COURSE DESCRIPTION CARD - SYLLABUS

Course name
Systems of Water Treatment [S2IŚrod1-ZwWOWiG>SUW]

Course

Field of study
Environmental Engineering

Year/Semester
1/2

Area of study (specialization)
Water Supply, Water and Soil Protection

Profile of study
general academic

Level of study
second-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other (e.g. online)
0

Tutorials
15

Projects/seminars
30

Number of credit points

6,00

Coordinators

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Lecturers

Prerequisites

1.Knowledge: Student should have a basic knowledge about water technology (I degree of study), mathematics, chemistry, fluid mechanics and hydrology (I and II degree of study). 2.Skills: Student should be able to perform mathematical calculations, physical, chemical, mechanics of the fluids and calculation of equipment and facilities of water treatment plants (I degree of study). 3.Social competencies: Awareness to constantly update and supplement knowledge and skills.

Course objective

Knowledge of principles of design of processes and water treatment technological systems. Skill of pilot research design and procedures at pre-design study of processes and objects of water treatment as well as ability of managing of design, inwestment and operation of water treatment plants

Course-related learning outcomes

Knowledge:
1. Student knows the rules and methods of water treatment systems and processes design and of preparing a concept of water treatment sludge treatment and disposal.
2. Student has structured knowledge of possibilities and methods of intensification of treatment

effectiveness.
3. Student knows the rules of research and literature study planning
4. Student knows the method of research on water treatment processes in pilot and laboratory scale.
5. Student has the ability to describe the chemical and technological concept of water treatment as well as to select processes and parameters.

Skills:
1. Student can describe the water treatment system, including the processes selection and sequence
2. Student knows how to design the processes of water treatment based on pre-design research
3. Student knows how to do the conception of analytical control for treatment system, as well as prepear the operating instructions.
4. Student can determine the technological system of sludge treatment and disposal.

Social competences:
1. Student understands the need for a systematic deepening and broadening his/her competences.
2. Student knows that there are often several solutions for technical problems with respect to technical conditions and economic aspects.
3. Student understands the need for teamwork in solving theoretical and practical problems.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture activity checkup
Written final exam, with possible oral evaluation
Evaluation
4,6-5,0- very goodLecture, main course (30h)
4,3-4,5 - plus good
4,0-4,2 - good
3,5-3,9 - plus satisfactoty
3,0-3,4 - satisfactoty
Less than 3,0 - not satisfactoty
- Laboratory
Theory oral checkup before each laboratory
Written report of each laboratory exercise, defence.
Activity evaluation during each laboratory
Final test
Excercises
-written final test
Evaluation
4,6-5,0- very goodLecture, main course (30h)
4,3-4,5 - plus good
4,0-4,2 - good
3,5-3,9 - plus satisfactoty
3,0-3,4 - satisfactoty
Less than 3,o - not satisfactoty
- Design exercises:
Verification of project advancements and independent design work on each project
Written report, written final test and oral defence of the report.
Final mark:70% defence evaluation+30%report evaluation

Programme content

Lecture (30h)
Sources of microbiological and anthropogenic threats to surface and groundwater: classification of water pollutants, micro-pollutants, toxicity, biodegradability, trophicity.
Water technology design experiment: treatment concepts, pilot studies, selection of treatment technology.
Treatment technological systems: treatment efficiency and reliability, the principle of multi-stage barriers.
Process design: sedimentation, coagulation with pH correction and adsorption, rapid and membrane

filtration, chemical and catalytic oxidation processes, biological processes, iron removal and manganese removal, disinfection, by-products, post-disinfection of microbial activation
Water quality in the water supply network: organoleptic quality, chemical stability of the water composition, chemical and electrochemical corrosion, biological water stabilization, biological corrosion, maintenance of water quality in the disinfection process.
Processes of sediment management: mass and volume balance of backwash water and sediments, sedimentation, gravitational thickening, mechanical dewatering, flow of sediments as non-Newtonian liquids, drying, freezing, possibilities of using the solid phase of sediments.
Methods:
-multimedial presentation
Methods:
-multimedial presentation
Laboratory:
1.Membrane filtration, the efficiency of removing organic matter from filtered water. The exercise will be performed on a laboratory installation purchased under the project:
"Retrofitting the educational room with a laboratory stand for advanced ecological education of students of the Poznań University of Technology in the field of water treatment, recovery and renewal" co-financed by the Provincial Fund for Environmental Protection and Water Management in Poznań. www.wfosigw.poznan.pl
2. Optimization of the surface water coagulation process.
3. Colour removal in GAC filter and in silica sand bed, hydraulics and effects evaluation.
Excercise:
Accounting exercises covering the following topics:
-the mixing process,
- characteristics of the filter beds and the filter backwash process,
-the process of selecting filter materials,
-effectiveness of the disinfection process,
-volume coagulation process,
-direct coagulation process,
-sludge management,
Design:
Design of surface water treatment plant:
1.Selection and preparation of chemical reagents (coagulants, flocculants)
2. Chemical stabilization of water - determining the dose of lime (method of successive approximation s)
3. Storage of chemical reagents (dry warehouses, wet warehouses, mixing tanks, solution tanks)
4. Principles of designing the process of rapid mixing in mechanical chambers
5. Principles of designing the flocculation process in hydraulic slow mixing chambers
6. Principles of designing the sedimentation process in horizontal and multi-stream sedimentation tanks
7. Principles of designing the filtration process in rapid filter beds
8. Principles of designing the process of filter backwashing and filtration drainages

Teaching methods

-multimedia presentation
-different sources of knowledge
-group work: questions and discussion.
-individual and group work
-measurements,
-presentation and operation of research and analytical equipment
-possible interpretation of results presentation

Bibliography

Basic:
1. Heidrich Z. i inni: Urządzenia do uzdatniania wody. Arkady, Warszawa 1987
2. Praca zbiorowa, Wodociągi i Kanalizacja w Polsce, tradycja i współczesność, Polska Fundacja Odnowy Zasobów Wodnych, Poznań-Bydgoszcz, 2002 r.

Additional:
1. AWWA, Technical Editor F. W. Pontius, Water Quality and Treatment, Mc Coraw-Hill, Inc, New York,

1990
2. MWA, Water Treatment, Principles and Design, John Wiley and Sons, Inc., Hoboken, New Jersey, 2005

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,00
Classes requiring direct contact with the teacher	90	3,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	60	2,50