COURSE DESCRIPTION CARD - SYLLABUS

Course name
Water technology

Course

Field of study
Environmental Engineering
Area of study (specialization)

Level of study
First-cycle studies
Form of study
full-time

Year/Semester
2 / 4
Profile of study
general academic
Course offered in
Polish
Requirements
compulsory

Number of hours

Lecture
30
Laboratory classes
30
Other (e.g. online)
0
Tutorials
0
Projects/seminars
30

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
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Faculty of Environmental Engineering and Energy

Berdychowo 4, 61-131 Poznań

Responsible for the course/lecturer:
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Faculty of Environmental Engineering and Energy

Berdychowo 4, 61-131 Poznań

Prerequisites

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.

Course objective

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.

Course-related learning outcomes

Knowledge

1. The student has knowledge of mathematics, chemistry, environmental biology and other areas useful for formulating and solving simple tasks in the field of environmental engineering - [KIS_W01]

2. The student has detailed knowledge related to the assessment of water pollution, water protection, sanitary chemistry - [KIS_W04]

3. The student knows the basic methods, techniques, tools and materials used to solve simple engineering tasks in the field of environmental engineering, in particular water treatment systems - [KIS_W07]

Skills

1. The student is able to carry out experiments, including measurements and analyzes of water quality in the area of selected elements of water treatment systems - [KIS_U03]

2. The student is able to use analytical and experimental methods to formulate and solve engineering tasks in the field of environmental engineering, including: - engineering programs, - measurement methods (pressure, temperature, water flow velocity) - [KIS_U04]

3. The student is able to identify and formulate specifications of simple engineering tasks of a practical nature, characteristic of environmental engineering, including selected water treatment systems - [KIS_U08]

4. The student is able to design and implement a simple device or process using appropriate methods, techniques and tools, select a device typical for environmental engineering, in particular in the field of: water treatment systems - [KIS_U10]

Social competences

1. The student is aware of the responsibility for making decisions - [KIS_K03]

2. The student is aware of the non-technical aspects and effects of engineering activities, including its impact on the environment - [KIS_K02]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Exam (effect KIS_W01, KIS_W04, KIS_07) (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 KIS_W01, KIS_W04; KIS_W07; KIS_U02; KIS_U08; KIS_U10; KIS_K03; KIS_K02)

- 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 (50% of the oral prezentation + 50% of the project)

Laboratories (effect KIS_U03; KIS_U02; KIS_K03):

- written entry tests before each class,

- report on each exercise,

- final test of tasks and the most important information regarding all laboratory classes,

- continuous assessment during each class (activity).

Programme content

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 an groundwater treatment plant with specified physical and chemical composition for the assumed efficiency including:

1. Selection of water aeration method

2. Calculations of water aeration devices

3. Selection and calculation of filters for iron and manganese removal of water

4. Backwashing filter beds

5. Equipment maintenance operations of the plant.

Laboratory:

1. Filter materials - sieve analysis.

2. Speed, filtration resistance and bacwashing of the filter beds.

3. Removal of iron from groundwater in the filtration process.

4. Sedimentation - process testing in static conditions.

5. Coagulation - removing turbidity from water.

6. Corrosivity of water after coagulation.

Teaching methods

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

Project: a design method using multimedia presentations

Laboratory: experiments, teamwork

Bibliography

Basic

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

7. Hanna Labijak, Technologia wody:Ćwiczenia laboratoryjne, Wydawnictwo Politechniki Poznańskiej, 2004

Additional

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

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	90	3,5
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam, project preparation) [1]	60	2,5

[1] delete or add other activities as appropriate