



Course title: WATER AND SEWAGE MANAGEMENT IN INDUSTRY

ECTS credit allocation (and other scores): 2.0

Semester: autumn

Level of study: ISCED-6 - first-cycle programmes (EQF-6)

Branch of science: Engineering and technology

Language: English

Number of hours per semester: 15/15

Course coordinator/ Department and e-mail: dr hab inż. Joanna Rodziewicz, prof. UWM/Department of Environmental Engineering; joanna.rodziewicz@uwm.edu.pl

Type of classes: classes and lectures

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#### Substantive content

**CLASSES:** Balancing of water and sewage in an industrial plant. Calculation of water demand for industrial purposes (membrane cooling of liquids and gases in heat exchangers, indirect cooling of devices and machines). Calculation of the need for additional water for closed cooling circuits. Dimensioning of circulating water-cooling devices (cooling ponds, splash pools, cooling towers, fan cooling towers).

**LECTURES:** Water and sewage management systems in industrial plants. Water and wastewater balance of an industrial plant (water demand in industrial plants; membrane cooling of liquids and gases in heat exchangers; indirect cooling of devices and machines; direct, closed gas cooling; industrial wastewater and return water; outflow of backwater and industrial wastewater). Systems supplying industrial plants with process water (primary water sources; water intakes; utilities and network devices; laying pipes in collective collectors (canals)). Circulating water cooling equipment (selection of water-cooling equipment; cooling ponds; splash pools; open coolers; tower coolers; fan coolers; membrane coolers).

**Learning purpose:** Familiarize students with the processes taking place in industrial plants and the principles of designing and closing water and sewage circuits.

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On completion of the study programme the graduate will gain:

**Knowledge:** The student knows the principles of water and wastewater balancing in industrial plants and has knowledge about the functioning of devices for cooling circulating water.

**Skills:** The student is able to calculate the water demand for cooling fluids in heat exchangers and for indirect cooling of devices. Can determine the amount of additional water to replenish the circulating water. The student is able to calculate the basic dimensions of devices for cooling circulating water.

**Social Competencies:** The student identifies the needs of rational water management and wastewater treatment in industrial plants and is aware of the impact of water and wastewater management in industrial plants on the natural environment.

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#### Basic literature:

1) Bartkowska J., Królikowski A.J., Orzechowska M., Gospodarka wodno-ściekowa w zakładach przemysłowych, wyd. Wydawnictwo Politechniki Białostockiej, Białystok, 1991; 2) Mielcarewicz E., Gospodarka wodno-ściekowa w zakładach przemysłowych, wyd. Arkady, Warszawa, 1990 3) Rüffre H., Rosenwinkel K. H., Oczyszczanie ścieków przemysłowych,



wyd. Projprzem. – EKO, Bydgoszcz, 1990; 4) Bartkiewicz B., Umiejewska K., Oczyszczanie ścieków przemysłowych, wyd. Wydawnictwo Naukowe PWN, 2010

Supplementary literature:

1) Nawirska A., Szymański L., Gospodarka wodno – ściekowa w zakładach przemysłu spożywczego. Przewodnik do ćwiczeń, wyd. Wydawnictwo Akademii Rolniczej we Wrocławiu, 2002; 2) Koziorowski B., Oczyszczanie ścieków przemysłowych, Wydawnictwo WNT, 1980; 3) Kozioł J., Stechman A., Przemysłowa woda chłodząca, wyd. Wydawnictwo Politechniki Śląskiej, 2007

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The allocated number of ECTS points consists of:

Contact hours with an academic teacher: 1.28

Student's independent work: 0.72