



COURSE CARD

1. Basic information

Course name in English:	Natural resources of the Solar System	
Course name in Polish:	Surowce naturalne Układu Słonecznego	
Number of hours:	15	
Type of course:	Elective course	
Form of course:	mixed forms (combination of lecture, seminar and laboratory)	
Code of course:		
Course leader:	<i>Prof. Tadeusz A. Przylibski</i>	
Faculty of the course leader:	W6 Faculty of Geoengineering, Mining and Geology	
Email address of the course leader:	Tadeusz.Przylibski@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	<input checked="" type="checkbox"/>
	Automation, electronic, electrical engineering and space technologies	<input checked="" type="checkbox"/>
	Information and communication technology	<input checked="" type="checkbox"/>
	Biomedical engineering	<input checked="" type="checkbox"/>
	Chemical engineering	<input checked="" type="checkbox"/>
	Civil engineering, geodesy and transport	<input checked="" type="checkbox"/>
	Materials engineering	<input checked="" type="checkbox"/>
	Mechanical engineering	<input checked="" type="checkbox"/>
	Environmental engineering, mining, and energy	<input checked="" type="checkbox"/>
	Mathematics	<input checked="" type="checkbox"/>
	Chemical sciences	<input checked="" type="checkbox"/>
	Physical sciences	<input checked="" type="checkbox"/>
Management and quality studies	<input checked="" type="checkbox"/>	

2. Objectives

Introduction to the issues of obtaining raw materials for the needs of the economy. Characteristics of sources and possibilities of meeting needs in the near future. The myth of circularity in the raw materials economy and the myth of renewability. The formation and structure of the Solar System as the basis for knowledge about the possibility of searching for various types of raw materials in individual objects of our planetary system. Deposit formation processes on Earth and other objects in the solar system - state of knowledge. Presentation of sources, methods and methods of obtaining raw materials and the needs for their use and application in relation to their basic types, i.e. metallic, energy, chemical and rock raw materials. Students' own research on rocks and accumulations of terrestrial and extraterrestrial raw materials.

3. Content

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



No.	Topic	Number of hours	Form of classes
1	Sources of raw materials for the economy	2	lecture
2	The formation and structure of the Solar System	2	lecture
3	Deposits and deposit-forming processes	2	lecture
4	Metallic raw materials (deposits, resources, mining, demand and application)	2	seminar
5	Energy resources (deposits, mining, demand and application)	2	seminar
6	Chemical raw materials, rock raw materials and others	2	seminar
7	Terrestrial rocks and selected deposits	2	laboratory
8	Extraterrestrial rocks and selected deposits	1	laboratory

4. Prerequisites

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

Open mind. Ability to use the Internet and scientific resources gathered there. Uncommon ability to communicate verbally, exchange views and experiences. Mastering the basics of the art of scientific discussion.

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	
	<i>KNOWLEDGE. Doctoral student knows and understands:</i>	
SzD_W3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	<input checked="" type="checkbox"/>
SzD_W4	research methodology;	<input checked="" type="checkbox"/>
SzD_W5	the rules for the dissemination of scientific results, including in open access mode;	<input checked="" type="checkbox"/>
SzD_W6	the fundamental dilemmas of modern civilization;	<input checked="" type="checkbox"/>
SzD_W7	the legal and ethical conditions of scientific activity;	<input checked="" type="checkbox"/>
SzD_W8	the economic and other relevant conditions of scientific activity;	<input checked="" type="checkbox"/>
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.	<input checked="" type="checkbox"/>
	<i>SKILLS. Doctoral student is able to:</i>	
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;	<input checked="" type="checkbox"/>



	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.	☒
	<i>SOCIAL COMPETENCES. Doctoral student is ready to:</i>	
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.

STUDENTS AUTOCRITICAL EVALUATION ON THE BASE OF NEW KNOWLEDGE AND ABILITIES COMPLETED

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.

DISCUSSION, DISCUSSION, DISCUSSION, FIRST OF ALL DISCUSSION; MULTIMEDIA PRESENTATIONS – SHORT LECTURES; LITERATURE STUDENTS OWN STUDIES; SIMPLE FIELD AND LABORATORY MEASUREMENTS AND OBTAINED DATA INTERPRETATION AGAINST SCIENTIFIC KNOWLEDGE AND LAW REGULATIONS

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.

Research papers published in leading scientific journals including, but not limited to:
Energy & Environmental Science
Resources Conservation and Recycling



Water Research
Environmental Science and Technology
Chemosphere
Natural Resources Forum
International Journal of Environmental Science and Technology
International Journal of Mining Science and Technology
Mineral Processing and Extractive Metallurgy Review
Ore Geology Reviews
Mining Metallurgy & Exploration
Geology
Ore Geology Reviews
Geothermics
Earth, Planets and Space
International Journal of Mining, Reclamation and Environment
Resource Geology
Mineral Deposits
Annual Review of Earth and Planetary Sciences
Space Science Reviews
Earth and Planetary Science Letters
Monthly Notices of the Royal Astronomical Society
Icarus
Planetary Science Journal
Earth, Planets and Space
Meteoritics and Planetary Science
Planetary and Space Science
Solar System Research
Space Science and Technology
Earth, Moon and Planets
Advances in Planetary Science
Earth and Planetary Science Letters
Geochimica et Cosmochimica Acta
Geochemistry, Geophysics, Geosystems
Journal of Rare Earths
Geochemistry

9. Other remarks

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

I plan to extend the next editions to 30 hours of classes.