COURSE DESCRIPTION CARD - SYLLABUS

Course name

Water Supply Systems

Course

Field of study

Environmental Engineering Second-cycle Studies

Year/Semester

1/2

Area of study (specialization)

Water Supply, Water and Soil Protection

Profile of study

general academic

Level of study

Second-cycle studies

Course offered in

polish

Form of study

part-time

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.

2. Student knows the methods for calculating the systems supplying water supply systems.

3. Student knows the criteria for calibration of hydraulic models and the impact of parameter changes on the results obtained.

4. Student knows the theoretical basis of geographic information systems that can be used to model water supply systems.

5. Student knows the phenomenon of secondary water pollution in water supply systems.

6. student understands the issues related to water quality management in water supply systems.

Skills

1. Student can prepare performance characteristics of selected sources of water supply systems.

2. Student can perform calculation of selected hydraulic power systems.

3. Student is able to build computer models of water distribution system.

4. Can identify parameters that may cause adverse effects in water distribution systems.

5. Student understands the need to check and verify obtained results.

Social competences

1. Student sees the need to systematically increase their skills and competences.

2. Student understands the need to work in a team to solve theoretical and practical problems.

3. Student is aware of an impact of their decisions on activities.

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 (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).

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.To pass this tutorials student must to obtain min. 50% score.

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 (learning effect: W5, W6, KIS1, KIS2, U1, U2, U4).

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 (learning effect K1).

Project exercises:

Practical exercises: evaluation of advanced projects (learning effect U01, U02, U03, U04, U05, KIS1, KIS2, KIS4).

Continuous assessment of project completion at each class, rewards for activity (learning effect KIS1).

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 model building, difficulties and solutions used in EPANET software.

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. Simplification of the structure - modeling.

4. New functionalities of water distribution modelling software Smart water networks.

5. Monitoring of water supply networks.

6. Sorage of water, tank representation, characteristrics, point of localisation selections using GIS and modelling techologies.

7. Flushing of water netowrks.

8. Tasks carried out by measuring devices monitoring water supply networks.

9. Water losses in the water supply network (search methods, calculations and determination of DMA zones).

10. Reliability of functioning and safety of water supply systems (criticality analysis, location of gate valves, determination of basic parameters of water supply system reliability).

11. Hydraulic hammer anlaysis.

12. Fire protection for water supply systems

Exercises topics:

Part 1:

Calculation of tasks:

1. Discharge of hydrant during fire flow events.

2. Simple impact of operations with pump and tank for pressure value for one particular junctions and disscusions about imporments of hydraulic conditions based on water model expample.

3. Testing of water hydrant and all posible calcucations around this topic.

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 water quality changes.

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 software.

Teaching methods

Learning 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 person conducting the presentation along with the calculations carried out on the example, students are required to conduct calculations during the class.

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. The content of the topics discussed and their detailed description of the work is available on the web site (unlimited access).

Bibliography

Basic

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

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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 Agnieszka (IK)., 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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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.

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 laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	79	3,0

[1] delete or add other activities as appropriate