



Course title: ENVIRONMENTAL TECHNOLOGIES

ECTS credit allocation (and other scores): 4.5

Semester: spring

Level of study: ISCED-7 - second-cycle programmes (EQF-7)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 75

Course coordinator/ Department and e-mail: Dr. Habil. Eng. Magdalena Zielińska, Department of Environmental Biotechnology; magdalena.zielinska@uwm.edu.pl

Type of classes: classes

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#### Substantive content

CLASSES: Water treatment: iron and manganese removal by filtration, hardness removal by ion exchange. Membrane filtration, membrane bioreactors; determination of operating parameters of the processes. Technological parameters of the conventional activated sludge in totally mixed activated sludge reactors integrated with a membrane module. Nitrogen balance in wastewater treatment systems. Presentation of the biomass cultivation technologies in wastewater treatment systems including activated sludge, biofilm and aerobic granular sludge. Enzymatic activity of the biomass. The role of extracellular polymers in formation of complex microbial structures. Evaluation of the abundance and diversity of nitrogen converting microorganisms using molecular biology methods, depending on the composition of the wastewater. Theoretical bases of high-throughput sequencing (pyrosequencing). Sewage sludge digestion (primary and excess sludge).

LECTURES: –

Learning purpose: The aim of the course is to provide students with the selected unit processes, technological solutions and mechanisms used in water and wastewater treatment, and sewage sludge processing.

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On completion of the study programme the graduate will gain:

Knowledge: Student characterizes and knows the selected unit processes, technological solutions and mechanisms used in water and wastewater treatment, and sewage sludge processing.

Skills: Student analyzes the selected unit processes used in water and wastewater treatment, understands their role in the technologies used in environmental protection.

Social Competencies: Student is aware of the importance of technologies to prevent environmental degradation.

Basic literature: 1) Snyder L., Champness W., Molecular Genetics of Bacteria, wyd. ASM Press, 2007; 2) Spiro T.G., Stigliani W.M., Chemistry of the Environment, 2nd Edition, wyd. Prentice Hall, 2002; 3) Materials and laboratory protocols given by a teacher, author's script, wyd. UWM, 2018; 4) Wojnowska-Baryła I., Cydzik-Kwiatkowska A., Zielińska M., The application of molecular techniques to the study of wastewater treatment systems, Methods in molecular biology, wyd. Clifton, N.J., 2010, t. 599, s. 157-183, 5) van Haandel A.C., J.G.M. van der Lubbe, Handbook of Biological Wastewater Treatment. Design and Optimisation of Activated Sludge Systems, IWA Publishing 2012.

Supplementary literature:

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The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 3.08

Student's independent work: 0.92