Wrocław University of Science and Technology
Doctoral School

COURSE CARD

1. Basic information

Course name in English:	Recent research trends in environmental engineering, mining, and energy	
Course name in Polish:	Najnowsze kierunki badań w inżynierii środowiska, górnictwie i energetyce	
Number of hours:	30	
Type of course:	Recent research trends in discipline	
Form of course:	lecture	
Code of course:	W07ISG-SD0038W / IGQ100325W	
Course leader:	*Prof. Małgorzata Kabsch-Korbutowiczł*	
Faculty of the course leader:	W7 Faculty of Environmental Engineering	
Email address of the course leader:	malgorzata.kabsch-korbutowicz@pwr.edu.pl	
Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course):	Architecture and urban planning	☐
	Automation, electronic, and electrical engineering	☐
	Information and communication technology	☐
	Biomedical engineering	☐
	Chemical engineering	☐
	Civil engineering and transport	☐
	Mechanical engineering	☐
	Environmental engineering, mining, and energy	☒
	Mathematics	☐
	Chemical sciences	☐
	Physical sciences	☐
	Management and quality studies	☐

2. Objectives

1. Gaining knowledge about new developments in the environmental engineering, mining and energy discipline.
2. Gaining inspiration to apply and create new ideas in different areas of discipline research

3. Content

Detailed information about the course content, including topics and form of classes.

No.	Topic	Number of hours	Form of classes
1	Alternative water sources (Małgorzata Kabsch-Korbutowicz)	2	lecture
2	Innovative processes and technologies in air and	2	lecture

	climate protection (Izabela Sówka)		
3	New approaches of buried infrastructure's technical condition modelling (Małgorzata Kutyłowska)	2	lecture
4	Flexibility technologies in future energy systems (Ara Sayegh)	2	lecture
5	Measurement systems in environmental engineering (Andrzej Szczurek)	2	lecture
6	Profitability of conveyor belts refurbishment in the light of the circular economy and the full and efficient use of resources (Leszek Jurdziak)	2	lecture
7	The future of Geospatial in the next decade: where we are - where we are heading (Kazimierz Bęcek)	2	lecture
8	Forest biomass - this is our lifeline: how much we have and how quickly we squander it (Kazimierz Bęcek)	2	lecture
9	Unmanned Geomatics Engineering: how to make maps without leaving office (Kazimierz Bęcek)	2	lecture
10	Shredding of mineral materials with water jet techniques as a new approach to the effective extraction of minerals (Przemysław Borkowski)	2	lecture
11	Next generation of nuclear and thermonuclear energy systems - challenges and solutions (Maciej Chorowski)	2	lecture
12	Transformation of district heating towards zero-emission sources and climate neutrality (Norbert Modliński)	2	lecture
13	Cryogenics in power engineering (Jarosław Poliński)	2	lecture
14	Renewable energy sources - selected issues (Sławomir Pietrowicz)	2	lecture
15	Modern refrigeration - challenges in the age of changing climate (Bartosz Zajączkowski)	2	lecture

4. Prerequisites

List of prerequisites relating to knowledge, skills and other competences for course participants.

5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

Symbol	Learning outcome	
	KNOWLEDGE. Doctoral student knows and understands:	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	☒
SzD_W4	research methodology;	☐
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	☐

SzD_W6	the fundamental dilemmas of modern civilization;	☒
SzD_W7	the legal and ethical conditions of scientific activity;	☐
SzD_W8	the economic and other relevant conditions of scientific activity;	☐
SzD_W9	basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.	☐
	SKILLS. Doctoral student is able to:	
SzD_U2	use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research hypothesis, - develop research methods, techniques and tools, and use them creatively, - draw conclusions on the basis of scientific research; critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development; transfer the results of scientific activities to the economic and social spheres;	☐
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	☐
SzD_U4	disseminate research results, including in popular forms;	☐
SzD_U5	initiate debates and participate in a scientific discourse;	☐
SzD_U6	be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;	☐
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	☐
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	☐
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	☐
	SOCIAL COMPETENCES. Doctoral student is ready to:	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	☐
SzD_K4	maintaining and developing the ethos of research and creative environments, including: - carrying out scientific activities in an independent manner, - respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection.	☐

6. Evaluation

Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.

The final grade will be based on the quality of essay prepared by the PhD student, which will demonstrate how the proposed dissertation topic relates to recent research directions in the discipline

7. Teaching methods

Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.

Multimedia presentation, disscusion

8. Literature

List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.

PRIMARY LITERATURE:

1. Valuing Water. The United Nations World Water Development Report (2021). https://unesdoc.unesco.org/ark:/48223/pf0000375724
2. Innovation in Climate Change Adaptation, Editor: Walter Leal Filho, Springer (2016) https://link.springer.com/book/10.1007/978-3-319-25814-0
3. Ernest O.Doebelin "Measurement Systems Application & Design" McGraw-Hill, 2007, 5th Edition
4. Anani, Nader. (2020). Renewable Energy Technologies and Resources. Artech House. https://app.knovel.com/hotlink/toc/id:kpRETR0003/renewable-energy-technologies/renewable-energy-technologies
5. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.. (2018). 2018 ASHRAE® Handbook - Refrigeration (SI Edition). American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE). https://app.knovel.com/hotlink/toc/id:kpASHRAER1/ashrae-handbook-refrigeration/ashrae-handbook-refrigeration
6. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.. (2018). 2018 ASHRAE® Handbook - Refrigeration (SI Edition). American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE). https://app.knovel.com/hotlink/toc/id:kpASHRAER1/ashrae-handbook-refrigeration/ashrae-handbook-refrigeration
7. Jha, A.R.. (2006). Cryogenic Technology and Applications. Elsevier. https://app.knovel.com/hotlink/toc/id:kpCTA00008/cryogenic-technology/cryogenic-technology
8. Rosen, Marc A. Koohi-Fayegh, Seama. (2016). Cogeneration and District Energy Systems - Modeling, Analysis and Optimization. Institution of Engineering and Technology. https://app.knovel.com/hotlink/toc/id:kpCDESMAO1/cogeneration-district/cogeneration-district
9. UK geospatial Commission (2020) Unlocking the power of location: the UK's geospatial strategy 2020 to 2025
10. The Future of Geospatial. https://www.gim-international.com/content/article/the-future-of-geospatial-are-we-everyone-s-friend-or-do-they-not-know-we-exist
11. K. Becek, (2014). The Internet of Things: Are We at the Fringes of a Paradigm Shift in Geomatics https://www.academia.edu/7436151/The_Internet_of_Things_Are_We_at_the_Fringes_of_a_Paradigm_Shift_in_Geomatics

12. K. Becek, Real-Time Mapping: Contemporary Challenges and the Internet of Things as the Way Forward. GEODESY AND CARTOGRAPHYVol. 65, No 2, 2016, pp. 129-138. DOI: 10.1515/geocart-2016-0009.
13. K. Becek, (2010). Biomass Representation in Synthetic Aperture Radar Interferometry Data Sets. https://www.academia.edu/26629231/Biomass_Representation_in_Synthetic_Aperture_Radar_Interferometry_Data_Sets
14. Bujakowski W,(.2015) Geologiczne, Środowiskowe i Techniczne uwarunkowania projektowania i funkcjonowania zakładów geotermalnych w Polsce. Studia Rozprawy Monografie nr 193. IGSMiE PAN.Kraków.
15. Fowler C.M.R,. (2018) The solid Earth. An Intruduction to Global Geophisics. Cambridge University Press.

9. Other remarks

Additional remarks, comments, (e.g., language of the course)