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|  | UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE  Wydział Geoinżynierii |
|  | **Sylabus przedmiotu – część A** |
| **49S2-ENB** | **Environmental biotechnology** |
| **2020L** |  |
| **ECTS: 4.00** |  |

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| **TREŚCI MERYTORYCZNE:**  **Wykład**  Biotechnology in environmental engineering – definitions and objectives. Aerobic and anaerobic biological wastewater treatment (typical plant configuration), continuous-flow and batch systems. Biological deodorization. Generation and management of waste in wastewater treatment systems. Bioremediation of polluted soils, biosurfactants in bioremediation - types, characteristics, application  **Ćwiczenia laboratoryjne**  ĆWICZENIA:Efficiency of pollutant removal and operational parameters in wastewater treatment systems, designing of reactors for wastewater treatment (activated sludge, aerobic granular sludge technology, membrane bioreactors). Amount of sewage sludge generated during urban wastewater treatment (ATV, EPA), design tasks for thickening, aerobic stabilization, methane fermentation with energy balance of the process, conditioning, dewatering and final disposal of sludge. Soil bioremediation in biopile – concept and design, indexes to evaluate terrestrial plant performance in phytoremediation, the use of biosurfactants in soil bioremediation. Field classes at facilities that implement different biotechnological processes for environmental purposes.  **Ćwiczenia terenowe**  ĆWICZENIA:Efficiency of pollutant removal and operational parameters in wastewater treatment systems, designing of reactors for wastewater treatment (activated sludge, aerobic granular sludge technology, membrane bioreactors). Amount of sewage sludge generated during urban wastewater treatment (ATV, EPA), design tasks for thickening, aerobic stabilization, methane fermentation with energy balance of the process, conditioning, dewatering and final disposal of sludge. Soil bioremediation in biopile – concept and design, indexes to evaluate terrestrial plant performance in phytoremediation, the use of biosurfactants in soil bioremediation. Field classes at facilities that implement different biotechnological processes for environmental purposes.  **CEL KSZTAŁCENIA:**  Upon completion of the course the students shall be able to achieve knowledge of biotechnological methods used for environmental engineering  **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\_U05+, IT/ISG2A\_U02+, IT/ISG2A\_U03+, IT/ISG2A\_U04+, IT/ISG2A\_W01+, IT/ISG2A\_W04+  **Symbole efektów kierunkowych:**  K2\_K02++, K2\_U02+, K2\_U03+, K2\_W01+, K2\_W11+  **EFEKTY UCZENIA SIĘ (Wiedza, Umiejętności, Kompetencje społeczne):**   |  |  | | --- | --- | | **K1** | Willingness to cooperate in a team and orientation for their own intellectual development | | **K2** | Understands the need to use principles of sustainable development in environmental engineering | | **U1** | Ability to present and discuss the results of the performed experiments and to work in a team | | **U2** | Ability to choose, design and assess the efficiency of proecological technologies | | **W1** | Knowledge of the principles of designing and operation of biotechnological systems | | **W2** | Knowledge of solutions used for effective protection of the environment concerning wastewater treatment,  sludge management and soil bioremediation |   **FORMY I METODY DYDAKTYCZNE:**   |  | | --- | | Wykład-['K1', 'U1', 'W2']-Classes, lectures panel-Biotechnology in environmental engineering – definitions and objectives. Aerobic and anaerobic biological wastewater treatment (typical plant configuration), continuous-flow and batch systems. Biological deodorization. Generation and management of waste in wastewater treatment systems. Bioremediation of polluted soils, biosurfactants in bioremediation - types, characteristics, application | | Ćwiczenia laboratoryjne-['W1', 'U2']-Laboratory classes-ĆWICZENIA:Efficiency of pollutant removal and operational parameters in wastewater treatment systems, designing of reactors for wastewater treatment (activated sludge, aerobic granular sludge technology, membrane bioreactors). Amount of sewage sludge generated during urban wastewater treatment (ATV, EPA), design tasks for thickening, aerobic stabilization, methane fermentation with energy balance of the process, conditioning, dewatering and final disposal of sludge. Soil bioremediation in biopile – concept and design, indexes to evaluate terrestrial plant performance in phytoremediation, the use of biosurfactants in soil bioremediation. Field classes at facilities that implement different biotechnological processes for environmental purposes. | | Ćwiczenia terenowe-['K2']-field classes-ĆWICZENIA:Efficiency of pollutant removal and operational parameters in wastewater treatment systems, designing of reactors for wastewater treatment (activated sludge, aerobic granular sludge technology, membrane bioreactors). Amount of sewage sludge generated during urban wastewater treatment (ATV, EPA), design tasks for thickening, aerobic stabilization, methane fermentation with energy balance of the process, conditioning, dewatering and final disposal of sludge. Soil bioremediation in biopile – concept and design, indexes to evaluate terrestrial plant performance in phytoremediation, the use of biosurfactants in soil bioremediation. Field classes at facilities that implement different biotechnological processes for environmental purposes. |   **FORMA I WARUNKI WERYFIKACJI EFEKTÓW UCZENIA SIĘ:**   |  | | --- | | Wykład-(Kolokwium pisemne)-['U1', 'W1', 'W2']-written test | | Ćwiczenia laboratoryjne-(Raport)-['K1', 'K2']-Laboratory reports | | Ćwiczenia terenowe-(Sprawozdanie)-['U2']- scientific homework |   **Literatura:** | |  | | --- | | **Akty prawne kierunku określające**  **efekty uczenia się:** 187/2013 (Inżynieria środowiska),  **Kod ISCED:** -  **Status przedmiotu:** Obligatoryjny  **Grupa przedmiotów:** A - przedmioty podstawowe  **Dyscyplina**: Inżynieria, technika  **Język wykładowy**: ANG  **Program:** Biotechnologia - studia drugiego stopnia stacjonarne (z tokiem nauczania w języku angielskim)  **Etap**: Biotechnology pierwszy rok semestr pierwszy  **Profil kształcenia:** Ogólnoakademicki  **Tryb studiów:**Stacjonarne  **Rodzaj studiów:** Drugiego stopnia |  |  | | --- | | **Przedmioty**  **wprowadzające:** brak  **Wymagania**  **wstępne:** brak |  |  | | --- | | **Koordynatorzy:**  **Agnieszka Cydzik-Kwiatkowska, agnieszka.cydzik@uwm.edu.pl** | |

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|  | UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE  Wydział Geoinżynierii |
|  | **Szczegółowy opis przyznanej punktacji ECTS – część B** |
| **49S2-ENB** | **Environmental biotechnology** |
| **2020L** |  |
| **ECTS: 4.00** |  |

Na przyznaną liczbę punktów ECTS składają się:

1. Godziny kontaktowe z nauczycielem akademickim:

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| - udział w: Wykład | 15 h |
| - udział w: Ćwiczenia laboratoryjne | 30 h |
| - udział w: Ćwiczenia terenowe | 15 h |
| - konsultacje | 2 h |
|  | Ogółem: 62 h |

2. Samodzielna praca studenta:

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| preparation for passing the course | 58.00 h |
|  | Ogółem: 58.00 h |

Ogółem (godziny kontaktowe + samodzielna praca studenta): 120.00 h

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

liczba punktów ECTS = 120.00 h : 30 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 | 2.07 ECTS |
| - w tym liczba punktów ECTS za godziny realizowane w formie samodzielnej pracy studenta | 1.93 ECTS |