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|  | UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE  Wydział Geoinżynierii |
|  | **Sylabus przedmiotu – część A** |
| **49S2-BWM** | **Bioproducts from waste materials** |
| **2020L** | **Bioproducts from waste materials** |
| **ECTS: 3.00** |  |

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| **TREŚCI MERYTORYCZNE:**  **Wykład**  Composting – theoretical background. Role of additives (amendments and bulking agent). Moisture, C/N ratio, porosity and free air space. Oxygen demand and aeration strategies. Maturation and humification; factors affecting humic substances content in mature compost. Compost/humic substances as useful bioproducts. Basic and principles of anaerobic digestion. Hydrogen production from waste materials. Enhancement of methane production during anaerobic digestion. Two-stage technologies of anaerobic digestion to increase biogas production. Hydrogen production technologies. Production of methane from agricultural wastes. Technological strategies for biodegradable polymers – production of polyhydroxyalkanoates (PHAs) using pure and mixed microbial cultures. Biochar production technology – factors and types of reactors. Characteristics and classification of biochar. Biochar application.  **Ćwiczenia laboratoryjne**  ĆWICZENIA:Sewage sludge composting – technological concept. Characterization of basic parameters in feedstock and mature compost. Technological concept of two stage biogas plant (1o dark fermentation, 2o methane production) for optimum biogas production. Hydrogen and methane as bioproducts of anaerobic digestion. The effect of carbon to nitrogen ratio (C/N) in the culture medium on the efficiency of PHAs accumulation in activated sludge. Calculations on biochar classification and its application as soil amendment  **Ćwiczenia projektowe**  ĆWICZENIA:Sewage sludge composting – technological concept. Characterization of basic parameters in feedstock and mature compost. Technological concept of two stage biogas plant (1o dark fermentation, 2o methane production) for optimum biogas production. Hydrogen and methane as bioproducts of anaerobic digestion. The effect of carbon to nitrogen ratio (C/N) in the culture medium on the efficiency of PHAs accumulation in activated sludge. Calculations on biochar classification and its application as soil amendment  **CEL KSZTAŁCENIA:**  Upon completion of the course the students shall be able to get acquainted with the possibilities and technologies of recovery of different bioproducts from waste materials  **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\_U03++, IT/ISG2A\_U04++, IT/ISG2A\_U06++, IT/ISG2A\_W08+, IT/ISG2A\_W05+  **Symbole efektów kierunkowych:**  K2\_K02++, K2\_U04++, K2\_W07+  **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, therein use of waste as source of bioproducts | | **U1** | Ability to present the results of the performed experiments and to work in a team | | **U2** | ability to calculate parameters for biotechnological processes, e.g. composting, anaerobic digestion, ability to classify biochars | | **W1** | Knowledge of the rules of the sustainable use of the environment, therein use of waste as a resources |   **FORMY I METODY DYDAKTYCZNE:**   |  | | --- | | Wykład-['K2']-multimedia presentation-Composting – theoretical background. Role of additives (amendments and bulking agent). Moisture, C/N ratio, porosity and free air space. Oxygen demand and aeration strategies. Maturation and humification; factors affecting humic substances content in mature compost. Compost/humic substances as useful bioproducts. Basic and principles of anaerobic digestion. Hydrogen production from waste materials. Enhancement of methane production during anaerobic digestion. Two-stage technologies of anaerobic digestion to increase biogas production. Hydrogen production technologies. Production of methane from agricultural wastes. Technological strategies for biodegradable polymers – production of polyhydroxyalkanoates (PHAs) using pure and mixed microbial cultures. Biochar production technology – factors and types of reactors. Characteristics and classification of biochar. Biochar application. | | Ćwiczenia laboratoryjne-['U1', 'W1']-Laboratory classes-ĆWICZENIA:Sewage sludge composting – technological concept. Characterization of basic parameters in feedstock and mature compost. Technological concept of two stage biogas plant (1o dark fermentation, 2o methane production) for optimum biogas production. Hydrogen and methane as bioproducts of anaerobic digestion. The effect of carbon to nitrogen ratio (C/N) in the culture medium on the efficiency of PHAs accumulation in activated sludge. Calculations on biochar classification and its application as soil amendment | | Ćwiczenia projektowe-['K1', 'U2']-Calculation classes-ĆWICZENIA:Sewage sludge composting – technological concept. Characterization of basic parameters in feedstock and mature compost. Technological concept of two stage biogas plant (1o dark fermentation, 2o methane production) for optimum biogas production. Hydrogen and methane as bioproducts of anaerobic digestion. The effect of carbon to nitrogen ratio (C/N) in the culture medium on the efficiency of PHAs accumulation in activated sludge. Calculations on biochar classification and its application as soil amendment |   **FORMA I WARUNKI WERYFIKACJI EFEKTÓW UCZENIA SIĘ:**   |  | | --- | | Wykład-(Kolokwium pisemne)-['K1', 'U1']-written test (90 min) | | Ćwiczenia laboratoryjne-(Raport)-['W1', 'K2']-Laboratory reports | | Ćwiczenia projektowe-(Projekt)-['U2']-technological projects |   **Literatura:** | |  | | --- | | **Akty prawne kierunku określające**  **efekty uczenia się:** 187/2013 (Inżynieria środowiska),  **Kod ISCED:** -  **Status przedmiotu:** Obligatoryjny  **Grupa przedmiotów:** C - przedmioty specjalnościowe/związane z zakresem kształcenia  **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:**  **Dorota Kulikowska, dorotak@uwm.edu.pl** | |

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|  | UNIWERSYTET WARMIŃSKO-MAZURSKI W OLSZTYNIE  Wydział Geoinżynierii |
|  | **Szczegółowy opis przyznanej punktacji ECTS – część B** |
| **49S2-BWM** | **Bioproducts from waste materials** |
| **2020L** | **Bioproducts from waste materials** |
| **ECTS: 3.00** |  |

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 | 20 h |
| - udział w: Ćwiczenia projektowe | 10 h |
| - konsultacje | 4 h |
|  | Ogółem: 49 h |

2. Samodzielna praca studenta:

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| preparation for passing the course | 41.00 h |
|  | Ogółem: 41.00 h |

Ogółem (godziny kontaktowe + samodzielna praca studenta): 90.00 h

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

liczba punktów ECTS = 90.00 h : 30 h/ECTS = **3.00** ECTS

Średnio: 3.00 ECTS

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| - w tym liczba punktów ECTS za godziny kontaktowe z bezpośrednim udziałem nauczyciela akademickiego | 1.63 ECTS |
| - w tym liczba punktów ECTS za godziny realizowane w formie samodzielnej pracy studenta | 1.37 ECTS |