STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Water supply**			Code **1010101241010130902**
Field of study **Environmental Engineering First-cycle Studies**	Profile of study (general academic, practical) **(brak)**		Year /Semester **2 / 4**
Elective path/specialty **-**	Subject offered in: **Polish**		Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**		
No. of hours Lecture: **30** Classes: **15** Laboratory: **-** Project/seminars: **15**			No. of credits **5**
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**			ECTS distribution (number and %) **5 100%**

Responsible for subject / lecturer:

dr inż.Agnieszka Szuster-Janiaczyk
email: agnieszka.szuster-janiaczyk@put.poznan.pl
tel. (61)6652436
Faculty of Civil and Environmental Engineering
ul. Berdychowo 4 60-965 Poznań

Responsible for subject / lecturer:

dr inż. Karolina Mazurkiewicz
email: karolina.mazurkiewicz@put.poznan.pl
tel. (61)647 5827
Faculty of Civil and Environmental Engineering
ul. Berdychowo 4 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Fluid mechanics: knowledge of physical quantities characterising liquids; units; the basic notions and principles describing the flow of water in conduits; knowledge of the methods used to measure such quantities. Knowledge of equations describing the phenomena; understanding the causes of water hummer and cavitation and knowledge of the principles used to describe tchem. Mathematics: knowledge of the formulation basics and the methods of solving of systems of algebraic linear and non-linear equations. Knowledge of the basics of mathematical optimization.
2	**Skills**	Determining extreme values of functions. Solving problems with hydraulic calculations for pipelines connected with reservoirs and pumps; solving algebraic, linear and non-linear equations and systems of equations; measurements of hydraulic parameters; selection of measuring devices.
3	**Social competencies**	Awareness of the need to continuously update and upgrade the knowledge and skills.

Assumptions and objectives of the course:

Conveying the basic knowledge and skills in planning, designing and operation of process equipment and technological operations associated with water abstraction, storage and transport from the intakes to water treatment plants and from water treatment plants to service lines supplying household water distribution systems.

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

Knowledge:

1. The student has knowledge about the structure of systems for water abstraction and transport to water distribution and supply systems. The student knows the functions, types and properties of the equipment making up process assemblies in the systems. - [K_W02, K_W05]

2. The student knows the functions, types and characteristics of the devices in the technological systems - [K_W02, K_W05, K_W06]

3. The student knows the basic techniques and tools necessary to solve engineering problems in the scope of structure and maintenance of equipment employed in water abstraction and distribution systems. - [KW_05, K_W06, K_W07]

4. The student knows the principles of designing vertical wells, including pump and siphon systems transporting water from vertical wells to the water treatment plants, the rules of selecting and dimensioning equipment for the system. - [K_W05, K_W06, K_W07]

5. The student knows the methods of programming development, designing and operating water supply systems and equipment items of which such systems are composed. - [K_W05, K_W06, K_W07]

6. The students knows the standards characterising the level of services and the equipment maintenance standards. - [K_W06, K_W08,K_W08]

7. The student knows consecutive stages in the process of planning, designing and building water systems and the requirements applicable to the necessary design documentation. - [K_W06, K_W08]

8. The student knows technologies involved in the construction of water supply networks, including the open-cut and trenchless methods of pipe laying. The rules of tightness testing and final acceptance - [K_W05, K_W07]

Skills:

1. The student can identify the properties, analyse the operating conditions and assess the technical condition of the technological systems used for water abstraction. - [K_U01,KU_08, KU_11,KU_13]

2. The student can formulate and solve problems involving selection and dimensioning of the system components during the process of planning, designing, building, renovating and maintaining the systems - [K_U01,K_U07, K_U09,KU_1K_U13,KU_1KU_15]

3. The student can plan and carry out experiments, including simulations of the operating conditions of pipelines transporting water from water intakes and in water supply networks, including their interaction with other components of the water supply systems. - [KU_07,K_U08K_U09,K_U13]

4. The student can formulate and solve engineering problems, taking into account the system aspects and the economic and legal factors of planning, designing and maintaining equipment. - [K_U10,K_U12,K_U14]

Social competencies:

1. The student understands the need for teamwork in the solving of theoretical and practical problems. - [K_K03, K_K04]

2. The student is aware of the significance of problems associated with water management optimization. - [K_K02]

3. The student can identify the social and political factors which may have an impact on the decisions made in the process of water supply systems management. - [K_K01,K_06K_K07]

4. The student recognizes the need for systematic enhancement of knowledge and development of competences and skills. - [K_K01, K_K06]

Assessment methods of study outcomes

Lecture (Examination of learning outcomes: W01, W02, W03, W5, W06, W07)

Written exam consisting of 28 questions, which are a combination of open, closed and test questions. Duration: 60 minutes. Maximum score: 100 points.

Grading scale:

0 ÷ 49.5 - insufficient (2.0)

50 ÷ 60 - sufficient (3.0)

60,5 ÷ 70 - sufficient plus (3,5)

70,5 - 80 - good (4,0)

80,5 - 90 - good plus (4,5)

90,5 ÷ 100 - very good (5,0)

Auditing exercises (check the learning outcomes: W 04, W08, W09, U02, U04, K03)

Two-quiz test and two open-ended questions. Duration of 90 minutes. Maximum score: 40 points.

Grading scale:

0 ÷ 19.5 - insufficient (2.0)

20 ÷ 24 - sufficient (3.0)

24,5 - 28 - sufficient plus (3,5)

28,5 - 32 - good (4,0)

32,5 ÷ 36 - good plus (4,5)

36,5 ÷ 40 - very good (5,0)

Project exercises (Examination of learning outcomes: U05, U06, K01, K02)

Checking progress in class work, as documented in the consultation tab.

Credit on the basis of the 3-stage design exercise.

Maximum score: 60 points - 1st stage: 17 points, 2nd stage: 19 points, 3rd stage: 24 points

Grading scale:

0 ÷ 29.5 - insufficient (2.0)

30 ÷ 36 - sufficient (3.0)

36,5 ÷ 42 - sufficient plus (3,5)

42,5 ÷ 48 - good (4,0)

48,5 ÷ 54 - good plus (4,5)

54,5 ÷ 60 - very good (5,0)

Lecture:

A two-part written final exam: part 1 - checking the knowledge (questions and test); part 2 ? checking the skills (2 problems), continuous evaluation during each lecture (rewarding activity).

Recitation classes:

1 written tests at the end of semester,

continuous evaluation during each class (rewarding activity).

Project classes:

points awarded for timely solving of tasks in particular stages of the project,

evaluation of the report and answers to questions checking individual involvement n the project task completion.

Course description

Function and structure of the water supply system, description of the systems and elements.

Classification of the systems. Examples of spatial configuration layouts ? system structures. The principles of determining water demand. Planning and programming water supply systems. The sources of water supply for collective water distribution systems. Surface and ground water intakes. Functions and roles performed in the system by water distribution assemblies. The principles of equipment selection and dimensioning. The methods of solving problems associated with hydraulic analysis of water supply systems characterised by various degrees of complexity. The criteria and methods of optimization in the designing of water distribution systems. Materials and reinforcement of water pipelines. Preparations and the consecutive stages of the process of planning and building water supply networks. The methods and materials used in the construction of water supply networks. Operation of water intakes, pumping stations, reservoirs and water networks. Computer-aided designing and operation of water intake and transport systems. Databases and spatial information systems. Computer modelling of systems. The operating principles of water distribution systems. Management of equipment renovation and upgrading. Preventing secondary pollution of water. Standards characterising the level of equipment maintenance in water supply systems.

Subject of the project : Programme and spatial concept of a water distribution system.

1.Calculating the demand for water.

2.Planning the system structure and determining the useful capacity of the holding reservoirs.

3.Dimensioning the diameters of the water mains.

4.Selection of the pumping equipment.

5.Simulation of the operating conditions and evaluation of the designed system.

Learning methods:

Lecture: Lecture using multimedia presentations, combined with discussion with the listeners.

Auditing exercises: practice method using multimedia presentation.

Design exercises: a design method using multimedia presentations

Basic bibliography:

1. Knapik K., Bajer J., Wodociągi, Politechnika Krakowska, 2011

2. Gabryszewski T., Wodociągi, Arkady, Warszawa, 1983

3. Advance Water Distribution Modeling and Managment, First Edition, by Haestad Methods, Inc, 2003-2004, Waterbury, USA

Additional bibliography:

1. Mielcarzewicz E., Obliczenia systemów zaopatrzenia w wodę, Arkady, Warszawa 2000

2. Wodociągi i kanalizacja w Polsce tradycja i współczesność, Praca zbiorowa, PFOZW, Bydgoszcz, Poznań, 2002

3. Szuster-Janiaczyk Agnieszka, 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

Result of average student's workload

Activity	Time (working hours)
1. Attendance at the lectures	30
2. Participation in recitation classes	15
3. Participation in project classes	15
4. Participation in consultations on the project implementation, recitation and laboratory classes	5
5. Performance at the project classes (work at home, including installation of the software and learning how to operate it).	45
6. Preparation for the final test in recitation classes	20
7. Preparation for the exam and attendance at the examination session.	20

Student's workload

Source of workload	hours	ECTS
Total workload	125	5
Contact hours	65	3
Practical activities	60	2