COURSE DESCRIPTION CARD - SYLLABUS

Course name
Systems of Wastewater Treatment [N2IŚrod2-ZwWOWiG>SOŚ]

Course

Field of study
Environmental Engineering

Year/Semester
2/3

Area of study (specialization)
Water Supply, Water and Soil Protection

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
18

Laboratory classes
10

Other (e.g. online)
0

Tutorials
0

Projects/seminars
14

Number of credit points

6,00

Coordinators

dr hab. inż. Zbysław Dymaczewski prof. PP
zbyslaw.dymaczewski@put.poznan.pl

Lecturers

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 prepear a conception design of a municipal WWTP
2. Student can prepear 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

Lecture
Modeling of wastewater treatment processes
Integrated removal of organic and biogenic compounds in the activated sludge process
A modern wastewater treatment plant as a water, energy and valuable raw material recovery plant

Design exercises
Technological concept of a municipal sewage treatment plant
Computer simulation of a biological treatment plant with activated sludge.

Laboratory exercises
Processes of pollutant removal and resource recovery in a wastewater treatment plant.

Course topics

Lecture
Basic knowledge in modeling wastewater treatment processes.
Computer simulation of a sewage treatment plant with activated sludge: model development, ASM1, 2, 2d, 3, 3P models.
Advanced removal of nutrients from wastewater.
Treatment of leachates generated in sewage treatment process.
A modern treatment plant as an integrated system for wastewater treatment and recovery of water, energy and valuable resources.

Design exercises
Technological concept of a municipal sewage treatment plant, design calculations using an advanced spreadsheet.

Computer simulation of a biological treatment plant with activated sludge, building a model of the treatment plant, interpretation of results for various operating conditions of the system, optimization of the treatment process.

Laboratory exercises
Recovery of phosphorus from leachate.
In-depth characterization of wastewater for the purposes of modeling the activated sludge process.

Teaching methods

lecture: inform., problem, program text, method: problem, excercise, 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	6,00
Classes requiring direct contact with the teacher	42	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	108	4,00