GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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|---|---|---|---|---|---|---|---|
| Subject name and code | Sewerage Systems, PG_00059951 | | | | | | |
| Field of study | Environmental Engineering | | | | | | |
| Date of commencement of studies | February 2024 | | Academic year of realisation of subject | | 2024/2025 | | |
| Education level | second-cycle studies | | Subject group | | Obligatory subject group in the field of study<br>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 | | | | | | |
| 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 |
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| 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. | [SU4] Assessment of ability to use methods and tools<br>[SU5] Assessment of ability to present the results of task |
| 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. | [SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| 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. | [SW2] Assessment of knowledge contained in presentation<br>[SW3] Assessment of knowledge contained in written work and projects |
| 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. | [SW1] Assessment of factual knowledge<br>[SW2] Assessment of knowledge contained in presentation |
| 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. | [SU1] Assessment of task fulfilment<br>[SU3] Assessment of ability to use knowledge gained from the subject<br>[SU4] Assessment of ability to use methods and tools |

## Subject contents

LECTURES **(A) Modelling and dimensioning of the systems of sewage transport:** *Gravitational network of a sanitary sewage system:* 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. *Gravitational network of a rain drain system:* 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). *Unconventional sanitary sewage systems:* 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) Chosen methods of the optimization of sewage systems.** The problem of the global optimization of the sewage system. Optimization of the gravitational-pressure sewage transport system by known routes of pipes.

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.

## 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 |
|---|---|---|
| Written exam | 65.0% | 55.0% |
| Design exercise | 85.0% | 45.0% |

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| Recommended reading | Basic literature | **1.**Błaszczyk Wł. i in. Kanalizacje t. I: Sieci i pompownie, Warszawa: Arkady 1979r. i kolejne wznowienia **2.** Agnieszka Służalec PROJEKTOWANIE SIECI KANALIZACYJNYCH *Studia i Materiały Informatyki Stosowanej, Tom 4, Nr 9, 2012, str. 17-28* **3.** Andrzej Wartalski, Jerzy Wartalski: Projektowanie hydrauliczne rurociągów z tworzyw sztucznych. Ochrona Środowiska 2000, 1(76), **4.** wyd. WILO: Kanalizacja ciśnieniowa w systemie WILO PORADNIK dla projektantów, Warszawa 2002r. **5**. wyd. ROEDIGER POLSKA: System kanalizacji próżniowej przeznaczony do odprowadzania ścieków z obszarów zabudowanych, Białystok, Gdańsk, Bielsko-Biała, 2001r. **6.** Marek Kalenik: Zasady projektowania i budowy kanalizacji podciśnieniowej. Szkoła Główna Gospodarstwa Wiejskiego, Wydział Budownictwa i Inżynierii Środowiska, Katedra Inżynierii Budowlanej, Zakład Wodociągów i Kanalizacji (https://infrastruktura.um.warszawa.pl/sites/infrastruktura.um.warszawa.pl/files/zasady_projektowania_i_budowy_kanalizacji_podcisnieniowej_-_semiarium.pdf) **7.** Program Net-San firmy Instal-Soft Opis programu, instrukcja obsługi, **8.**GRUNDFOS: Program Doboru Pomp i Przepompowni Ścieków SUPO Opis programu, instrukcja obsługi, **9.** Ireneusz Nowogoński: Epa SWMM 5.1, Wykorzystanie i rozbudowa modelu sieci kanalizacyjnej2018-04-25 (https://www.iis.uz.zgora.pl/files/SWMM-instr.pdf) **10.** Katalogi firmowe / poradniki dla projektantów dostępne w Internecie: PipeLife, WAVIN, HOBAS, GRUNDFOS, WILO in. **11.** Orłowska M., Orłowski R.: Wymiarowanie kanalizacji ciśnieniowej. W: materiałach II Konferencji Naukowo Technicznej INSTALACJE WODOCIĄGOWE I KANALIZACYJNE PROJEKTOWANIE WYKONAWSTWO EKSPLOATACJA. Warszawa Dębe, 15-16.05.2007r. **12.** Orłowska-Szostak M., Orłowski R.: Wyznaczanie i symulacje sytuacji miarodajnych przy wymiarowaniu kanalizacji ciśnieniowej. Prace Naukowe Politechniki Warszawskiej, seria: Inżynieria Środowiska, , z.57, Oficyna Wydawnicza PW, Warszawa 2019r. **13.** Andrzej Wartalski, Jerzy Wartalski: Projektowanie hydrauliczne rurociągów z tworzyw sztucznych (w tym metoda naprężeń stycznych/ścinających). Ochrona Środowiska, 1(76) 2000r., str. 19-24. |
| | Supplementary literature | **1. Findeisen, Wł. (1985). Analiza systemowa. PWN, Warsaw, Poland. 2. Szymkiewicz R.: Metody numeryczne w inżynierii wodnej,Wydawnictwo Politechniki Gdańskiej, Gdańsk, 2007 3. Nowogoński Ireneusz: Epa SWMM 5.1.Wykorzystanie i rozbudowa modelu sieci kanalizacyjnej, 2018-04-25. 4. Orłowska-Szostak M., Orłowski R.: Wymiarowanie kanalizacji ciśnieniowej oparte o analizę miarodajnych sytuacji eksploatacyjnych, materiały Seminarium - Warsztatów nt. Modelowanie systemów kanalizacyjnych. Politechnika Łódzka, Wydział Budownictwa, Architektury i Inżynierii Środowiska; Polska Akademia Nauk, Komitet Inżynierii Lądowej i Wodnej, Sekcja Inżynierii Sanitarnej. Łódź, 30 listopada 2012 r. 5. KWH Poradnik: SYSTEMY GRAWITACYJNE, WŁAŚCIWOŚCI, PROJEKTOWANIE, MONTAŻ, 2019r.** |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | Project of the fragment of a graviational-pressure sewer system performed with applying the professional software.<br><br>The project taking into account the unsimultaneousness of the sewage outfall and the method of shear stress.<br><br>Dimensioning of the pressure sewage system based on the simulation of extreme situations with the use of EPANET subrutine.<br><br>Dimensioning of the vacuum sewage system based on the simulation of extreme situations. | |
| Work placement | Not applicable | |