

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Water Treatment Technology		Code 1010134251010130903
Field of study Environmental Engineering Extramural First-	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 5
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: 20 Classes: - Laboratory: - Project/seminars: 20		No. of credits 5
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 %) 5 100% 5 100%
Responsible for subject / lecturer: dr hab. inż. Alina Pruss email: alina.pruss@put.poznan.pl tel. 61 665 34 97 Faculty of Civil and Environmental Engineering Berdychowo 4, 60-965 Poznań		Responsible for subject / lecturer: dr hab. inż. Joanna Jeż-Walkowiak email: joanna.jez-walkowiak@put.poznan.pl tel. 61 665 34 97 Faculty of Civil and Environmental Engineering Berdychowo 4, 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Student should have a basic knowledge mathematics, chemistry, fluid mechanics and general knowledge from environmental engineering.
2	Skills	Student should be able to perform mathematical calculations, physical, chemical, mechanics of the fluids.
3	Social competencies	Awareness to constantly update and supplement knowledge and skills.
Assumptions and objectives of the course: Knowledge of water treatment processes as well as principles of design and operation of water treatment facilities. Creation an ability for solving problems concerning designing, investment and operation of installation and facilities of water treatment plants, including sludge management.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student has structured and theoretically founded knowledge of methods of water treatment. - [[[K2_W03, K2_W04, K2_W07]]]		
2. Student has an ordered knowledge of design methods of basic technological processes used in the raw water treatment technology - [K2_W03, K2_W04, K2_W07]		
Skills:		
Social competencies:		
1. Student understands the need for teamwork in solving theoretical and practical problems - [K2_K03]		
2. Student understands the different roles in teamwork and the need for information and knowledge exchange in a group work - [K2_K03, K2_K04]		
3. Student understands the need for a systematic deepening and broadening his/her competences - [K2_K01]		
Assessment methods of study outcomes		

<p>Exam (written and spoken), Defence of design and verification of theoretical knowledge. Written exam - 5 open questions. For each question the maximum number of points 20. 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)</p> <p>Project (effect W2, U2, K2) - checking the progress of the project in each activity, - verbal defense of the project (verification of independent design work and acquired skills). Evaluation of the project (70% of the defense rating + 30% of the project)</p>

Course description

Water treatment technology: basic terminology, meaning, goals and place in water-wastewater management, water recovery. Water sources and quality: surface water, groundwater, infiltration water, contaminants and water quality indicators, physical, chemical and biological contamination, water quality protection. Drinking water quality requirements: WHO requirements, EU Directive, Polish Health Ministry Directive. Processes and object of water treatment: coagulation, storage and installation of reagents, mixing tanks, flocculation tanks; sedimentation, rectangular and vertical clarifiers, sludge blanket clarifiers, tube settler; slow sand filtration, rapid filtration, direct filtration, rapid filters, granular carbon filters, filtration materials, filter backwashing, drainage systems; water aeration, devices for aeration of water, iron and manganese removal technology, Filters for iron and manganese removal; disinfection, chlorine, chlorine dioxide, ozone, disinfection byproducts, UV-disinfection. Water treatment plants: location and protection zones, site arrangement, sludge management.

Project
 Technological design of Water Treatment Plant.

Basic bibliography:

1. Apolinary L. Kowal, Maria Świdarska - Bróz, Oczyszczanie wody, PWN, Warszawa 2009
2. Zbigniew Heidich i inni, Urządzenia do uzdatniania wody, zasady projektowania i przykłady obliczeń, Arkady, Warszawa 1987
3. Anna M. Anielak Wysokoefektywne metody oczyszczania wody, PWN, Warszawa 2015

Additional bibliography:

1. MWH, Water Treatment Principles and Design (Secondo Editio, Revised by J. C. Crittenden, R. R. Trussell, D. W. Hanol, K. J. Howe and G. Tchobanoglous), John Wiley & Sons, Inc., Hoboken, NY, 2005.
2. Joanna Jeż-Walkowiak, Wpływ właściwości złóż filtrów pospiesznych na efekty technologii odżelaziania i odmanganiania wód podziemnych, Wydawnictwa PP, Poznań 2016

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures (contact hours)	20
2. Participation in project (contact hours, practical)	20
3. Design preparation (practical)	30
4. Project consulting (contact hours, practical)	25
5. Exam preparations	30

Student's workload

Source of workload	hours	ECTS
Total workload	125	5
Contact hours	45	2
Practical activities	75	3