



## Subject card

Subject name and code	Sewerage Systems, PG_00059951						
Field of study	Environmental Engineering						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle studies	Subject group			Obligatory subject group in the field of study 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	2	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Sanitary Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Ryszard Orłowski					
	Teachers	dr inż. Ryszard Orłowski dr inż. Maria Orłowska-Szostak					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	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		62.0	127
Subject objectives	Supplying students with the tidied up, possibly complete knowledge and abilities enabling to perform design and analytical works for the sewage and rain water systems with the use the professional software. Teaching students proper use this software based on the deepened knowledge from the scope of the simultaneousness of the sewage outfall from objects, as well as from the scope of hydraulics, new methods of dimensioning and technical solutions applied in classical sewage systems as well as nonconventional sewage systems.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_U10	He is able to design the developed system of a sanitary sewage system and rain waters system from the area of the urbanized area.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	K7_W06	He has an expanded and deepened the hydraulic knowledge necessary in the design of sewer systems; knows professional computer programs assisting the design.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge
	K7_W04	The student has possibly complete knowledge and abilities enabling to perform optimal design and analytical works for the sewage and rain water systems with the use the professional software and taking into account the art of state operation of these systems.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation
	K7_U07	He has some widened and deepened knowledge in a range of sewer systems design and the systems draining off water from the urbanized area; he knows modern technologies in the object systems and professional computer programs assisting the design. He is able to evaluate and choose the most appropriate, in given conditions, sewage system taking into account all the technical and economic aspects.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	K7_U06	He can use computer models for solving problems of analysis or design of the sewer systems. Modifying models enables him the optimum description of analysed and designed systems.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools
Subject contents	<p><b>LECTURES (A) Modelling and dimensioning of the systems of sewage transport:</b> <i>Gravitational network of a sanitary sewage system:</i> Content of the set of calculations (determining the authoritative flows, calculations performed while dimensioning of pipelines), division of applied methods in a sanitary sewage system. Methods applied in tasks of the design type. Computer modelling of unsteady flows in the sewage gravitational-pressure system. <i>Gravitational network of a rain drain system:</i> Methods applied in tasks of the design type. Computer modelling of the unsteady outflow from the urbanised drainage area (i.e. systems of draining off /developing sewers and rain waters and thaw waters from the areas). <i>Unconventional sanitary sewage systems:</i> Dimensioning of the pressure sewage system based on the simulation of extreme situations. Dimensioning of the vacuum sewage system based on the simulation of extreme situations. <b>(B) Chosen methods of the optimization of sewage systems.</b> The problem of the global optimization of the sewage system. Optimization of the gravitational-pressure sewage transport system by known routes of pipes.</p> <p>EXERCISES: Review of the professional software used for the computer assisted design of the gravitational sewage system and pump stations in the gravitational-pressure sewage system, in this, among others, the control of operation of computer programs for generating design/reliable flows taking into account the unsimultaneousness of the sewage outfall to a sewer system, classical dimensioning and simultaneous dimensioning based on the method of shear stress. Individual projects of fragments of sewer systems performed with the use the professional software. The exercises (performed in students group) in the scope of dimensioning of the pressure and the vacuum sewage systems. Introduction to the storm water management model.</p>		
Prerequisites and co-requisites	Ranked basic program of the subject "Sewage systems". Acquaintance of bases of hydraulics, of description of the flow in channels. Basic acquaintance of numerical methods, including the general knowledge in the scope of methods of solving non-linear sets of equations. Acquaintance of the program Auto Cad.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Design exercise	85.0%	45.0%
	Written exam	65.0%	55.0%

Recommended reading	Basic literature	<p>1. Błaszczyk Wł. i in. <i>Kanalizacje t. I: Sieci i pompownie</i>, Warszawa: Arkady 1979r. i kolejne wznowienia</p> <p>2. Agnieszka Stuzalec <i>PROJEKTOWANIE SIECI KANALIZACYJNYCH Studia i Materiały Informatyki Stosowanej, Tom 4, Nr 9, 2012, str. 17-28</i></p> <p>3. Andrzej Wartalski, Jerzy Wartalski: <i>Projektowanie hydrauliczne rurociągów z tworzyw sztucznych. Ochrona Środowiska 2000, 1(76)</i>, 4. wyd. WİLO: <i>Kanalizacja ciśnieniowa w systemie WİLO PORADNIK dla projektantów</i>, Warszawa 2002r.</p> <p>5. wyd. ROEDIGER POLSKA: <i>System kanalizacji próżniowej przeznaczony do odprowadzania ścieków z obszarów zabudowanych</i>, Białystok, Gdańsk, Bielsko-Biała, 2001r.</p> <p>6. Marek Kalenik: <i>Zasady projektowania i budowy kanalizacji podciśnieniowej</i>. Szkoła Główna Gospodarstwa Wiejskiego, Wydział Budownictwa i Inżynierii Środowiska, Katedra Inżynierii Budowlanej, Zakład Wodociągów i Kanalizacji (<a href="https://infrastruktura.um.warszawa.pl/sites/infrastruktura.um.warszawa.pl/files/zasady_projektowania_i_budowy_kanalizacji_podcisnieniowej_-_seminarium.pdf">https://infrastruktura.um.warszawa.pl/sites/infrastruktura.um.warszawa.pl/files/zasady_projektowania_i_budowy_kanalizacji_podcisnieniowej_-_seminarium.pdf</a>)</p> <p>7. Program Net-San firmy Instal-Soft Opis programu, instrukcja obsługi,</p> <p>8. GRUNDFOS: Program Doboru Pomp i Przepompowni Ścieków SUPO Opis programu, instrukcja obsługi,</p> <p>9. Ireneusz Nowogoński: <i>Epa SWMM 5.1, Wykorzystanie i rozbudowa modelu sieci kanalizacyjnej</i> 2018-04-25 (<a href="https://www.iis.uz.zgora.pl/files/SWMM-instr.pdf">https://www.iis.uz.zgora.pl/files/SWMM-instr.pdf</a>)</p> <p>10. Katalogi firmowe / poradniki dla projektantów dostępne w Internecie: PipeLife, WAVIN, HOBAS, GRUNDFOS, WİLO in.</p> <p>11. Orłowska M., Orłowski R.: <i>Wymiarowanie kanalizacji ciśnieniowej</i>. W: materiałach II Konferencji Naukowo Technicznej <i>INSTALACJE WODOCIĄGOWE I KANALIZACYJNE PROJEKTOWANIE WYKONAWSTWO EKSPLOATACJA</i>. Warszawa Dębe, 15-16.05.2007r.</p> <p>12. Orłowska-Szostak M., Orłowski R.: <i>Wyznaczenie i symulacje sytuacji miarodajnych przy wymiarowaniu kanalizacji ciśnieniowej</i>. Prace Naukowe Politechniki Warszawskiej, seria: <i>Inżynieria Środowiska</i>, z.57, Oficyna Wydawnicza PW, Warszawa 2019r.</p> <p>13. Andrzej Wartalski, Jerzy Wartalski: <i>Projektowanie hydrauliczne rurociągów z tworzyw sztucznych (w tym metoda naprężeń stycznych/ścinających)</i>. <i>Ochrona Środowiska</i>, 1(76) 2000r., str. 19-24.</p>
	Supplementary literature	<p>1. Findeisen, Wł. (1985). <i>Analiza systemowa</i>. PWN, Warsaw, Poland.</p> <p>2. Szymkiewicz R.: <i>Metody numeryczne w inżynierii wodnej</i>, Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2007</p> <p>3. Nowogoński Ireneusz: <i>Epa SWMM 5.1. Wykorzystanie i rozbudowa modelu sieci kanalizacyjnej</i>, 2018-04-25.</p> <p>4. Orłowska-Szostak M., Orłowski R.: <i>Wymiarowanie kanalizacji ciśnieniowej oparte o analizę miarodajnych sytuacji eksploatacyjnych</i>, materiały <i>Seminarium - Warsztatów nt. Modelowanie systemów kanalizacyjnych</i>. Politechnika Łódzka, Wydział Budownictwa, Architektury i Inżynierii Środowiska; Polska Akademia Nauk, Komitet Inżynierii Lądowej i Wodnej, Sekcja Inżynierii Sanitarnej. Łódź, 30 listopada 2012 r.</p> <p>5. KWH Poradnik: <i>SYSTEMY GRAWITACYJNE, WŁAŚCIWOŚCI, PROJEKTOWANIE, MONTAŻ</i>, 2019r.</p>
	eResources addresses	<p>Adresy na platformie eNauczanie:</p> <p>Kanalizacje (z projektowaniem komputerowym) - stacjonarne_2023/2024 - Moodle ID: 32472  <a href="https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32472">https://enauczanie.pg.edu.pl/moodle/course/view.php?id=32472</a></p>
Example issues/ example questions/ tasks being completed	<p>Project of the fragment of a gravitational-pressure sewer system performed with applying the professional software.</p> <p>The project taking into account the unsimultaneousness of the sewage outfall and the method of shear stress.</p> <p>Dimensioning of the pressure sewage system based on the simulation of extreme situations with the use of EPANET subroutine.</p> <p>Dimensioning of the vacuum sewage system based on the simulation of extreme situations.</p>	
Work placement	Not applicable	