STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Severage Systems		**1010135221010130357**
Field of study	Profile of study (general academic, practical)	Year /Semester
Enviromental Engineering Extramural Second-	**(brak)**	**1 / 2**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Water Suply, Water Soil Protection	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
Second-cycle studies	**part-time**	
No. of hours		No. of credits
Lecture: **20** Classes: **10** Laboratory: **-** Project/seminars: **16**		**6**
Status of the course in the study program (Basic, major, other)	(university-wide, from another field)	
(brak)	**(brak)**	
Education areas and fields of science and art		ECTS distribution (number and %)
technical sciences **Technical sciences**		**100 6%** **100 6%**

Responsible for subject / lecturer:

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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 and Second-cycle studies: Fluid Mechanics, Wastewater disposal, Water management with elements of hydrology
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

Assumptions and objectives of the course:

Widening and deepening of knowledge and skills acquired in the first-cycle studies required for solution of complex engineering problems concerning wastewater and stormwater disposal.

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

Knowledge:

1. Student knows the method of rainfall data processing including total and effective rainfall hyetographs evaluation (lect).. - [K2_W07, K2_W08]
2. Student knows assumptions and algorithms for storm sewer design based on IDF curve (lect). - [K2_W04, K2_W05, K2_W07]
3. Student knows basic relations of de Saint-Venant model and algorithm of rainfall-runoff computations (class). - [K2_W03]
4. Student knows methods of dimensioning of selected storm sewer system components (lect.). - [K2_W06, K2_W07]
5. Student has knowledge of aims of BMP (Best Management Practices) and methods applied for their achievement (lect.). - [K2_W05, K2_W07, K2_W08]
6. Student Knows principles of creating sewarage system monitoring network (lect.) - [K2_W07, K2_W08, K2_W09]

Skills:

1. Student can evaluate hyetographsof total and effective rainfall (proj.). - [K2_U09, K2_U17]
2. Student can design storm sewer network based on IDF curves (proj.). - [K2_U09, K2_U10, K2_U16]
3. Student can create simulation model of storm sewer system with the use of SWMM (class.). - [K2_U18, K2_U19]
4. Student can perform dimensioning of sewer networks components of special purposes with the use of Epanet anf SWMM (proj.) - [K2_U09, K2_U14, K2_U16]
5. Student can apply BMP for reduction of runoff (class). - [K2_U15, K2_U17]
6. Student can assess fulfillment of requirements for drainage systems according to PN-EN 752 (proj.) - [K2_U08, K2_U11, K2_U15]

Social competencies:

1. The student sees the need for systematic incresing his skills and competences (proj.). - [K2_K01]
2. The student understands the need for teamwork in solving theoretical and practical problems (proj.). - [K2_K04]
3. The student has awareness of engineering activity effect on environment (class). - [K2_K02]

Assessment methods of study outcomes

Lectures: Written final exam (4-5 questions to answer) (effects W1, W2, W4, W5, W6)

The grading scale (the percentage of points/grade):

0-30 2,0
31-44 3,0
45-58 3,5
59-72 4,0
73-86 4,5
87-100 5,0

Classes:

Written test (multiple choice test, 20 questions,) (effects W3, U1, U3, U5, K3)

The grading scale (the percentage of points/grade):

0-50 2,0
51-60 3,0
61-70 3,5
71-80 4,0
81-90 4,5
91-100 5,0

Projects:

The final grade is arithmetic mean of two grades for project and analysis of sewage pump station made with the use of Epanet and project of sewerage systems for urban catchment made with the use of SWMM (effects U2, U4, U6, K1, K2)

Each project was evaluated on basis of following criteria: correctness of accepted assumptions and calculation methods, correctness of calculations and draws, edition of the project and student engagement. Final grade is arithmetic mean of grades obtained for each criteria (criteria were evaluated with the scale from 1 to 5).

The grading scale (the percentage of points/grade):

0-2,50 2,0
2,51-3,24 3,0
3,25-3,74 3,5
4,25-4,74 4,5
4,75-5,00 5,0

Course description

Design of storm sewers based on IDF curves. Assumptions and algorithms.

Runoff from urban catchments. Total and effective rainfall (SCS method) hyetographs evaluation. Kinematic wave model. Runoff hydrograph computation.

Dimensioning methods for sewerage systems special objects (pumping stations, retention tanks, storm overflows) with the use of Epanet and SWMM.

Outflow retention. Cumulative outflow curve. Volume of retention tank.
Critical shear stress method of sewers design based on self-cleaning velocity criterion.
Basis of pressure sewer system design. Assumptions and limitations.
Design methods of special structures of sewer networks : pumping stations, storage tanks, CSO, siphons.
Reduction of storm water outflow from catchment by application of BMP. Review of solutions. Basic rules of dimensioning.
Strength computations of sewers. Assumptions and main stages of procedure.
Advanced rainfall-runoff models and their implementation in computer models (SWMM).
Trenchless methods of sewers construction - a review, criteria of selection.
Rehabilitation methods of sewers - review, criteria of selection.
Monitoring of sewers systems - aims and ways of realization.

Education methods:

Lecture with the use of multimedia presentation and the elements of seminar lecture and problem-focused lecture.

Classes based on training method completed by visual cases study and classic lecture (with multimedia presentation) .

Project with the design method completed by a lecture with multimedia presentation.

Basic bibliography:

1. Kotowski A. Podstawy bezpiecznego wymiarowania odwodnień terenów, tom I i II, Wyd. Seidel-Przywecki, 2015
2. Słyś D. Retencja i infiltracja wód deszczowych. Oficyna Wyd. Politechniki Rzeszowskiej, 2008
3. Bolt A., Suligowski Z. Kanalizacja- projektowanie, wykonanie, eksploatacja. Seidel-Przywecki, 2012
4. Weismann D.: Komunalne przepompownie ścieków, Wyd. Seidel-Przywecki, 2001

Additional bibliography:

1. Mrowiec M. : Efektywne wymiarowanie i dynamiczna regulacja kanalizacyjnych zbiorników retencyjnych, Wydawnictwo Politechniki Częstochowskiej, 2009
2. Dąbrowski W.: Oddziaływania sieci kanalizacyjnych na środowisko, Wydawnictwo Politechniki Krakowskiej, 2004
3. Kuliczkowski A.: Technologie bezwykopowe w inżynierii środowiska, Seidel-Przywecki, 2010
4. Królikowska J.: Niezawodność funkcjonowania i bezpieczeństwo sieci kanalizacyjnej, Seidel-Przywecki, 2010
5. 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
6. M. Skotnicki, M. Sowiński: Wpływ własności modelu opad-odpływ na relację pomiędzy dokładnością odwzorowania zlewni a charakterystykami odpływu / Czasopismo Inżynierii Lądowej, Środowiska i Architektury - 2016, T. 33, z. 63, nr 2/II, s. 413-428

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures (contact hours)	20
2. Participation in tutorials (contact hours)	10
3. Participation in projects (contact hours, practical activities)	16
4. Participation in consultations related to tutorials and practical exercises (contact hours)	7
5. Preparing of the projects (work at home)	35
6. Preparation for the tutorials (work at home)	15
7. Preparation for the final test of tutorials (work at home)	15
8. Preparation for the exam (work at home)	30
9. Presence at the exam (contact hours)	2

Student's workload

Source of workload	hours	ECTS
Total workload	150	6
Contact hours	55	2
Practical activities	58	2