COURSE DESCRIPTION CARD - SYLLABUS

Course name
Water Supply Systems

Course

Field of study
Environmental Engineering
Area of study (specialization)
Water Supply, Water Soil Protection
Level of study
Second-cycle studies
Form of study
part-time

Year/Semester
1 / 2
Profile of study
general academic
Course offered in
Polish
Requirements
compulsory

Number of hours

Lecture
18
Laboratory classes
Other (e.g. online)
Tutorials
18
Projects/seminars
10

Number of credit points

5

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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Prerequisites

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

Course objective

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

Course-related learning outcomes

Knowledge

1. Student knows the calculation methods used to model water supply systems and kryteria kalibracji modeli hydraulicznych oraz wpływ zmian parametrów na otrzymywane wyniki (effects obtained during the lecture) - [[KIS2_W01, KIS2_W03]]

2. Student knows the criteria for calibration of hydraulic models and the impact of parameter changes on the results obtained (effects obtained during the lecture) - [[KIS2_W01, KIS2_W07].]

3. Student knows the theoretical basis of geographic information systems that can be used to model water supply systems (effects obtained during the lecture) - [[KIS2_W01, KIS2_W05].]

4. Student knows the phenomenon of secondary water pollution in water supply systems (effects obtained during the lecture) - [[KIS2_W01, KIS2_W09].]

5. Student understands the issues related to water quality management in water supply systems (effects obtained during the lecture) - [[KIS2_W01, KIS2_W09]]

Skills

1. Student can prepare performance characteristics of selected sources of water supply systems - [KIS2_U05, KIS2_U09, KIS2_U10]

2. Student can perform calculation of selected hydraulic power systems - [KIS2_U05, KIS2_U09, KIS2_U10]

3. Student is able to build computer models of water distribution system - [KIS2_U01, KIS2_U05, KIS2_U07, KIS2_U08, KIS2_U09.]

4. Can identify parameters that may cause adverse effects in water distribution systems - [KIS2_U01, KIS2_U05, KIS2_U07, KIS2_U08.]

5. Student understands the need to check and verify obtained results - [KIS2_U01, KIS2_U08, K2_U10, K2_U15]

Social competences

1. Student sees the need to systematically increase their skills and competences - [KIS2_K01]

2. Student understands the need to work in a team to solve theoretical and practical problems - [KIS2_K01, KIS2_K03, KIS2_K04]

3. Student is aware of an impact of their decisions on activities. - [KIS2_K02, KIS2_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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.

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).

Practical exercises :

Part 1: Calculation of tasks and design of a drilled well. At the end of the colloquium with tasks related directly to the design of the well.

Part 2: Tutorials: evaluation of presentation prepared in subgroups, test

Choice of one of subjects suggested by the lecturer, delivery of a presentation and its defence ? work done in subgroups.

Scale range: (NB; 2,0; 2,5; 3,0; 3,5; 4,0; 4,5; 5,0). To pass student has to obtain min. 50% points.

Part 3: 40min written examination test that includes a dozen multiple choice and two open questions. To pass this topic student must to obtain min. 50%

Continuous assessment during classes, rewards for activity.

Project exercises:

Practical exercises: evaluation of advanced projects.

Continuous assessment of project completion at each class, rewards for activity.

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 positive rate and min.50% correct performed tasks.

Programme content

Lectures:

1. Introduction to graph theory, development history and methods of computer modeling of individual elements of water supply systems. Stages of building the model.

2. Data acquisition methods for building a computer model of water supply networks. The use of a computer model for analysis and evaluation of the water supply system.

3. Methods for calibration, verification and validation of hydraulic models of water supply systems.

4. Water intake. Types of intakes and ways of receiving surface and underground water.

5. Hydraulic interaction of systems supplying water supply systems (reduced characteristics).

6. Cooperation of the well system with the pumping station, cooperation of pumps with the pumping station, controls setting methods.

7. Monitoring of water supply networks.

8. Water losses in the water supply network (methods of searching, calculating and determining DMA zones).

9. Hydraulic hammer analysis.

10. Fire protection of water supply systems

Exercises topics:

Part 1:

Calculation of tasks and design of a drilled well. Tasks:

1. Determination of the filtration coefficient by means of trial pumping.
2. Determination of the soil type of the aquifer based on the graining curve.
3. Filter selection and dimensioning of components and reinforcement of the drilled well.
4. Pump selection.

Part 2:

6. Management of water quality in water supply systems and risk analysis.
7. Secondary water contamination in water systems.
8. Modelling of changes of quality.

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. Calculation and analysis two proposition of the models in hydraulic model based on EPANET software.

Teaching methods

1. Lectures: All lectures are presented in the form of multimedia presentations. Selected topics are discussed in the problematic perspective. The lead person then uses the plate from the table.

2. Exercises: The content of the topics discussed and their detailed description responsable person using the projector shows how to perform specific tasks. For second task, all possible topics will be discuss and lecturer explains the way of preparing each presentation.

3. Project: The scope of the project is divided into stages. Every stage are presented in a short multimedia presentation (about 15 minutes). Then, during discussion and questions, based on the example, teacher explain the different ways of performing each task (15min). The last 60min is devoted to an individual assessment of each stage of the project implementation.

Bibliography

Basic

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2. Grabarczyk Cz., Hydraulika urządzeń wodociągowych, Warszawa, WNT, 2015 (tom1 i 2).

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4. Kwietniewski M., GIS w wodociągach i kanalizacji, PWN, Warszawa, 2008.

Additional

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. 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

7. 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

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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

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,0
Classes requiring direct contact with the teacher	46	2,0
Student's own work (literature studies, preparation for tutorials, preparation for tests/exam, project preparation) [1]	79	3,0

[1] delete or add other activities as appropriate