STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Severage Systems		**1010102211010130357**
Field of study	Profile of study (general academic, practical)	Year /Semester
Environmental Engineering Second-cycle	**(brak)**	**1 / 1**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Water Supply, Water and Soil Protection	**Polish**	**obligatory**
Cycle of study:	Form of study (full-time,part-time)	
Second-cycle studies	**full-time**	
No. of hours		No. of credits
Lecture: **2** Classes: **1** Laboratory: **-** Project/seminars: **2**		**5**
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 %)

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, Geology and Hydrology, Meteorology and Climatology, Wastewater disposal, Water management, Numerical methods and statistic.
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:

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 hietograms evaluation. - [K_W02, K_W04]
2. Student knows assumptions and algorithms for storm sewer design based on IDF curve. - [K_W02, K_W04]
3. Student knows basic relations of kinematic wave model and algorithm of rainfall computations. - [K_W07]
4. Student knows critical shear-stress method basic assumptions and relations used in design of sewers. - [K_W07]
5. Student knows methods of dimensioning of selected storm sewer system components. - [K_W06, K_W07]
6. Student has knowledge of aims of BMP and methods applied for their achievement. - [K_W06, K_W07]
7. Student knows basis of sewers buliding in situ including of trenchless methods of pipe laing. - [K_W05, K_W07]
8. Student knows actually applied rehabilitation methods of sewers. - [K_W05, K_W07]
9. Student has basic knowledge on strength computations of sewers - [K_W07]

Skills:

1. Student can evaluate intensity-duration-frequency (IDF) curve. - [K_U17, K_U19]
2. Student can design storm sewer network based on IDF curves. - [K_U08, K_U19]
3. Student can evaluate histograms of total and effective rainfall based on SCS method. - [K_U08, K_U19]
4. Student can apply kinematic wave method for evaluation of runoff hydrograph. - [K_U08, K_U19]
5. Student can perform dimensioning of sewer networks components of special purposes. - [K_U08, K_U17, K_U19]
6. Student can apply BMP for reduction of runoff. - [K_U17, K_U19]
7. Student can evaluate rehabilitation technologies and trenchless construction methods of sewers. - [K_U15]

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

Assessment methods of study outcomes

Written final exam

Tutorials:

Evaluation of report containing solutions of problems of wastewater disposal from urban catchment.

Checking acquaintance with applied computational methods.

Practical exercises

Evaluation of advanced projects of separated sewer systems for urban catchment.

Checking of knowledge confirming understanding of presented in projects solutions.

Course description

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

Runoff from urbanized catchments. Total and effective rainfall (SCS method) hietograms evaluation. Kinematic wave model. Runoff hydrogram computation.

Retention of outflow. Cumulative outflow curve. Volume of retention tank.

Critical shear stress method of sewers design based on self-cleaning 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 a 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.

Basic bibliography:

1. Kotowski A. Podstawy bezpiecznego wymiarowania odwodnień terenów, Seidel-Przywecki, 2011
2. Królikowska J.: Niezawodność funkcjonowania i bezpieczeństwo sieci kanalizacyjnej, 2010

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 bezwykopkowe w inżynierii środowiska, Wydawnictwo Seidel-Przywecki, Warszawa 2010
4. Geiger W., Dreiseitel H.: Nowe sposoby odprowadzania wód deszczowych. Poradnik. Projprzem-EKO Bydgoszcz, 1999.

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	30
4. Participation in consultations related to tutorials and practical exercises	3
5. Preparing (at home) reports of the practical exercises	22
6. Preparation (at home) reports for the tutorials	20
7. Preparation for the final test of tutorials	5
8. Preparation for the final test of the practical exercises	5
9. Preparation for the exam and the presence at the exam	20

Student's workload

Source of workload	hours	ECTS
Total workload	150	5
Contact hours	78	3
Practical activities	60	2