



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Fundamentals of Water Supply and Sewage Collection Systems

### Course

Field of study

Environmental Protection Technologies

Area of study (specialization)

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Level of study

First-cycle studies

Form of study

full-time

Year/Semester

III/6

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

30

Laboratory classes

45

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

### Number of credit points

3

### Lecturers

Responsible for the course/lecturer:

drhab. inż. Joanna Jeż-Walkowiak

e-mail: joanna.jez-walkowiak@put.poznan.pl

Faculty of Environmental Engineering and Energy

ul. Berdychowo 4, 60-965 Poznań

Responsible for the course/lecturer:

drinż. Agnieszka Szuster-Janiaczyk

mail:agnieszka.szuster-janiaczyk@put.poznan.pl

Faculty of Environmental Engineering and Energy

ul. Berdychowo 4, 60-965 Poznań

### Prerequisites

Basic knowledge of analytical chemistry, process chemistry, technical drawing, fluid mechanics.

### Course objective

Acquiring knowledge about basic processes and devices and installations used in water and wastewater treatment as well as water supply and sewage collection.

### Course-related learning outcomes

Knowledge

1.Student has a basic knowledge of the water and sewage systems, design principles, and calculating network and water supply and sewerage facilities. K\_W03,

2.Student knows the law regulations referred to water quality in distribution systems. K\_W14, K\_W15



3. Student knows the wastewater and sludge characteristic. K\_W06, K\_W09

4. Student has the basic knowledge of processes and utilities applied for water and wastewater treatment and disposal. K\_W03, K\_W05, K\_W10, K\_W12

5. Student has the basic knowledge referred to design and operation of objects at water treatment plant and wastewater treatment plant. K\_W10, K\_W12, K\_W13

#### Skills

1. Student has the basic skills for drinking water quality evaluation with respect to regulations. K\_U01, K\_U10,

2. Student has the basic skills for water requirement/demand and wastewater volume calculation. K\_U01,

3. Student has the basic skills for water intake classification. K\_U01, K\_U16,

4. Student has the basic skills for wastewater treatment train recommendation with respect to wastewater composition. K\_U15, K\_U16,

5. Student has the basic skills for water treatment train recommendation with respect to raw water composition. K\_U15, K\_U16,

#### Social competences

1. Student understands the need for systematic deepening and broadening his/her competences - [K2\_K01].

2. Student understands the value of ethics in engineering professional activity. K\_K02, K\_K05

3. Student understands the need for teamwork, taking part in different activities. K\_K03

#### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written two stage finale exam

Laboratory exercises:

Short entrance written test before each laboratory

Oral answer

Written report of each laboratory exercise

Activity evaluation during each laboratory

#### Programme content

Lectures:



1. Water Supply Systems, mono and multi-zone systems, gravity and pressure systems, general characteristic.
2. Water demand.
3. Water network: line, hydraulic calculation, pressure lines, pipe placement in road, materials and utilities.
4. Water tanks, types and functions/purpose, volume, equipment and construction.
5. Pumping station and water tank (under pressure): types and purpose; selection of pump, pipes and water-air tanks; equipment, construction guidelines/engineering recommendations.
6. Sewage systems, gravity, pressure, general characteristic; Sewage net equipment.
7. Sewage line in road profile. Quality and quantity of sewage. Sewer and utilities calculation. Pumping stations.
8. Basic law regulations referred to drinking water quality.
9. Wastewater characteristic and composition. Quality parameters. Contaminants loads. PE – people equivalent.
10. Technological treatment trains.
11. Processes: removed contaminants, objects and devices. Effectiveness of processes. Primary treatment (screening, grid removal, primary sedimentation). Chemical treatment. Integrated biological treatment (removal of carbon, nitrogen and phosphorus).
12. Sludge treatment and disposal, processes and objects.
13. Natural raw water.
14. Processes for suspended solids, colloids and dissolved contaminants removal from ground and surface water, mechanism and effects. Objects, operation, technological parameters. Technological trains.
15. Sludge treatment and disposal, processes and objects.

Laboratory classes:

1. Basics of microbiology, cell structure and bacterial colony.
2. Collection of water and bottom sediments. Assessment of surface water pollution and water ion balance.
3. Bacteriological sanitary analysis of water.



4. Examination of activated sludge breathing using the Warburg method and microscopic analysis of activated sludge.
5. Structure of a typical plant cell and microscopic analysis of seston.
6. Water aeration
7. Sedimentation and hydraulic efficiency of the settling tanks .
8. Coagulation for turbidity removal.
9. Groundwater filtration for iron removal.
10. Technical trip to Water Treatment Plant
11. Technical treap to Wastewater Treatment Plant

### Teaching methods

Lecture - multimedial presentation, discusion -

Laboratory clasess - practical experiment, analytical and microbiologicalanalyses

Technical trip to Wastewater Treatment Plant

### Bibliography

Basic

- 1.Gabryszewski T., Wodociągi, Arkady, Warszawa 1983.
- 2.Mielcarzewicz E., Obliczanie systemów zaopatrzenia w wodę, Arkady, Warszawa 2000.
- 3.Wodociągi i kanalizacja. Poradnik. Praca Zbiorowa, Arkady, Warszawa 1971.
- 4.Błaszczyk W. i in., Kanalizacja, Arkady, Warszawa 1974.
- 5.Sowiński: Projektowanie sieci i urządzeń kanalizacyjnych, Wyd. Politechniki Poznańskiej, Poznań 1986.
- 6.Praca zbiorowa pod redakcją Z. Dymaczewskiego, J.A. Oleszkiewicza, M.M. Sozańskiego: Poradnik eksploatatora oczyszczalni ścieków. Wyd. II, PZITS, Oddz. Poznań, LEM s.c. Kraków, Poznan1997.
- 7.Heidrich Z.: Urządzenia do oczyszczania ścieków - Projektowanie, przykłady obliczeń. Wyd. „Seidel-Przywecki” Sp. z o.o., Warszawa 2005.
- 8.Heidrich Z. i inni: Urządzenia do uzdatniania wody. Arkady, Warszawa 1987.
- 9.Praca zbiorowa, Wodociągi i Kanalizacja w Polsce, tradycja i współczesność, Polska Fundacja Odnowy Zasobów Wodnych, Poznań-Bydgoszcz, 2002 r.
10. Kowal A.L., Świdarska-Bróż M. Oczyszczanie wody, Wyd. PWN 2007



11. Michałkiewicz M., Fiszler M. Biologia sanitarna: ćwiczenia laboratoryjne. Wyd. Politechniki Poznańskiej, 2007

Additional

1. AWWA, Technical Editor F. W. Pontius, Water Quality and Treatment, Mc Coraw-Hill, Inc, New York, 1990

MWA, Water Treatment, Principles and Design, John Wiley and Sons, Inc., Hoboken, New Jersey, 2005.

**Breakdown of average student's workload**

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	75	2,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, raports preparation) <sup>1</sup>	15	0,5

<sup>1</sup> delete or add other activities as appropriate