STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Sewage and Waste Technology**		Code **1010134261010135218**
Field of study **Environmental Engineering Extramural First-**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 6**
Elective path/specialty **-**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **part-time**	
No. of hours Lecture: **24** Classes: **12** Laboratory: **-** Project/seminars: **16**		No. of credits **7**
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** **Technical sciences**		ECTS distribution (number and %) **7 100%** **7 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge about chemistry, environmental biology, ecology and general knowledge from environmental engineering
2	**Skills**	Ability for searching valuable information. Reading research articles and reports with understanding. Ability to use existing knowledge and its application in a new perspective. Basic principles of working in a group and writing a project reports.
3	**Social competencies**	Awareness to constantly update and supplement knowledge and skills

Assumptions and objectives of the course:

- The objective of the course is to broaden the knowledge and skills scopes of wastewater technology necessary for the selection of technology methods of basic pollutants removal from municipal wastewater.

-The course is dealing with problems concerning waste management of solid wastes and their utilization. The objective of the course is to develop skill on waste management planning, waste segregation, mechanic-, thermal- and biological- treatment, and landfilling of waste.

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

Knowledge:

1. Student knows the technological systems of wastewater treatment depending on the wastewater characterization on influent and effluent - [K_W03, K_W04]

2. Student knows the design methods of basic technological processes and technological systems of wastewater treatment and sludge handling and disposal systems for waste and sludge produced at WWTP - [K_W04, K_W05,K_W07]

3. . Student understands basics of experiment in pre-design research of WWTP - [K_W04, K_W07]

4. Student has structured and theoretically founded knowledge of the existing waste management systems - [KW07]

Skills:

1. Student can prepear the design concept of technology for municipal wastewater treatment plant - [K_U03, K_U04,K_U09, K_U11]

2. Student can work in a team (measurements and elaboration of the obtained experimental data) - [K_U04, K_U11,K_U16]

3. Student is able to plan waste management system in accordance with the demand in the region - [K_U07]

4. Student is able to design and explain the system of collection, transport and transfer of waste - [K_U01]

Social competencies:

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1. Student understands the need for teamwork in solving theoretical and practical problems - [K_K03]
2. Student understands the different roles in a teamwork and the need for information and knowledge exchange in a group work - [K_K03, K_K04]
3. Student is aware of the need for sustainable development in waste management systems - [K_K02]

Assessment methods of study outcomes

- Lecture (effect W3, W4, W5, W7)

Two-part written final exam. The requirement to pass the exam is to obtain a minimum of 50 credits from each part (waste water and solid waste technology). The final score is based on the sum of the points obtained from both parts.

Written exam - after 5 questions from each part. A total of 10 open questions. For each question the maximum number of points 10. Criteria of evaluation depending on the number of points obtained:

Number of points - rating

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 satisfactory (3.0)

Below 50 points - insufficient (2.0)

Exercises (effect U1, U7, K1, K2)

- final test (at the end of the semester) on waste water treatment and solid waste management technology).

Written check - up to 3 open questions, from each part (waste and waste water technology). A total of 6 questions. For each question the maximum number of points 5. The condition for passing the written test is to obtain a minimum of 7.5 points from each part (waste water and solid waste technology). The final score is based on the sum of the points obtained from both parts.

Criteria for evaluation based on the number of points obtained:

Number of points - rating

28 -30 very good (5.0)

25 - 27.5 good plus (4.5)

22 - 24.5 good (4.0)

19 - 21.5 sufficient plus (3.5)

15 - 18.5 satisfactory (3.0)

Less than 15 points - insufficient (2.0)

- Project exercises (effects U1, U7, K1)

Checking the progress of the project with wastewater treatment and solid waste. The final grade is the arithmetic average of the two grades obtained.

Grading scale:

very good (5.0)

good plus (4.5)

good (4.0)

Positive plus (3,5)

satisfactory (3.0)

insufficient (2.0)

Course description

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- 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 WWTP (screening, grit chambers, grease tank, primary settling tanks).Biological WWTP (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.

-Basic concepts of waste management: waste generation, the amount and composition, collection and segregation of waste, recycling and reuse, incineration, biological treatment (composting, biogas production), waste disposal, waste management regulations, the impact of waste on the environment.

Projects:

Students will be divided into groups of about 4-6 (depending on the number of students in groups) within which they will work on solving the waste management problem for specific town/city based on the knowledge acquired from the lectures and literature. Additionally, the following soft skills will be acquired: working in groups, sharing tasks, searching for valuable information, writing reports, presenting the results.

Education methods:

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

Classes - example with the use of multimedia presentation

Project - practical project executed alone

Basic bibliography:

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

2. Jaroszynski T.: Materiały pomocnicze do ćwiczeń projektowych. Maszynopis w formacie pdf.

3. Bień J.B.: Osady ściekowe. Teoria i praktyka. Wydawnictwo Politechniki Częstochowskiej. Częstochowa 2002

4. Rosik-Dulewska Cz.: Podstawy gospodarki odpadami, PWN 2010

Additional bibliography:

1. Praca zbiorowa pod redakcją Z. Dymaczewskiego: Poradnik eksploatatora oczyszczalni ścieków. Wyd. III, PZITS, Oddz. Wielkopolski, Poznań 2011

2. Podedworna J., Umiejewska K.: Technologia osadów ściekowych. Warszawa. Oficyna Wyd. Politechniki Warszawskiej. 2008

Result of average student's workload

Activity	Time (working hours)
1. Lecture participation (contact hours)	24
2. Training participation (contact hours)	12
3. Preparation for training exercises (work at home)	21
4. Project participation (contact hours)	16
5. Project preparation at home (work at home)	35
6. Project consultation with the instructor (Student is assumed to attend 5 consultations)	5
7. Preparation for examination of classes and project exercises	25
8. Preparation for the exam (work at home)	35
9. Presence at the exam (contact hours)	2

Student's workload

Source of workload	hours	ECTS
Total workload	175	7
Contact hours	59	2
Practical activities	46	2

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