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|  | UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE  Wydział Geoinżynierii |
|  | **Sylabus przedmiotu – część A** |
| **49S2-WWT** | **Water and wastewater treatment** |
| **2020L** | **Water and wastewater treatment** |
| **ECTS: 4.00** |  |

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| **TREŚCI MERYTORYCZNE:**  **Ćwiczenia laboratoryjne**  ĆWICZENIA:Water treatment: iron and manganese removal by filtration, hardness removal by ion exchange, turbidity and color removal by membrane filtration; determination of operating parameters of the processes. Evaluation of the effectiveness of wastewater treatment depending on the composition of wastewater. 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  **Ćwiczenia audytoryjne**  ĆWICZENIA:Water treatment: iron and manganese removal by filtration, hardness removal by ion exchange, turbidity and color removal by membrane filtration; determination of operating parameters of the processes. Evaluation of the effectiveness of wastewater treatment depending on the composition of wastewater. 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  **CEL KSZTAŁCENIA:**  The aim of the course is to provide students with the selected unit processes, technological solutions and mechanisms used in water, wastewater and sludge treatment.  **OPIS EFEKTÓW UCZENIA SIĘ PRZEDMIOTU W ODNIESIENIU DO OPISU CHARAKTERYSTYK DRUGIEGO STOPNIA EFEKTÓW UCZENIA SIĘ DLA KWALIFIKACJI NA POZIOMACH 6-8 POLSKIEJ RAMY KWALIFIKACJI W ODNIESIENIU DO DYSCYPLIN NAUKOWYCH I EFEKTÓW KIERUNKOWYCH:**  **Symbole efektów dyscyplinowych:**  IT/ISG2A\_K05++, IT/ISG2A\_K07++, IT/ISG2A\_U07+, IT/ISG2A\_U04+, IT/ISG2A\_U19++, IT/ISG2A\_U18++, IT/ISG2A\_U16++, IT/ISG2A\_U11++, IT/ISG2A\_W04+  **Symbole efektów kierunkowych:**  K2\_K02++, K2\_U05+, K2\_U13+, K2\_U15++, K2\_W11+  **EFEKTY UCZENIA SIĘ (Wiedza, Umiejętności, Kompetencje społeczne):**   |  |  | | --- | --- | | **K1** | Is aware of the importance of technologies to prevent environmental degradation. Is able to work in the | | **K2** | Is aware of the need for learning throughout life | | **U1** | Analyzes the selected unit processes used in water and wastewater treatment, understands their role in the technologies used in environmental protection. Determines experimentally the operational parameters of water and wastewater treatment. Determines the effectiveness of wastewater treatment by activated sludge method,depending on the composition of wastewater | | **U2** | Calculates the nitrogen balance in wastewater treatment systems. Calculates the amount and the volume of sewage sludge produced in biological systems. Can determine biogas productivity during anaerobic processes | | **U3** | Knows how to interpret the relationships between the molecular and technological results. Knows how to characterize biomass in wastewater treatment systems. Knows how to apply techniques of molecular biology in order to obtain information about the microorganisms that inhabit wastewater treatment systems | | **U4** | Can write a report from the conducted experiments | | **W1** | Characterizes and knows the selected unit processes, technological solutions and mechanisms used in water, wastewater and sludge treatment. Defines technological parameters of water and wastewater treatment. Defines the types of biomass in wastewater treatment sysmes and recognizes the relationships between technological parameters of wastewater treatment and the structure of microbial consortia in activated sludge. Characterizes the composition of extracellular polymers and defines their role in the formation of complex microbial structures. Understands the role of extracellular enzymes in biological tretament. Characterizes groups of nitrogen-converting microorganisms in astewater treatment systems. Lists the molecular biology techniques used to evaluate the abundance and diversity of microorganisms in wastewater treatment systems, including emerging technologies. Recognizes the possibilities of use of solar energy and the enrgy coming from anaerobic disgestion of sewage sludge for |   **FORMY I METODY DYDAKTYCZNE:**   |  | | --- | | Ćwiczenia laboratoryjne-['K1', 'U1', 'K2', 'U4']-laboratory classes-ĆWICZENIA:Water treatment: iron and manganese removal by filtration, hardness removal by ion exchange, turbidity and color removal by membrane filtration; determination of operating parameters of the processes. Evaluation of the effectiveness of wastewater treatment depending on the composition of wastewater. 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 | | Ćwiczenia audytoryjne-['W1', 'U2', 'U3']-with the use of a computer and course classes-ĆWICZENIA:Water treatment: iron and manganese removal by filtration, hardness removal by ion exchange, turbidity and color removal by membrane filtration; determination of operating parameters of the processes. Evaluation of the effectiveness of wastewater treatment depending on the composition of wastewater. 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 |   **FORMA I WARUNKI WERYFIKACJI EFEKTÓW UCZENIA SIĘ:**   |  | | --- | | Ćwiczenia laboratoryjne-(Raport)-['K1', 'U1', 'K2', 'U3', 'U4']-raport | | Ćwiczenia audytoryjne-(Kolokwium pisemne)-['W1', 'U2']-test |   **Literatura:** | |  | | --- | | **Akty prawne kierunku określające**  **efekty uczenia się:** 187/2013 (Inżynieria środowiska),  **Kod ISCED:** -  **Status przedmiotu:** Obligatoryjny  **Grupa przedmiotów:** B - przedmioty kierunkowe  **Dyscyplina**: Inżynieria, technika  **Język wykładowy**: ANG  **Program:** Process Engineering and Environmental Protection - studia drugiego stopnia stacjonarne (z tokiem nauczania w języku angielskim)  **Etap**: Process Engineering and Environmental Protection pierwszy rok semestr pierwszy  **Profil kształcenia:** Ogólnoakademicki  **Tryb studiów:**Stacjonarne  **Rodzaj studiów:** Drugiego stopnia |  |  | | --- | | **Przedmioty**  **wprowadzające:** Techniques of genetic engineering  **Wymagania**  **wstępne:** brak |  |  | | --- | | **Koordynatorzy:**  **Magdalena Zielińska, magdalena.zielinska@uwm.edu.pl** | |

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|  | UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE  Wydział Geoinżynierii |
|  | **Szczegółowy opis przyznanej punktacji ECTS – część B** |
| **49S2-WWT** | **Water and wastewater treatment** |
| **2020L** | **Water and wastewater treatment** |
| **ECTS: 4.00** |  |

Na przyznaną liczbę punktów ECTS składają się:

1. Godziny kontaktowe z nauczycielem akademickim:

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| - udział w: Ćwiczenia laboratoryjne | 56 h |
| - udział w: Ćwiczenia audytoryjne | 19 h |
| - konsultacje | 2 h |
|  | Ogółem: 77 h |

2. Samodzielna praca studenta:

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| przygotowanie do kolokwium | 8.00 h |
| przygotowanie do ćwiczeń laboratoryjnych | 12.00 h |
| przygotowanie raportu | 3.00 h |
|  | Ogółem: 23.00 h |

Ogółem (godziny kontaktowe + samodzielna praca studenta): 100.00 h

1 punkt ECTS = 25-30 h pracy przeciętnego studenta,

liczba punktów ECTS = 100.00 h : 25 h/ECTS = **4.00** ECTS

Średnio: 4.00 ECTS

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| - w tym liczba punktów ECTS za godziny kontaktowe z bezpośrednim udziałem nauczyciela akademickiego | 3.08 ECTS |
| - w tym liczba punktów ECTS za godziny realizowane w formie samodzielnej pracy studenta | 0.92 ECTS |