

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Technologies of Water		Code 1010101241010130903
Field of study Environmental Engineering First-cycle Studies	Profile of study (general academic, practical) (brak)	Year /Semester 2 / 4
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 15 Classes: - Laboratory: - Project/seminars: 30		No. of credits 4
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		ECTS distribution (number and %)
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.</p> <p>Written exam - A total of 5 open questions. For each question the maximum number of points 20. Criteria of evaluation depending on the number of points obtained:</p> <p>Number of points - rating</p> <p>91 -100 very good (5.0)</p> <p>81 - 90 good plus (4,5)</p> <p>71 - 80 good (4.0)</p> <p>61 - 70 sufficient plus (3,5)</p> <p>50 - 60 satisfactory (3.0)</p> <p>Below 50 points - insufficient (2.0)</p> <p>Project (effect W2, U2, K2)</p> <p>- checking the progress of the project in each activity,</p> <p>- oral presentation of the project (verification of independent design work and acquired skills). Evaluation of the project (70% of the oral presentation + 30% of the project)</p>
<p style="text-align: center;">Course description</p>
<p>1. Water treatment technology: basic terminology, meaning, goals and place in water-wastewater management, water recovery.</p> <p>2. Water sources and quality: surface water, groundwater, infiltration water,</p> <p>3. Contaminants and water quality indicators, physical, chemical and biological contamination, water quality protection.</p> <p>4. Drinking water quality requirements: WHO requirements, EU Directive, Polish Health Ministry Directive.</p> <p>5. Processes and object of water treatment: water aeration, devices for aeration of water, iron and manganese removal technology,</p> <p>6. Filters for iron and manganese removal;filtration materials, filter backwashing, drainage systems</p> <p>7. Disinfection, chlorine, chlorine dioxide, ozone, disinfection byproducts, UV-disinfection.</p> <p>8. Water treatment plants: location and protection zones, site arrangement, sludge management.</p> <p>Project</p> <p>Technological design of Water Treatment Plant.</p> <p>Learning methods:</p> <p>Lecture: Lecture using multimedia presentations, combined with discussion with the listeners.</p> <p>Project: a design method using multimedia presentations</p>
<p>Basic bibliography:</p> <p>1. Apolinary L. Kowal, Maria Świdorska - Bróz, Oczyszczanie wody, PWN, Warszawa 2009</p> <p>2. Zbigniew Heidich i inni, Urządzenia do uzdatniania wody, zasady projektowania i przykłady obliczeń, Arkady, Warszawa 1987</p> <p>3. Pruss A., Jeż-Walkowiak J., Sozański M.M. Krótka charakterystyka metali i metaloidów objętych projektem [W]: Metale i substancje towarzyszące w wodach przeznaczonych do spożycia w Polsce / pod red. Adama Postawy i Stanisława Witczaka. - Kraków : Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie Wydział Geologii, Geofizyki i Ochrony Środowiska, 2011. - S. 13-17</p> <p>4. Pruss A., Jeż-Walkowiak J., Sozański M.M. Ocena możliwości usuwania nadmiaru metali i metaloidów w procesach uzdatniania wody w szczególności żelaza, manganu i arsenu [W] Metale i substancje towarzyszące w wodach przeznaczonych do spożycia w Polsce / pod red. Adama Postawy i Stanisława Witczaka. - Kraków : Akademia Górniczo-Hutnicza im. Stanisława Staszica w Krakowie Wydział Geologii, Geofizyki i Ochrony Środowiska, 2011. - S. 51-79</p> <p>5. Anna M. Anielak, Wysokoefektywne metody oczyszczania wody, PWN, Warszawa 2015</p> <p>6. Joanna Jeż-Walkowiak, Wpływ właściwości złożeń filtrów pospiesznych na efekty technologii oddzielania i odmanganiania wód podziemnych, Wydawnictwa PP, Poznań 2016</p>
<p>Additional bibliography:</p> <p>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.</p> <p>2. Sozański, Peter M. Huck, Badania doświadczalne w rozwoju Technologii Uzdatniania Wody, Monografie Komitetu Inżynierii Środowiska PAN, vol. 42, Lublin 2007</p> <p>3. Joanna Jeż-Walkowiak, Wpływ właściwości złożeń filtrów pospiesznych na efekty technologii oddzielania i odmanganiania wód podziemnych, Wydawnictwo PP, Poznań 2016</p> <p>4. Best practice guide on the control of iron and manganese in water supply / ed. by Adam Postawa, Colin Hayes, London, United Kingdom, IWA Publishing, 2013, ISBN 9781780400044</p>
<p style="text-align: center;">Result of average student's workload</p>

Activity		Time (working hours)
1. Participation in lectures (contact hours)		15
2. Participation in project (contact hours, practical)		30
3. Design preparation (practical)		20
4. Design problems consulting (contact hours)		5
5. Exam preparations		30
Student's workload		
Source of workload	hours	ECTS
Total workload	100	4
Contact hours	50	2
Practical activities	50	2