

POLITECHNIKA KRAKOWSKA IM. TADEUSZA KOŚCIUSZKI

KARTA PRZEDMIOTU

obowiązuje studentów rozpoczynających studia w roku akademickim 2022/2023

Wydział Inżynierii Środowiska i Energetyki

Kierunek studiów: Environmental and Land Engineering

Profil: Ogólnoakademicki

Forma studiów: stacjonarne

Kod kierunku: 14

Stopień studiów: II

Specjalności: bez specjalności

1 INFORMACJE O PRZEDMIOCIE

NAZWA PRZEDMIOTU	Soil remediation
NAZWA PRZEDMIOTU W JĘZYKU ANGIELSKIM	Soil remediation
KOD PRZEDMIOTU	WIŚIE ELE oIIS C7 22/23
KATEGORIA PRZEDMIOTU	Przedmioty kierunkowe
LICZBA PUNKTÓW ECTS	4.00
SEMESTRY	1

2 RODZAJ ZAJĘĆ, LICZBA GODZIN W PLANIE STUDIÓW

SEMESTR	WYKŁAD	CWICZENIA	LABORATORIA	LABORATORIA KOMPUTERO- WE	PROJEKT	SEMINARIUM
1	18	0	12	0	10	0

3 CELE PRZEDMIOTU

Cel 1 Raising students knowledge referring to contaminated soil and groundwater remediation as necessary complement for education in the area of environmental engineering

4 WYMAGANIA WSTĘPNE W ZAKRESIE WIEDZY, UMIEJĘTNOŚCI I INNYCH KOMPETENCJI

1 General chemistry (inorganic and organic)

5 EFEKTY KSZTAŁCENIA

EK1 Wiedza characteristics and fate of most common soil and groundwater pollutants

EK2 Wiedza methods of risk assessment for soil and groundwater

EK3 Wiedza understanding of different treatment technologies: their applicability for specific inorganic and organic contaminants; principles of action

EK4 Umiejętności ability to select proper remediation technology depending on a type of pollution and local conditions; conducting basic calculations; performing simple analysis and experiments on remediation

6 TREŚCI PROGRAMOWE

WYKŁAD		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
W1	Characterisation of soil and groundwater environment; common inorganic and organic pollutants and their fate in soil and groundwater; their mobility and sequestration	2
W2	Standards of soil and groundwater quality: presentation of current Polish and other national standards	2
W3	Risk assessment methods for soil and groundwater contamination: methods of HRA, ERA, agricultural productivity; TRIAD, RBCA	2
W4	Immobilization and barrier methods: physical barriers, hydraulic barriers, physical-hydraulic barriers; permeable barriers; immobilisation of metals	2
W5	Physical methods of remediation: LNAPL skimming, vapour extraction, multiphase extraction, pump-and-treat, thermal desorption, soil washing and flushing, soil venting, air sparging	2
W6	Chemical methods of remediation: in-situ oxidation and reduction	2
W7	Bioremediation of soil and groundwater: natural attenuation and intensive biotreatment; different in- and ex-situ methods, bioremediation in different conditions and its requirements	3
W8	Expanding knowledge on soil remediation processes, basing on new selected materials. Overview of modelling software	3

LABORATORIA		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
L1	Basic characteristics of soil	3
L2	Immobilization of heavy metals in soil	3
L3	Oxidation of contaminants by Fenton reagent	3
L4	Experiment on selected process of soil remediation	3

PROJEKT		
LP	TEMATYKA ZAJĘĆ OPIS SZCZEGÓŁOWY BLOKÓW TEMATYCZNYCH	LICZBA GODZIN
P1	Prediction of risk by contaminant plume spread in groundwater, using analytical solutions, quality standards and simple models	10

7 NARZĘDZIA DYDAKTYCZNE

N1 Lectures

N2 Board assignments

N3 Laboratory classes

N4 Consultations

8 OBCIĄŻENIE PRACĄ STUDENTA

FORMA AKTYWNOŚCI	ŚREDNIA LICZBA GODZIN NA ZREALIZOWANIE AKTYWNOŚCI
Godziny kontaktowe z nauczycielem akademickim, w tym:	
Godziny wynikające z planu studiów	40
Konsultacje przedmiotowe	10
Egzaminy i zaliczenia w sesji	2
Godziny bez udziału nauczyciela akademickiego wynikające z nakładu pracy studenta, w tym:	
Przygotowanie się do zajęć, w tym studiowanie zalecanej literatury	25
Opracowanie wyników	10
Przygotowanie raportu, projektu, prezentacji, dyskusji	15
SUMARYCZNA LICZBA GODZIN DLA PRZEDMIOTU WYNIKAJĄCA Z CAŁEGO NAKŁADU PRACY STUDENTA	102
SUMARYCZNA LICZBA PUNKTÓW ECTS DLA PRZEDMIOTU	4.00

9 SPOSOBY OCENY

OCENA FORMUJĄCA

F1 Written test (exam)

F2 Practical assignment

F3 Board assignment

OCENA PODSUMOWUJĄCA

P1 Compilation of component grades

WARUNKI ZALICZENIA PRZEDMIOTU

W1 A minimum of 51% of points in written test covering knowledge outcomes is necessary for grade 3.0.

W2 Active participation in laboratory classes and completion of reports. Grade for laboratory classes will be awarded basing on of students activity during classes, quality of data presentation and interpretation in reports, as well as timely preparation of reports.

W3 Correct and on-time accomplishment of board assignments (project classes). Grade will be awarded considering general correctness, quality of conclusions as well as timely preparation of reports.

W4 The module grade = (laboratory classes grade *0.1) + (project classes grade *0.2) + (examination grade * 0.7)

OCENA AKTYWNOŚCI BEZ UDZIAŁU NAUCZYCIELA

B1 Board assignments

KRYTERIA OCENY

EFEKT KSZTAŁCENIA 1	
NA OCENĘ 2.0	Student does not know any of most typical soil contaminants by name
NA OCENĘ 3.0	Student lists all most common soil and groundwater contaminants by name and with a reference to their chemical category.
NA OCENĘ 3.5	As above, plus: knows some categories of contaminants with respect to behaviour in soil environment
NA OCENĘ 4.0	As above, plus: knows all categories of contaminants with respect to their behaviour in soil environment (mobility, solubility, volatility, sequestration, etc.)
NA OCENĘ 4.5	As above, plus: has some knowledge about physical-chemical basis of contaminants behaviour in soil environment
NA OCENĘ 5.0	As above, plus: has detailed knowledge about physical-chemical basis of contaminants behaviour in soil environment
EFEKT KSZTAŁCENIA 2	
NA OCENĘ 2.0	Student does not know all Polish standards referring to soil and groundwater quality.
NA OCENĘ 3.0	Student has basic knowledge about Polish standards of soil quality (name of acts, contents). Students lists methods of risk assessment (HRA, ERA, agricultural productivity).
NA OCENĘ 3.5	As above, plus: has some knowledge referring to rules of Polish legislation.
NA OCENĘ 4.0	As above, plus: has detailed knowledge about Polish standards of soil quality (stages of contamination assessment; acceptable level according to soil groups, etc.; obligation of remediation; allowed methods of remediation).
NA OCENĘ 4.5	As above, plus: student knows rules of risk assessment in Polish legislation referring to soil quality
NA OCENĘ 5.0	As above, plus: student has knowledge in the area of Polish soil quality standards comparison to respective other national soil quality standards. Student has basic knowledge in the area of soil risk assessment procedures (HRA, ERA, TRIAD, bioavailability assessment)
EFEKT KSZTAŁCENIA 3	
NA OCENĘ 2.0	Students shows serious lack of knowledge with a reference to categories and individual treatment methods by name
NA OCENĘ 3.0	Student knows the names and categories of soil remediation methods: different types of barriers, immobilisation, physical, chemical and biological, presented during the course
NA OCENĘ 3.5	As above, plus: knows basic principles of most important and common methods: physical barriers, permeable barriers, LNAPL skimming; pump-and-treat, soil washing, oxidation in-situ; knows basics principles of bioremediation

NA OCENĘ 4.0	As above, plus: has detailed knowledge about principles of most important and common methods: physical barriers, immobilisation, permeable barriers, LNAPL skimming; pump-and-treat, soil washing, oxidation in-situ; has some more advanced knowledge in the area of bioremediation (such as different types of metabolisms, methods of delivery of necessary electron donors, acceptors, etc.)
NA OCENĘ 4.5	As above, plus: has detailed knowledge about principles of all treatment methods presented during the course, including bioremediation;
NA OCENĘ 5.0	As above, plus: knows the applicability of treatment methods for different types of contaminants.
EFEKT KSZTAŁCENIA 4	
NA OCENĘ 2.0	Student is not able to perform or makes important errors in basic calculations of contaminants transport
NA OCENĘ 3.0	Student can calculate basic elements of contaminants transport: groundwater velocity, contaminants velocity, retardation factor
NA OCENĘ 3.5	As above, plus: student can identify different types of contaminant plume behaviour
NA OCENĘ 4.0	As above, plus: student can indicate direction of contaminants plume spread basing on groundwater level measurements
NA OCENĘ 4.5	As above, plus: student is able to indicate the appropriate treatment methods for some types of contaminants
NA OCENĘ 5.0	As above, plus: student is able to indicate the appropriate treatment methods for all types of contaminant

10 MACIERZ REALIZACJI PRZEDMIOTU

EFEKT KSZTAŁCENIA	ODNIESIENIE DANEGO EFEKTU DO SZCZEGÓŁOWYCH EFEKTÓW ZDEFINIOWANYCH DLA PROGRAMU	CELE PRZEDMIOTU	TREŚCI PROGRAMOWE	NARZĘDZIA DYDAKTYCZNE	SPOSOBY OCENY
EK1		Cel 1	W1	N1 N4	F1 P1
EK2		Cel 1	W2 W3	N1 N4	F1 P1
EK3		Cel 1	W4 W5 W6 W7 W8 L1 L2 L3	N1 N3 N4	F1 F2 P1
EK4		Cel 1	W1 W4 W5 W6 W7 W8 L1 L2 L3 L4 P1	N1 N2 N3 N4	F1 F2 F3 P1

11 WYKAZ LITERATURY

LITERATURA PODSTAWOWA

- [1] | Alvarez P., Ilman W. — *Bioremediation and natural attenuation*, Miejscowość, 2006, John Wiley& Sons
- [2] | Suthersan S., Payne F — *In situ remediation engineering*, Boca Raton, 2005, CRC Press
- [3] | Autor — *Publications (chapters, papers, etc.) recommended by course teacher during classes*, Miejscowość, 0, Wydawnictwo
- [4] | Suthersan S et al. — *Remediation engineering*, Boca Raton, 2017, CRC Press

12 INFORMACJE O NAUCZYCIELACH AKADEMICKICH

OSOBA ODPOWIEDZIALNA ZA KARTĘ

dr hab. inż. Tomasz Baczyński (kontakt: tomaszb@vistula.wis.pk.edu.pl)

OSOBY PROWADZĄCE PRZEDMIOT

1 dr hab. inż. Tomasz Baczyński (kontakt: tomasz.baczynski@pk.edu.pl)

13 ZATWIERDZENIE KARTY PRZEDMIOTU DO REALIZACJI

(miejscowość, data)

(odpowiedzialny za przedmiot)

(dziekan)

PRZYJMUJĘ DO REALIZACJI (data i podpisy osób prowadzących przedmiot)

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