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
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes

Other (e.g. online)

Tutorials

Projects/seminars
15

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
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Faculty of Environmental Engineering and Energy

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Responsible for the course/lecturer:

Prerequisites

1. Knowledge:

- mathematic (trigonometric functions; formulas of: cross sections, perimeters and volumes for geometric figures; mathematical transformations);

- fluid mechanics (uniform flows in open channels, Chezy formula).

2. Skills:

Acquaintance of basic terminology in area of environmental engineering. Self-education ability.

3. Social competencies:

Awareness of the need to constantly update and supplement knowledge and skills.

Course objective

The main purpose of the course is to present the basic knowledge of: sewerage systems, calculation methods concerning non-pressure sewage pipelines, sewerage systems designing, trenchless technologies, sewage pumping station modeling in Epanet and rainwater harvesting.

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 main trenchless sewer renewal methods.

9. Student knows the basis of sewerage system maintenance.

10. Students knows the basis of rainwater harvesting.

11. Student knows the basis of sewage pumping station designing, modeling and operational analysis.

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 storm water 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 design gravitational sewer and storm water networks.

6. Student can evaluate trenchless technology of sewer rehabilitation.

7. Student can design the rainwater retention tank.

8. Student can design pumping statiation, develop a model of pumping station in Epanet and do the operational analysis.

Social competences

1. The student sees the need for systematic increasing his skills and competences.

2. The student has awareness of engineering activity effect on environment.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written examination.

Written exercises (average runoff coefficient for specified area, hydraulic calculations for specified cross sections and flow conditions, storage tank for rainwater harvesting).

Model developed in Epanet- sewage pumping station.

Programme content

Classification of wastewater and sewerage systems. Overview of sewer types, typical materials and cross sections of gravity-flow sewers, runoff coefficient. Information about location of sewers and sewer maintenance including trenchless renovation. Calculations of sewerage systems (wastewater and storm water flows). Hydraulic calculations concerning non-pressure sewage pipelines. Minimal burial depth of sewers. Minimal sewer slopes, burial depth, floods in cities. Requirements concerning sewerage systems designing. Sewerage system design- tasks. Calculations of sewerage systems- problem tasks in sewerage systems designing. Overview of sewer appurtenances and special objects in combined sewer systems and storm water sewer systems. Overview of vacuum sewer systems and pressure sewer systems. Sewage pumping station designing, modeling and operational analysis (tutorial in Epanet). Rainwater harvesting. Overview of trenchless technologies.

Teaching methods

Multimedia projector, conversation; blackboard and individual calculations, Epanet.

Bibliography

Basic

Mackenzie L. Davis, Water and Wastewater Engineering, Design Principles and Practice, The McGraw-Hill Companies 2010

Mazurkiewicz K.: lectures notes as a printed Power Point presentation

Metcalf & Eddy, Inc. Wastewater engineering: treatment, disposal and reuse, McGraw-Hill, Inc., third edition 1991

Wastewater Engineering, Treatment and Recovery, Fifth edition, Volume 1 and 2, Metcalf & Eddy/ Aecom 2014

Additional

Escritt L.B., Sewerage and sewage treatment, International practice, A Wiley-Interscience Publication, John Wiley and Sons, 1984

Haq S.A., Harvesting rainwater from building, Springer 2017

Imhoff K., Handbook of urban and drainage and wastewater disposal, A Wiley-Interscience Publication, John Wiley and Sons, 1989

Zhu Q., Gould J., Li Y., Ma Ch., Rainawter harvesting for agriculture and water supply, Springer 2015

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	35	1,5
Student's own work (literature studies, preparation for exam, project/ excercises preparation) [1]	115	4,5

[1] delete or add other activities as appropriate