COURSE DESCRIPTION CARD - SYLLABUS

Course name
Sewerage Systems

Course

Field of study
Environmental Engineering

Year/Semester
3 / 5

Area of study (specialization)

Profile of study
general academic

Level of study
First-cycle studies

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars
30

Number of credit points

4

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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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 (lect.). - [KIS_W05]

2. Student knows algorithms of sewage quantity computations and methods of runoff evaluation from urban catchments (lect). - [KIS_W07]

3. Student knows typical cross-sections of sewers and materials used for their construction (lect.). - [KIS_W05, KIS_W06]

4. Student knows classification and algorithms of solutions of basic hydraulic problems meeting in computations of gravitational sewers (proj.). - [KIS_W07]

5. Student knows constrains and rules applied in design of wastewater and stormwater networks (lect.) - [KIS_W07]

6. Student knows functions, types and characteristics of special constructions and devices used in wastewater systems (lect.). - [KIS_W06]

7. Student knows structures, principles of operation and application limitations of pressure and vacuum sewer systems (lect.). - [KIS_W06, KIS_W07]

8. Student knows main technologies applied by construction of sewers including the open-cut and trenchless methods of pipe laying (proj.). - [KIS_W05, KIS_W07]

9. Student knows the basis of sewerage system maintenance (proj.). - [KIS_W06]

Skills

1. Student can compute sewage quantity required for dimensioning sewers (proj.). - [KIS_U08]

2. Student can determine parameters of rainfall used for runoff computation and dimensioning of objects and storm water systems (proj.). - [KIS_U08]

3. Student can evaluate runoff from catchment as a basis for dimensioning storm sewers (proj.). - [KIS_U06, KIS_U08]

4. Student can solve hydraulic problems for gravitational sewers using different auxiliary materials (proj.). - [KIS2_U09]

5. Student can solve problems of wastewater system components dimensioning and /or selection from catalogues (proj.). - [KIS_U06, KIS_U07, KIS_U09]

6. Student can design gravitational sewer and storm water networks (proj.). - [KIS_U06, KIS_U10]

Social competences

1. The student sees the need for systematic incresing his skills and competences (lect.). - [KIS_K01]

2. The student understands the need for teamwork in solving theoretical and practical problems (proj.). - [KIS_K03]

3. The student has consciousness of engineering activity effect on environment (proj.). - [KIS_K03]

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) (effects W1, W2, W3, W5, W6, W7, W8, W9, K1)

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:

Evaluation of simple project of separate sewer systems (50% of total grade) (effects U5, U6, K2, K3).

Written test (50% of total grade) (effects W4, U1, U2, U3, U4).

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

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.

Hydraulic computations of gravitational sewers: assumptions, computation formulas. Computational problems classification and algorithms of solution. Auxiliary materials.

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.

Layout of sewer network.

Special structures on the network functions, types operation manholes drop shafts, pumping stations, siphons.

Storm water 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.

Construction of sewers. Types and methods of ground excavations. Methods of trenches drainage.

Trenchless construction of sewers review of methods.

Basis of maintenance and inspection of sewer systems.

Project:

Development of separate sewer system project (sewers cross sections dimensioning, preparation of longitundinal sewer profiles, selection of devices for rainwater treatment, designing of wastewater pumping station including pressure pipe parameters)

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	4,0
Classes requiring direct contact with the teacher	60	2,5
Student's own work (literature studies, preparation for tests/exam, project preparation) [1]	40	1,5

[1] delete or add other activities as appropriate