COURSE DESCRIPTION

Resurse energetice și mediu/Energetic resources and the environment

Academic year 2026-2027

1. Programme-related data

1.1. Higher Education Institution	Babeș-Bolyai University
1.2. Faculty	Faculty of Environmental Science and Engineering
1.3. Department	Environmental Science
1.4. Field	Environmental Science
1.5. Level of study	Master
1.6. Degree programme / Qualification	Sustainable development and environmental management
1.7. Form of education	Full time

2. Course-related data

2.1. Course title	**Resurse energetice și mediu/Energy resources and the environment**			Course code	**NME4022**
2.2. Course coordinator	Prof. Calin Baciu				
2.3. Seminar coordinator	Prof. Calin Baciu				
2.4. Year of study	2	2.5. Semester	IV	2.6. Type of assessment	Exam
2.7. Course status	Compulsory			2.8. Course type	Specialisation subject

3. Total estimated time (hours per semester of teaching activities)

3.1. Number of hours per week	**4**	of which: 3.2. course	**2**	3.3. seminar/ laboratory/ project	**2**
3.4. Total of hours in the curriculum	56	of which: 3.5. course	28	3.6. seminar/ laboratory	**28**
Time allocation for individual study (IS) and self-taught activities (ST)					**hours**
Learning from textbooks, course materials, bibliography, and notes (IS)					32
Additional research in the library, on subject-specific electronic platforms, and on-site					26
Preparing seminars/ laboratories/ projects, assignments, reports, portfolios, and essays					20
Tutoring (professional guidance)					6
Examinations					4
Other activities [i.e.: two-way communication with the course coordinator/tutor]					6
3.7. Total hours of individual study (IS) and self-taught activities (ST)				**90**	
3.8. Total hours per semester				**150**	
3.9. Number of credits				**6**	

4. Prerequisites (where applicable)

4.1. curriculum-related	
4.2 skills-related	

5. Specific conditions (where applicable)

5.1. course-related	
5.2. seminar/laboratory-related	

6.1. Competencies resulting from the completion of the degree programme *(as referred to in the curriculum)*

Professional competencies	
Competency code	**Competency**
PC4	Investigate pollution: Identify the cause of pollution incidents, as well as its nature and the extent of the risks, by performing tests on the site of pollution as well as in a laboratory and performing research.
PC8	Implement environmental protection measures: Enforce environmental criteria to prevent environmental damage. Strive for the efficient use of resources in order to prevent waste and reduce costs. Motivate colleagues to take relevant steps to operate in an environmentally friendly manner.
PC12	Perform scientific research: Gain, correct or improve knowledge about phenomena by using scientific methods and techniques, based on empirical or measurable observations.
Transversal competencies	
Competency code	**Competency**
TC1	Think analytically: Produce thoughts using logic and reasoning in order to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
TC2	Work in teams: Work confidently within a group with each doing their part in the service of the whole.
TC3	Report on environmental issues: Compile environmental reports and communicate on issues. Inform the public or any interested parties in a given context on relevant recent developments in the environment, forecasts on the future of the environment, and any problems and possible solutions.

6.2. Learning outcomes relevant to the degree programme (as referred to in the curriculum)

Learning outcomes targeted by the subject		
Competency code	**Knowledge and comprehension**	**Specific academic skills**
CP4, CP7, CP10, CP11, CP12, CT1	4. The student/graduate identifies and describes advanced analytical techniques for the detection and quantification of chemical pollutants, as well as methods for sampling, preparation and analysis of environmental samples.	4. The student/graduate applies advanced analytical techniques for measuring pollutant concentrations in environmental samples. The student/graduate selects appropriate sampling and analysis methods depending on the type of sample and contaminant. The student/graduate interprets analytical results in the context of environmental quality assessment.
CP2, CP3, CP6, CP8, CP11, CT1, CT3	7. The student/graduate identifies and describes the processes and effects of global climate change, energy sources and their environmental impact, as well as the principles of sustainable use of energy resources.	7. The student/graduate analyses the impact of climate change on the environment and society. The student/graduate evaluates and compares energy sources from the perspective of sustainability and environmental impact.
CP4, CP5, CP7, CP10, CP11, CP12, CT1, CT2, CT3	10. The student/graduate describes the stages of the scientific research process and of carrying out an applied research project in the field of environmental engineering.	10. The student/graduate actively participates in research and professional practice processes, documenting activities and results. The student/graduate applies integrated theoretical and practical knowledge in solving complex environmental problems. The student/graduate formulates research questions, applies appropriate methodologies and draws well-founded conclusions.

7. Subject-specific learning outcomes

Knowledge and comprehension
1. The student knows and understands the main issues of the energy resources management at a global scale

2.	The student knows and understands the geological and geographical distribution of the conventional energy resources at a global scale
3.	The student knows and understands the global competition for resources and the links to economy and politics
4.	The student knows and understands the global competition for resources and the links to economy and politics
5.	The student knows and understands the correlation between energy resources exploitation and the environmental effects at a local and global scale
Specific academic skills	
1.	Teamwork for solving concrete issues
2.	Synthesis of complex notions and their practical use
3.	Assessing specific challenges by critical thinking

8. Contents

8.1. Course	**Teaching and learning methods**	**Remarks[1]**
Conventional resources of energy, types, and the history of their development	Interactive lecture	
Petroleum genesis, occurrence and distribution at worldwide scale	Interactive lecture	
Depletion of oil resources, the peak-oil theory, the current reserves	Interactive lecture	
The international oil and gas market	Interactive lecture	
Economic and political crises generated by the access to energy resources	Interactive lecture	
Coal as a major energy resource, use, new methods of extraction and use	Interactive lecture	
Global distribution of the coal resources, degree of depletion, future prospective	Interactive lecture	
Hydroelectric power. Distribution of the potential, positive and negative effects. Is it hydroelectric power a green energy?	Interactive lecture	
Nuclear energy, how the electricity is obtained from nuclear power?	Interactive lecture	
Environmental effects of using nuclear energy	Interactive lecture	
Unconventional energy for heating and cooling	Interactive lecture	
Unconventional energy for electricity production	Interactive lecture	
Unconventional fuels	Interactive lecture	
Comparing conventional and unconventional energy sources	Interactive lecture	

Bibliography

Deffeyes K (2008). Hubbert's Peak: The Impending World Oil Shortage (New Edition) Princeton University Press (September 29, 2008).
ENI (2023), World Oil and Gas Review, Rome.
European Renewable Energy Council (2010) Renewable Energy in Europe: Markets, Trends and Technologies, Earthscan.
Gauß P. (2009) International Trade China: Coal, Oil and Gas, GRIN Verlag.
Hunt J (1996). Petroleum geochemistry and geology, W. H. Freeman; Second Edition (October 15, 1995)
International Energy Agency (2024) World Energy Outlook 2024. OECD Publishing.
Kaltschmitt M., Streicher W., Wiese A. (2007) Renewable energy: technology, economics, and environment. Springer Verl.
Luft G., Korin A. (2009) Energy security challenges for the 21st century: a reference handbook, ABC-CLIO.
Moran D., Russell J.A. (2009) Energy security and global politics: the militarization of resource management, Routledge.

[1] For example, organisational aspects, recommendations for students, specific aspects relating to the course/seminar, such as inviting experts in the field, etc.

Müller-Kraenner S. (2008) Energy security: re-measuring the world, Earthscan.
Nersesian R.L. (2010) Energy for the 21st Century: A Comprehensive Guide to Conventional and Alternative Sources, M.E. Sharpe, Inc.
Shankleman J. (2006) Oil, profits, and peace: does business have a role in peacemaking? US Institute of Peace.
Wengenmayr R., Bührke T. (2008) Renewable energy: sustainable energy concepts for the future, Wiley-VCH.
NCR (2010) Assessing the Effects of the Gulf of Mexico Oil Spill on Human Health: A Summary of the June 2010 Workshop, http://www.nap.edu/catalog/12949.html
NCR (2018) Future Directions for the U.S. Geological Survey's Energy Resources Program, http://nap.edu/25141

8.2. Seminar/ laboratory	**Teaching and learning methods**	**Remarks**
Genesis of coal and petroleum	Dialogue	
Peak oil theory. Practical applicability	Dialogue	
Economic and environmental efficiency of energy resources exploitation.	Solving applications	
Types of nuclear reactors and working principles.	Dialogue	
Disasters due to nuclear energy use. Case study	Dialogue	
Energy efficiency of the unconventional resources	Solving applications	
Designing a local system for the improving the energy independency of a small city	Individual or group project	

Bibliography

Deffeyes K (2008). Hubbert's Peak: The Impending World Oil Shortage (New Edition) Princeton University Press (September 29, 2008).
ENI (2010), World Oil and Gas Review, Rome.
European Renewable Energy Council (2010) Renewable Energy in Europe: Markets, Trends and Technologies, Earthscan.
International Energy Agency (2004) Renewable energy: market & policy trends in IEA countries, OECD-IEA.
Kaltschmitt M., Streicher W., Wiese A. (2007) Renewable energy: technology, economics, and environment. Springer Verl.
Nersesian R.L. (2010) Energy for the 21st Century: A Comprehensive Guide to Conventional and Alternative Sources, M.E. Sharpe, Inc.
Wengenmayr R., Bührke T. (2008) , Renewable energy: sustainable energy concepts for the future, Wiley-VCH.
NCR (2018) Future Directions for the U.S. Geological Survey's Energy Resources Program, http://nap.edu/25141

9. Evaluation

Type of activity	9.1 Evaluation criteria[2]	9.2 Evaluation methods[3]	9.3 Percentage in the final grade
9.4. Course	Understanding the notions that have been discussed, capacity to use them in practical cases.	Exam	50%
	Synthesis of the acquired knowledge		
9.5. Seminary/ laboratory	Solving the practical themes that have been proposed, and the reliability of the results	Exam	50%
	The capacity to solve concrete applications.		
9.6 Minimum standard for passing			
Understanding the main notions that have been discussed The ability to synthesize data in order to obtain a complete view on the study topics			

[2] The evaluation criteria must directly reflect the learning outcomes targeted at the level of the degree programme respectively at the level of the subject. More specifically, the learning outcomes set out in the expected learning outcomes are assessed.

[3] Both final evaluation methods and ongoing evaluation strategies should be established.

10. SDG labels (Sustainable Development Goals)[4]

	○	Sustainable Development Generic Label

								
○	○	○	○	○	○	◉	○	○
								No label applies
○	○	○	○	○	○	○	○	○

Date of entry:
20/04/2026

Signature of course coordinator

Signature of seminar coordinator

Date of approval in the department:
...

Signature of the head of department

.....

[4] Select a single label which, according to the *Implementation of SDG labels in the academic process*, best matches the subject. If the subject addresses sustainable development in a generic manner (i.e. by presenting/introducing the general framework of sustainable development, etc.), then the Sustainable Development generic label may be applied. If none of the labels describe the subject, select the last option: *"No label applies."*