STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Water Treatment Technology		**1010101241010130903**

Field of study	Profile of study (general academic, practical)	Year /Semester
Environmental Engineering First-cycle Studies	**(brak)**	**2 / 4**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
First-cycle studies	**full-time**

No. of hours				No. of credits
Lecture: **15**	Classes: **-**	Laboratory: **-**	Project/seminars: **30**	**4**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**4 100%**

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

http://www.put.poznan.pl/

Exam (written and spoken), Defence of design and verification of theoretical knowledge.

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:

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)

Project (effect W2, U2, K2)

- checking the progress of the project in each activity,

- oral prezentation of the project (verification of independent design work and acquired skills). Evaluation of the project (70% of the oral prezentation + 30% of the project)

Course description

1. Water treatment technology: basic terminology, meaning, goals and place in water-wastewater management, water recovery.

2. Water sources and quality: surface water, groundwater, infiltration water,

3. Contaminants and water quality indicators, physical, chemical and biological contamination, water quality protection.

4. Drinking water quality requirements: WHO requirements, EU Directive, Polish Health Ministry Directive.

5. Processes and object of water treatment: water aeration, devices for aeration of water, iron and manganese removal technology,

6. Filters for iron and manganese removal;filtration materials, filter backwashing, drainage systems

7. Disinfection, chlorine, chlorine dioxide, ozone, disinfection byproducts, UV-disinfection.

8. Water treatment plants: location and protection zones, site arrangement, sludge management.

Project

Technological design of Water Treatment Plant.

Learning methods:

Lecture: Lecture using multimedia presentations, combined with discussion with the listeners.

Project: a design method using multimedia presentations

Basic bibliography:

1. Apolinary L. Kowal, Maria Świderska - Bróż, Oczyszczanie wody, PWN, Warszawa 2009

2. Zbigniew Heidich i inni, Urządzenia do uzdatniania wody, zasady projektowania i przykłady obliczeń, Arkady, Warszawa 1987

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

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

5. Anna M. Anielak, Wysokoefektywne metody oczyszczania wody, PWN, Warszawa 2015

6. Joanna Jeż-Walkowiak, Wpływ właściwości złóż filtrów pospiesznych na efekty technologii ozdżelziania i odmanganiania wód podziemnych, Wydawnictwa PP, Poznań 2016

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. Sozański, Peter M. Huck, Badania doświadczalne w rozwoju Technologii Uzdatniania Wody, Monografie Komitetu Inżynierii Środowiska PAN, vol. 42, Lublin 2007

3. Joanna Jeż-Walkowiak, Wpływ właściowości złoż filtrów pospiesznych na efekty technologii odżelaziania i odmanganiania wód podziemnych, Wydawnictwo PP, Poznań 2016

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

Result of average student's workload

http://www.put.poznan.pl/

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

http://www.put.poznan.pl/