COURSE DESCRIPTION CARD - SYLLABUS

Course name

Technologies of Wastewater

Course

Field of study

Environmental Engineering

Area of study (specialization)

Level of study

First-cycle studies

Form of study

part-time

Year/Semester

3/6

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

Number of hours

Lecture

24

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

15

Number of credit points

6

Lecturers

Responsible for the course/lecturer:

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Responsible for the course/lecturer:

Prerequisites

1.Knowledge:

In mathematics, physics, chemistry, environmental biology, fluid mechanics and other areas, useful for formulating and solving simple excercises in the field of environmental engineering

2.Skills :

Acquiring information from literature, databases and other properly selected sources, also in English or another foreign language recognized as a language of international communication in the field of environmental engineering. Solving excercises of fluid mechanics

3.Social competencies:

Awareness of the need to constantly update and supplement knowledge and skills. Teamwork

Course objective

-The objective of the course is to broaden the knowledge and skills in the field of wastewater technology necessary for the selection and design facilities and processes for removal of organic and biogenic pollutants from municipal wastewater

Course-related learning outcomes

Knowledge

1. Student knows the basic types of indicators of wastewater and sewage sludge pollution and the requirements for wastewater discharged into the sewage system and surface waters - [K_W03, K_W04]

2. Student knows and understands the methods of wastewater treatment in terms of removing from them the basic physical, chemical and biogenic pollutants and the treatment of sewage sludge generated in wastewater treatment plants (obtained during the lecture, project and laboratories) - [K_W04, K_W05,K_W07]

3. Student knows and understands the principles of operation and calculation methods of basic wastewater treatment plant devices and facilities (obtained during the lecture and project) - [K_W04, K_W07

Skills

1. Student is able to give a general concept of municipal wastewater treatment and management of sewage sludge generated in treatment plants (obtained during the lecture and project) - [K_U03, K_U04,K_U09, K_U11]

2. Student is able to perform design calculations of devices and facilities for wastewater treatment and sewage sludge treatment (obtained on the project) - [K_U04, K_U11, K_U16]

3. Student is able to perform basic measurements in sewage and activated sludge (pH, redox potential, dissolved oxygen concentration, concentration of total suspended solids, sludge volume index, etc., and perform calculations determining the basic technological parameters of activated sludge (obtained at the lecture, project and laboratories) - [K_U14 , K_U16]

Social competences

1. Student sees the need for continuous and systematic extending of their competences (obtained during the lecture, project and laboratories) - [K_K01, K_K03, K_K06]

2. Student is aware of the critical assessment of the solutions obtained resulting from the assumptions made and the large number of indicators of pollution in treated wastewater (obtained during the lecture, project and laboratories) - [K_K02, K_K04, K_K05]

3. Student understands the need for teamwork in solving design and operational problems of wastewater treatment plants (obtained during the lecture, project and laboratories) - [K_K03, K_K04, K_K05]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

1. Attendance and lecture activity checkup

2. Written final exam - 10 open questions to answer (effects W1,W2,W3,W4, K1).

Maximum amount of points for each question is 10. Criteria of estimates depending on scoring:

Points - estimate

91 - 100 very good (5,0)

81 - 90 Good plus (4,5)

71 - 80 Good (4,0)

61 - 70 Sufficient plus (3,5)

50 - 60 Sufficient (3,0)

below 50 - Insufficient (2,0)

Project (effects W1,W2,W3,W4, K1)

1. Verification of project advancements and independent design work after each step

2. Written exam after each of 3 project part. Werification of progress in realization of project balance of amount and qualities of screens, grid chambers, preliminary sedimentation tanks, biological reactors, secondary sedimentation tanks, part amount sewage sludge (characteristics of sludge, thickening,anaerobic digesters, dewatering of sludges). Scheme of designed sewage treatment plant. All of mentioned part is evaluated (account and graphic part). Besides, after all of 3 project written part (Part 1 primary treatment process, Part 2 biological treatment, Part 3 sludge handling) is written exam. All of part must be included on positive estimate.

Written Test - 3 open questions (W4, W7, K1). For each question maximum number of points 5. Assessment criteria depending on the score obtained:

Number of points - estimate

14 -15 very good (5.0)

12.5 - 13.5 good plus (4.5)

11 - 12 good (4.0)

9.5 - 10.5 sufficient plus (3.5)

8-9 satisfactory (3.0)

Less than 8 points - insufficient (2.0)

Laboratories (effects K1,K2,K3,K4, U4, U11, U16).

1. Short entrance written test before each laboratory

2. Written report of each laboratory exercise

3. Written final test regarding all exercises

4. Activity evaluation during each laboratory (promoting activity)

Final test - 4 tasks. No possibility to use cells, calculators etc. For each task max. 2.5 points, accuracy of 0.25 points

Number of points - estimate

9,25 - 10,00 very good (5,0)

8,25 - 9,00 good plus (4,5)

7,25 - 8,00 good (4,0)

6,25 - 7,00 sufficient plus (3,5)

5,25 - 6,00 sufficient (3,0)

5,00 i mniej - insufficient (2,0)

Programme content

-Lecture

Ecology in water and wastewater management. Type and characteristics of wastewater. Flow rates (quantity characteristic). Composition of wastewater. Wastewater characteristics (quality characteristic). Loading of contaminants. Unit loads. Population equivalent (p.e.). Regulation for effluent wastewater to sewer systems and recipients. Efficiency of treatment process at wastewater treatment plants (WWTP). Types of WWTPs, process flowsheets, processes used, pollutants removed, devices and facilities used, effectiveness. Mechanical treatment (screening, grit chambers, grease tank, primary settling tanks). Chemical WWTP. Biological treatment (trickling filters, activated sludge). Integrated biological processes for BOD removal (organic components) and nutrient removal (nitrogen and phosphorus). Types of solid and sludge wastes at WWTP. Sludge characteristic. Processes and devices used for treatment and disposal of sludge wastes: thickening, stabilization (anaerobic digestion, aerobic digestion, alkaline stabilization), dewatering. Sewage sludge disposal - utilization and landfilling.

Laboratory subjects area:

Hydraulic flow through a settling tank, sedimentation of suspended solids

aeration, activated sludge process investigation, nutrient removal

Project subjects:

1.Balance of rates (quantity characteristic) and composition of wastewater (quality characteristic). Loading of contaminants. Population equivalent (p.e.). Technological calculations of mechanical WWTP (screening, grit chambers, primary settling tanks)

2.Technological calculations of biological WWTP with nutrient removal (activated sludge, final settling tanks)

3.Technological calculations of devices used for treatment of sewage sludge (gravity and mechanical thickening, anaerobic digestion, devices for sludge dewatering).

Teaching methods

Lecture - lecture with the use of multimedia presentation and the elements of seminar lecture and problem-focused lecture.

Laboratory exercises - exercise, problem method, case study, measurement, observation, experiment

Project - practical project carried out alone (independently)

Bibliography

Basic

1. Poradnik eksploatatora oczyszczalni ścieków. (praca zbiorowa pod red. Zbysława Dymaczewskiego; aut: Z. Dymaczewski, T. Jaroszyński, J. Jeż-Walkowiak, M. Komorowska-Kaufman, M.Michałkiewicz, W.Niedzielski, M.M. Sozański). Wyd. 3, rozszerz., zmienione i uaktualnione, Poznań 2011, PZITS

2. Heidrich Z., Witkowski A.: Urządzenia do oczyszczania ścieków - Projektowanie, przykłady obliczeń. Wyd. 2, Seidel-Przywecki. Sp. z o.o., Warszawa 2010

3. Bylka H., Dymaczewski Z., Harasymowicz E., Jaroszynski T., i inni : Wodociągi i kanalizacja w Polsce tradycja i współczesność. Poznań-Bydgoszcz 2002.

4. 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

7. Catalogues (System Uniklar-77, prospects, web pages of manufacturers)

Additional

1. Wastewater Engineering. Treatment and Reuse. Metcalf & Eddy. Inc. Mc Graw Hill, Fourth edition, 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	60	3,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	90	4

[1] delete or add other activities as appropriate