COURSE DESCRIPTION CARD - SYLLABUS

Course name
Sewerage Systems [N1IŚrod2>Kan]

Course

Field of study
Environmental Engineering

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
10

Laboratory classes
0

Other
0

Tutorials
0

Projects/seminars
20

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge acquired within courses delivered earlier during First-cycle studies: Physics, Materials Technology, Fluid Mechanics. Self-education ability and awareness of the need to constantly update and supplement knowledge and skills.

Course objective

Conveying of the basic knowledge and skills in planning, design and operation of simple systems of wastewater disposal from urban catchments.

Course-related learning outcomes

Knowledge:
1. Student knows types and characteristic features of wastewater disposal systems.
2. Student knows algorithms of sewage quantity computations and methods of runoff evaluation from urban catchments.
3. Student knows typical cross-sections of sewers and materials used for their construction.
4. Student knows classification and algorithms of solutions of basic hydraulic problems meeting in computations of gravitational sewers.

5. Student knows constrains and rules applied in design of wastewater and stormwater networks.
6. Student knows functions, types and characteristics of special constructions and devices used in wastewater systems.
7. Student knows structures, principles of operation and application limitations of pressure and vacuum sewer systems.
8. Student knows the basis of sewerage system maintenance.

Skills:
1. Student can compute sewage quantity required for dimensioning sewers.
2. Student can determine parameters of rainfall used for runoff computation and dimensioning of objects and stormwater systems.
3. Student can evaluate runoff from catchment as a basis for dimensioning storm sewers.
4. Student can solve hydraulic problems for gravitational sewers using different auxiliary materials.
5. Student can solve problems of wastewater system components dimensioning and /or selection from catalogues.
6. Student can design gravitational sewer and stormwater networks.

Social competences:
1. The student has consciousness of engineering activity effect on environment.
2. The student understands the need for teamwork in solving theoretical and practical problems.
3. The student sees the need for systematic incresing his skills and competences.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lectures:
Written final exam (4-5 questions to answer).
The grading scale - grade (the percentage of points): ndst (0-30), dst (31-44), dst+ (45-58), db (59-72), db+ (73-86), bdb (87-100)
Projects:
Final grade is represented by an arithmetic mean of four grades given for: sewage pumping station project, gravitational sanitary sewer system project, stormwater sewer system project and a final test.
Projects are evaluated on basis of following criteria: correctness of assumptions and calculation methods, correctness of performed calculations and drawings, editorial level of the project, students engagement.
Written test (25% of total grade).
The grading scale - grade (the percentage of points): ndst (0-50), dst (51-60), dst+ (61-70), db (71-80), db+ (81-90), bdb (91-100)

Programme content

Waste water and storm water quantity computation.
Gravity sewage system - design and operation.
Facilities in sewage networks (storage tanks, pumping stations, CSO).
Rainwater management.
Basics of design and operation of pressure and vacuum sewage systems.

Course topics

Lectures:
Classification of waste water and wastewater disposal systems.
Sewage systems. Sewage quantity computation. Subcatchment evaluation. Typical cross-sections and materials of sewers. Junctions of sewer pipes.
Basis of sewers design. Design constrains. Self-cleaning velocity and minimal slope. Maximal velocity and slope. Nodes, their classification and interpretation, manholes. Factors determining minimal depth of sewers. Algorithm of sewer profile evaluation.
Location of sewers.
Special structures on the network functions, types operation manholes drop shafts, pumping stations, siphons.
Stormwater systems. Evaluation of runoff from urban catchment. Rational formula. Rainfall intensity

computations (design storms). Recommended formulas. Assumption of rainfall probability and duration. Basis of storm and combined sewers design. Special structures of storm water networks: storage tanks, CSO, grease and oil traps.
Structure and basis of operation of pressure and vacuum sewer systems.
Trenchless construction of sewers - review of methods.
Basis of maintenance and inspection of sewer systems.
Project:
Hydraulic computations of gravitational sewers: assumptions, computation formulas. Computational problems classification and algorithms of solution. Auxiliary materials.
Preparation of sewage pumping station project (selection of pumps and pressure pipe, hydraulic analysis of pumps and pressure pipe cooperation, calculations of power and energy consumption of the pumps).
Preparation of gravitational sanitary sewer system project (base map with sewer plan, sewers and house connection profiles)
Preparation of stormwater sewer system project (calculations of stormwater flows, selection of sewers size, performing of sewer profiles).

Teaching methods

Lecture with the use of multimedia presentation and the elements of seminar lecture and problem-focused lecture.
Project with the design method completed by a lecture with multimedia presentation.

Bibliography

Basic:
1. Kotowski A. Podstawy bezpiecznego wymiarowania odwodnień terenu tom I i II, Seidel-Przywecki, 2015
2. Imhoff K.; Imhoff K, R. Kanalizacja miast i oczyszczanie ścieków, Pojprzem-EKO, 1996
3. Królikowscy J. i A. Wody opadowe, Wyd. Seidel-Przywecki, 2012

Additional:
1. Weismann D.: Komunalne przepompownie ścieków. 2000
2. Kuliczkowski A. Technologie bezwykopowe w inżynierii środowiska. 2010.
3. Błaszczyk W. i inni Kanalizacja. Sieci i pompownie, t.1 Arkady 1983
4. K. Mazurkiewicz, M. Skotnicki, M. Sowiński: Opracowanie hietogramów wzorcowych na potrzeby symulacji odpływu ze zlewni miejskich / W: Hydrologia zlewni zurbanizowanych : praca zbiorowa / red. Leszek Hejduk, Ewa Kaznowska - Warszawa, Polska : Komitet Gospodarki Wodnej Polskiej Akademii Nauk, 2016 - s. 33-47
5. M. Skotnicki, M. Sowiński: Ocena zdolności retencyjnej kolektora kanalizacyjnego / Czasopismo Inżynierii Lądowej, Środowiska i Architektury - 2014, T. 31, z. 61, s. 265-283
6. M. Skotnicki, M. Sowiński: Wykorzystanie odpadów syntetycznych w modelowaniu odpływu ze zlewni miejskich / Zeszyty Naukowe Politechniki Rzeszowskiej. Budownictwo i Inżynieria Środowiska / Oficyna Wydaw. Politechniki Rzeszowskiej. - 2012, nr 283, z. 59 (2/12/I), s. 201-218

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	40	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,50