanalizacji, Monografia PAN, Warszawa (2010)11. Highway Hydrology. Publ. of US Department of Transportation (2002)12. Akan, A.O., Houghtalen, R.J.: Urban Hydrology, Hydraulics and Stormwater Quality. Engineering Applications and Computer Modeling. John Wiley and Sons, Inc. (2003)13. Chow, V.T.: Handbook of Applied Hydrology. McGraw Hill Book Company, New York (1964)14. McCuen, R. H.: Hydrological Analysis and Design. Practice Hall, Englewood Cliffs, New Jersey (2005)
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Explain the impact of urbanization processes on the course of a selected hydrological process in urban areas (e.g. infiltration, interception) 2. Explain the term of time of runoff concentration and its role in hydrological calculations. 3. Determine the the time of runoff concentration in the analyzed area. 4. Using the rational method, determine the peak value of the outflow rate from the selected area. 5. Explain the role (in the hydrological context) of the lag coefficient in the method of constant rainfall rates.	
Practical activites within the subject	Not applicable	

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