STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Wastewater Disposal**		Code **1010101251010131343**
Field of study **Environmental Engineering First-cycle Studies**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 5**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**

Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**

No. of hours				No. of credits
Lecture: **30** Classes: **15** Laboratory: **-** Project/seminars: **15**				**6**

Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**

Education areas and fields of science and art **technical sciences**	ECTS distribution (number and %**)** **6 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge acquired within courses delivered earlier during First-cycle studies: Fluid Mechanics, Geology and Hydrology, Meteorology and Climatology
2	**Skills**	Make advantage of informatics techniques, 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

Assumptions and objectives of the course:

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

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student knows types and characteristic features of wastewater disposal systems - [K_W05]

2. Student knows algorithms of sewage quantity computations and methods of runoff evaluation from urban catchments. - [K_W07]

3. Student knows typical cross-sections of sewers and materials used for their construction. - [K_W05, K_W07]

4. Student knows classification and algorithms of solutions of basic hydraulic problems met in computations of gravitational sewers. - [K_W07]

5. Student knows constrains and rules applied in design of wastewater and stormwater networks. - [K_W07]

6. Student knows functions, types and characteristics of special constructions and devices used in wastewater systems. - [K_W06]

7. Student knows structures, principles of operation and application limitations of pressure and vacuum sewer systems. - [K_W06, K_W07]

8. Student knows main technologies applied by construction of sewers including the open-cut and trenchless methods of pipe laying. - [K_W05, K_W07]

Skills:

1. Student can compute sewage quantity required for dimensioning sewers. - [K_U14, K_U16]

2. Student can determine parameters of rainfall used for runoff computation and dimensioning of objects and storm water systems. - [K_U14]

3. Student can evaluate runoff from a catchment as a basis for dimensioning storm sewers. - [K_U13, K_U16]

4. Student can solve hydraulic problems for gravitational sewers using different auxiliary materials. - [K_U08, K_U13, K_U16]

5. Student can solve problems of wastewater system components dimensioning and /or selection from catalogues. - [K_U14, K_U16]

6. Student can design local gravitational sewer and storm water networks. - [K_U16]

Social competencies:

1. The student understands the need for teamwork in solving theoretical and practical problems - [K_K01]

2. The student sees the need for systematic incresing his skills and competences - [K_K03, K_K04]

3. Student has consciousness of engineering activity effect on environment - [K_K02]

Assessment methods of study outcomes

Written final multianswer test

Tutorials:

Evaluation of report containing solutions of hydraulic problems for selected components of sewage system.

Checking acquaintance with applied computational methods.

Practical exercises

Evaluation of 2 simple projects of separated sewer systems.

Checking of knowledge confirming understanding of presented in projects solutions.

Course description

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 a 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 on 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.

Basic bibliography:

1. Kotowski A. Podstawy bezpiecznego wymiarowania odwodnień terenu, Seidel-Przywecki, 2011

2. Imhoff K. && R. Kanalizacja miast i oczyszczanie ścieków, Pojprzem-EKO, 1996

3. Królikowscy J. i A. Wody opadowe, Wyd. Seidel-Przywecki, 2012

Additional bibliography:

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

Result of average student's workload

Activity	Time (working hours)

1. Participation in lectures	30
2. Participation in tutorials	15
3. Participation in practical exercises	15
4. Participation in consultations related to tutorials and practical exercises	2
5. Preparing (at home) reports of the practical exercises	28
6. Preparation (at home) reports for the tutorials	20
7. Preparation for the final test of tutorials	10
8. Preparation for the final test of the practical exercises	10
9. Preparation for the exam and the presence at the exam	20

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	150	6
Contact hours	65	3
Practical activities	85	3