STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Water Supply Systems		**1010135221010130356**

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	**6 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge acquired at courses delivered earlier during First and Second-cycle studies of Mechanics of Fluids, Water Supply, Mathematics
2	**Skills**	Use of knowledge obtained and skills acquired as part of subjects mentioned above, especially Water Supply. Self-learning ability
3	**Social competencies**	Awareness of the need to constantly update and supplement skills and knowledge

Assumptions and objectives of the course:

Widening and deepening of knowledge and skills acquired in the first-cycle studies required to solve complex engineering problems that concern water supply

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

Knowledge:

1. (L-lectures) Student knows water supply systems calculation methods - [[K2_W01, K2_W03]]
2. (L, E-Exercises) Student knows methods used in water supply systems modelling - [[K2_W01, K2_W05, K2_W07]]
3. (L) Student knows a GIS basics needed for water supply systems modelling - [[K2_W01, K2_W05]]

Skills:

1. (E) Student can prepare performance characteristics of selected sources of water supply systems - [[K2_U05, K2_U09, K2_U10]]
2. (E) Student can perform calculation of selected hydraulic power systems - [[K2_U05, K2_U09, K2_U10]]
3. (L, E) Student is able to build input data basic structure necessary to build computer models of water distribution system - [[K2_U01, K2_U05, K2_U07, K2_U08, K2_U09, K2_U10]]
4. (E) Student can identify parameters that may cause adverse effects in water distribution systems - [[K2_U01, K2_U05, K2_U07, K2_U08, K2_U09, K2_U10]]
5. (E) Student understands the need to check and verify obtained results - [[K2_U01, K2_U08, K2_U10, K2_U15]]

Social competencies:

1. (E) Student sees the need to systematically increase their skills and competences - [[K2_K01]]
2. (E) Student understands the need to work in a team to solve theoretical and practical problems - [[K2_K01, K2_K03, K2_K04]]
3. (E) Student is aware of an impact of their decisions on activities (results obtained during auditorium excercises and projects) - [[K2_K02, K2_K05]]

Assessment methods of study outcomes

Final exam:

One part written exam (80min). Its timing is confirmed in the first of week of the semester. Exam consists of a few open questions. The goal is to assess knowledge gained during lectures (learning effect W1 to W6).

Range of scale: NB-absent; 2(?23 points); 2,5 (23,5 points); 3 (24-28 points); 3,5 (29-33 points);4,0 (34-38 points); 4,5 (39-43 points); 5 (44-46 points).

Classes (Exercises):

The goal is to prepare short presentation and defense of the topic prepared in the subgroups,

test. Range of scale: (NB;2,0;2,5;3,0;3,5;4,0;4,5;5,0). To pass this classes, student has to obtain min. 50% correct performed tasks and individual defense of the presentation.

Project exercises:

Practical exercises: evaluation of advanced projects (learning effect U01, U02, U03, U04, U05, K1, K2, K4).

Continuous assessment of project completion at each class ? rewards for activity (learning effect K1).

Range of scale: (NB;2,0;2,5;3,0;3,5;4,0;4,5;5,0). To pass this project student has to obtain min. 60% correct performed tasks and individual defense of the project.

Course description

Lectures:

1. GIS basics that concern water distribution systems modelling.
2. Allocation of water demand points integrated with GIS system points. Spatial data models.
3. Development of IT tools for modelling water distribution systems. Modelling with an application of computer programs. Stages of model construction.
4. Data acquisition methods for construction of water supply network models. Use of a computer model to analyse and evaluate a water supply system.
5. Water intakes. Types of shots and ways of capturing surface water and underground water.
6. Numeric terrain models. Create spatial-descriptive queries in SQL
7. Piping Systems Calculation (Series and Parrallel).
8. Tasks carried out by measuring equipment for monitoring of water supply networks.

Exercises topics:

Hydraulic calculation of the elements water distribution systems. Analysis data spacial formats and relation between them (spatial-descriptive queries-SQL language). Activities undertaken at vector and raster data based on available IT solutions.

Exercise topics (project):

1. Calculation of water demand for a given customer group.
2. Design a water network (location, diameter).
3. Design a pump station (hydraulic and efficiency curves).
4. Control theory-based simulation methods.
5. Calculation and analysis variety of the models in hydraulic model based on EPANET 2.0.14 software.

Learning methods:

1. Lectures: The contents of the lectures are presented in the form of multimedia presentations. Selected issues are discussed in a problematic way.

2. Exercises: Self-help work with the application, lecturer of exercises presents the way of accomplished task using the projector and the connected computer.

3. Projects:The scope of the project is divided into stages. Each stage the lecturer presents in a short multimedia presentation. Then, while discussing and asking questions, illustrating the example, we also explain the different ways of accomplishing each task.

Basic bibliography:

1. Mielcarzewicz E., Obliczanie systemów zaopatrzenia w wodę, Arkady, Warszawa 2001
2. Gabryszewski, Gabryszewski T., Wodociągi, PWN, Wrocław 1983
3. Grabarczyk Cz., Hydraulika urządzeń wodociągowych?, Warszawa, WNT, 2015 (tom1 i 2).
4. Kwietniewski M. i inni, Projektowanie elementów systemu zaopatrzenia w wodę, Wydawnictwo Politechniki Warszawskiej, Warszawa 1998
5. Kwietniewski M., GIS w wodociągach i kanalizacji, PWN, Warszawa, 2008

Additional bibliography:

1. Rossman L. A., EPANET 2 User?s Manual, US EPA, 2000
2. Boulos P.F. , Lansey K.E., Comprehensive Water Distribution Systems analysis Handbook for engineers and planners, MWH Soft., USA, 2006
3. Cesario L., Modelling, Analysis and design of Water Distribution Systems, AWWA, USA, 1995
4. Manual of Water Supply Practices M32, Computer Modeling of Water Distribution Systems, AWWA, USA, 2005
5. Reference Guide for Utilities, Water Distribution System Analysis. Field Studies, Modeling and Management, US EPA, USA, 2005
6. Szuster-Janiaczyk A., Zarządzanie jakością wody w systemach wodociągowych, XIX Krajowa, VII międzynarodowa konferencja naukowo-techniczna : zaopatrzenie w wodę, jakość i ochrona wód, Zakopane, 18-21 czerwca 2006 r. / red. Andrzej Królikowski, Marek M. Sozański / PZIiTS Oddz. Wielkopolski [i in.] [org.]. - Poznań : PZIiTS Oddz. Wielkopolski. - T. 1, 2006. - S. 863-883.
7. Bałut A, Bylka J., Modele komputerowe jako narzędzia wspomagania w procesie zarządzania układami rozprowadzającymi wodę w systemach wodociągowych?, Instal, nr 12, str.91-96, 2013r.
8. Urbaniak A., Bałut A., Brodziak R., Bylka J., Technologie IT w realizacji idei zrównoważonego rozwoju w systemach zaopatrzenia w wodę, Instal, nr 10, str.76-79, 2015r.
9. Kaźmierski T, Schiller T., Zmienność dostarczania wody do sieci wodociągowej miasta o liczbie mieszkańców 22 000 w okresie roku kalendarzowego, Gaz, woda i technika sanitarna, nr 6/2016, str. 213-217.
10. Bromberek Z., Kaźmierski T., Mazurkiewicz K., Schiller T., Mróz T., IV Międzynarodowa Konferencja Naukowo-Techniczna INFRAEKO 2014 : Nowoczesne miasta. Infrastruktura i środowisko, Rzeszów - Kraków 2014, str.33-49.

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures (contact hours)	20
2. Participation in exercises (contact hours, practical hours)	16
3. Participation in exercises project, (contact hours, practical hours)	10
4. Participation in consultations related to exercises (contact hours and independent work hours)	40
5. Preparation for the exercises-test,(independent work hours)	20
6. Preparation for the practical exercises- project, (independent work hours)	16
7. Preparation for the exam (independent work hours)	26
8. Presence at the exam (contact hours)	2

Student's workload

Source of workload	hours	ECTS
Total workload	150	6
Contact hours	88	4
Practical activities	46	2