STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Water Supply Systems**		Code **1010135221010130356**
Field of study **Enviromental Engineering Extramural Second-**	Profile of study (general academic, practical) **(brak)**	Year /Semester **1 / 2**
Elective path/specialty **Water Suply, Water Soil Protection**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **20** Classes: **10** Laboratory: **-** Project/seminars: **16**		No. of credits **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** **Technical sciences**		ECTS distribution (number and %) **6 100%** **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 and Second-cycle studies Fluid mechanics, Water supply, Mathematics
2	**Skills**	Use of knowledge obtained and skills acquired as part of the subjects mentioned above, especially Water supply. 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 water supply

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

Knowledge:

1. Student knows water supply systems calculation methods - [K2_W01, K2_W03]
2. Student knows methods used in water supply systems modelling - [K2_W01, K2_W05, K2_W07]
3. Student knows hydraulics models calibration criteria and an influence of changes in the parameters on obtained results - [K2_W01, K2_W07]
4. Student knows a GIS basics needed for water supply systems modelling - [K2_W01, K2_W05]

Skills:

1. Student can prepare performance characteristics of selected sources of water supply systems - [K2_U05, K2_U09, K2_U10]
2. Student can perform calculation of selected hydraulic power systems - [K2_U05, K2_U09, K2_U10]
3. Student is able to build input data basic structure necessary to build computer model of water distribution system - [K2_U01, K2_U05, K2_U07, K2_U08, K2_U09, K2_U10]
4. 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. Student understands the need to check and verify the obtained results - [K2_U01, K2_U08, K2_U10, K2_U15]

Social competencies:

1. Student sees the need for systematic increasing his skills and competences - [K2_K01]
2. Student understands the need for teamwork in solving theoretical and practical problems - [K2_K01, K2_K03, K2_K04]
3. Student has awareness of decisions impact on outcome of his activities - [K2_K02, K2_K05]

Assessment methods of study outcomes

Written final exam

Tutorials: evaluation of presentation prepared in subgroups, test

Practical exercises: evaluation of advanced projects, checking of knowledge confirming understanding of presented in projects solutions

Course description

Hydraulic interaction of power water systems. Analysis of universal formulas for lambda coefficient calculation.

Development of informatics tools for modelling and design of water supply network. Modelling of water distribution systems using computer programs. Stages of model construction. Data acquisition methods to build a computer model of water supply network. Use of computer model for analysis and evaluation of water distribution system.

Basics of GIS. Using GIS for water distribution systems modelling. Numeric surface models.

Tasks carried out by measuring equipment for water supply network monitoring.

Methods of water resources problems solving.

Exercise topics:

1. The GIS basics concerning modeling of water distribution systems.
2. Allocation of water demand points integrated with GIS systen points. Spatial data models.
3. History of development of water distribution systems modeling.
4. Water distribution systems quality changes modeling.
5. Calibration, verification and validation methods of hydraulic water distribution systems models.
6. Methods of water distribution systems simplifying - skeletonization.

Basic bibliography:

1. Gabryszewski T., Wodociągi, PWN, Wrocław 1983
2. Knapik K., Bajer J., Wodociągi, Wydawnictwo Politechniki Krakowskiej, Kraków, 2010
3. Mielcarzewicz E., Obliczanie systemów zaopatrzenia w wodę, Arkady, Warszawa 2001
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 Users 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., Modeling, 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

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in practical exercises	15
3. Preparation for the practical exercises	40
4. Preparation for the practical excersises exam	20
5. Preparation for the exam	43
6. Presence at the exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	150	6
Contact hours	47	2

Practical activities	55	2