



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Systems of Wastewater Treatment

### Course

Field of study

Environmental Engineering Second-cycle Studies

Area of study (specialization)

Water Supply, Water and Soil Protection

Level of study

Second-cycle studies

Form of study

part-time

Year/Semester

2/3

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

18

Laboratory classes

10

Other (e.g. online)

Tutorials

Projects/seminars

14

### Number of credit points

6

### Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

### Prerequisites

1.Knowledge: Student should have the basic knowledge of water and wastewater technology as well as mathematics, chemistry, fluid mechanics in the range presented on the 1st cycle study.

2.Skills: Student should be able to perform calculations in the field of mathematics, chemistry, fluid mechanics in the range presented on the 1st cycle study and should be able to do calculations for facilities of water and wastewater treatment plants in the range presented on the 1st cycle study.

3.Social competencies:

Ability for continuous self-improvement. Team work.



### Course objective

Aim: Enhancement of knowledge and skills in the field of wastewater treatment technology necessary for designing and maintenance of WWTP facilities

### Course-related learning outcomes

#### Knowledge

1. Student knows technological systems of wastewater treatment
2. Student knows methods of designing fundamental processes and technological systems of wastewater treatment and sludge management
3. Student understands the role of experiment in pre-design research
4. Student knows bases of mathematical modelling of activated sludge systems
5. Student knows selected unit processes of wastewater treatment and sludge management

#### Skills

1. Student can prepare a conception design of a municipal WWTP
2. Student can prepare a conception for sludge management
3. Student can perform a computer simulation of an activated sludge WWTP and give interpretation of the results
4. Student can perform lab experiments and give interpretation of the results

#### Social competences

1. Student understands the need of a team work in solving theoretical and practical problems
2. Student understands the need of a systematic improvement of his competence ]

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

#### Lectures:

- checking presence and activity,
- written final exam

#### Labs:

- written or oral short test at the beginning of each lab.,
- report after each lab.,



- continuous evaluation each lab.,
- final written test.

#### Designs:

- checking progress of work,
- evaluation of activity and knowledge on consultations,
- final written test
- report of the simulation project and it's defence.

#### Programme content

##### Lectures

- Objects of WWTP. Preparing technological scheme of WWTP.
- Factors affecting the choice of treatment method. Determination of influent flow and characteristics. Laboratory analyses and modelling for the needs of WWTP designing.
- Technological schemes of WWTPs.
- Systems for nutrients removal. Effectiveness of different WWTP systems.
- Systems for supernatant treatment.
- Systems for sludge management.
- Systems for odours removal.
- Computer simulation of WWTP: Activated Sludge Models ASM 1, 2, 2d, 3, optimisation of activated sludge, wastewater treatment process using computer simulation.

##### Designs

- Technological conception for municipal WWTP, calculation of hydraulic loss for selected units of WWTP.
- Computer simulation of an activated sludge WWTP.



### Laboratories

- Biological phosphorus removal
- Nitrogen removal
- Mechanical sludge dewatering

### Teaching methods

lecture: inform., problem, program text, method: problem, exercise, design, case study, laboratory, demonstration

### Bibliography

#### Basic

1. Łomotowski J., Szpindor A.: Nowoczesne systemy oczyszczania ścieków. Arkady, Warszawa 1999 r.
2. Bartoszewski K., Kempa E., Szpadt R.: Systemy oczyszczania ścieków. Skrypt Politechniki Wrocławskiej, Wrocław 1981 r.
3. . Praca zbiorowa pod redakcją Z. Dymaczewskiego: Poradnik eksploatatora oczyszczalni ścieków. wyd.3, PZITS, Poznań 2011
4. Heidrich Z., Witkowski A.: Urządzenia do oczyszczania ścieków. Projektowanie, przykłady obliczeń. Wyd. Seidel-Przywecki Sp. z o.o., Wyd. 1, Warszawa 2005 (wyd. 2, 2010)
5. Jaroszyński Ł., Jaroszyński T.: Dobór procesów do oczyszczania ścieków i przeróbki osadów ściekowych w komunalnych oczyszczalniach ścieków. Forum eksploatatora. 3/2017 (90), s. 40-43

#### Additional

1. Wastewater Engineering. Treatment and Reuse. Metcalf & Eddy. Inc. Mc Graw Hill, 4th edition international, 2004

### Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	42	2,0
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, project preparation) <sup>1</sup>	108	4,0

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