

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) general academic	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) other		(university-wide, from another field) university-wide
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 7 100% 7 100%
Responsible for subject / lecturer: dr inż. Tymoteusz Jaroszyński email: tymoteusz.jaroszynski@put.poznan.pl tel. 616652436 Faculty of Civil and Environmental Engineering ul. Piotrowo 5 60-965 Poznań		Responsible for subject / lecturer: dr Piotr Krajewski email: piotr.krajewski@put.poznan.pl tel. 616652436 Faculty of Civil and Environmental Engineering ul. Piotrowo 5 60-965 Poznań
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 prepare 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:		

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
<p>-Lecture (effect W1,W2,W3,W4, K1)</p> <p>1. Attendance and lecture activity checkup</p> <p>2. Written finale exam</p> <p>Classes (effect W1,W2,W3,W4, K1)</p> <p>1. Written exam of criteria design wasterwater treatment plant</p> <p>Project (effect W2,W3,W4,U1,U2,U3,K1,K2,K3)</p> <p>1. Verification of project advancements and independent design work after each step</p>

Course description
<p>-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.</p> <p>-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.</p> <p>Projects:</p> <p>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.</p> <p>Education methods:</p> <p>Lecture - lecture with the use of multimedia presentation and the elements of seminar lecture and problem-focused lecture.</p> <p>Classes - example with the use of multimedia presentation</p> <p>Project - practical project executed alone</p>

Basic bibliography:
<p>1. Heidrich Z., Witkowski A.: Urządzenia do oczyszczania ścieków - Projektowanie, przykłady obliczeń. Wyd. Seidel-Przywecki Sp. z o.o., Warszawa 2010</p> <p>2. Jaroszynski T.: Materiały pomocnicze do ćwiczeń projektowych. Maszynopis w formacie pdf.</p> <p>3. Bień J.B.: Osady sciekowe. Teoria i praktyka. Wydawnictwo Politechniki Częstochowskiej. Częstochowa 2002 3. Rosik-Dulewska Cz.: Podstawy gospodarki odpadami, PWN 2010</p>

Additional bibliography:
<p>1. Praca zbiorowa pod redakcją Z. Dymaczewskiego: Poradnik eksploatatora oczyszczalni ścieków. Wyd. III, PZITS, Oddz. Wielkopolski, Poznań 2011</p> <p>2. Podedworna J., Umiejewska K.: Technologia osadów ściekowych. Warszawa. Oficyna Wyd. Politechniki Warszawskiej. 2008</p>

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	116	5