Warsaw University of Technology

COURSE OFFERED IN THE DOCTORAL SCHOOL

Code of the course	4606-ES-000000N-0210	Name of the course	Polish	**Innowacje na rzecz zrównoważonej energii**	
			English	**Innovation for sustainable energy**	
Type of the course	Special courses				
Course coordinator	Dr hab. Robert Zajdler, prof. uczelni				
Implementing unit	WAINS	Scientific discipline / disciplines*	Law		
Level of education	Education of doctoral students	Semester	~~winter~~/summer		
Language of the course	English				
Type of assessment:	Credit with grade	Number of hours in a semester	30	ECTS credits	2
Minimum number of participants	12	Maximum number of participants	12	Available for students (BSc, MSc)	Yes

Type of classes		Lecture	Auditory classes	Project classes	Laboratory	Seminar
Number of hours	in a week	2				
	in a semester	30				

* does not apply to the Researcher's Workshop

1. Prerequisites

Initial knowledge of energy and sustainability issues. Familiarity with innovation and digitalisation issues would be an asset.

2. Course objectives

The aim of the course is to present a model for the functioning of energy markets (electricity, natural gas, oil and liquid fuels, heat), taking into account historical conditions and directions of actions taken at the political, legal and economic levels. The course is based on the requirements of European Union law and the directions of energy policy development, which will be related to global and Polish conditions. The learning outcome will be an in-depth knowledge of the functioning of the energy sectors at present and in the target model. Fuels and energy are key commodities enabling the economic development of countries and ensuring the expected standard of living of people. Progressive technological advances mean that the energy sector as we know it is slowly becoming a thing of the past. Its place is being taken by other models of operation, based on innovative and interlinked diverse technologies. Innovation provides a paradigm shift for the whole system. In addition, the expectations of an increasing number of society to live in a friendly environment and in an environment that is not constantly degraded makes environmental protection and environmental sustainability key determinants of the change models adopted. Given the special role of energy, the process must ensure security, solidarity and trust. Diversifying energy sources and ensuring energy security through solidarity and cooperation is a standard for functioning within the European Union. It provides the canvas for the energy transition within a fully integrated internal energy market, i.e. a market that allows energy to flow freely within the EU through appropriate infrastructure and without technical or regulatory barriers. In such a model, energy efficiency and renewable energy sources play an important role. They ensure that dependence on energy imports is reduced, emissions of environmentally harmful substances are lowered and economic growth is stimulated in new and innovative areas. Climate action, the decarbonisation of the economy, is at the heart of the changes taking place

3. Course content (separate for each type of classes)

Lecture

The aim of the class is to show all these conditions. The course will provide an overview of the economic, social, legal and economic principles of the European energy market. Students will be provided with the necessary understanding of the national and international dimensions of energy markets and the differing

conditions between the member states of the European Union. Upon completion of this course, participants will be able to understand the dynamics and evolution of European energy markets in the context of a geopolitical framework, explain regulatory and environmental requirements. Evaluate the challenges and opportunities for new and existing companies. Assess the future of the EU single energy market. The class will have an interdisciplinary character. The analysis will be based on historical EU policy documents. On their basis, the student will gain knowledge of the evolution of EU policy in this area, taking into account the key conditions (competition, environment, security, solidarity). The analysis in this area will be deepened by showing the economic conditions of the functioning of the energy market, which will allow for a more in-depth understanding of the changes taking place and their determinants. As the sector is highly dependent on the functioning of infrastructures, particular emphasis will be placed on understanding the technical and technological conditions of operation. The whole will be underpinned by showing the regulatory model as well as changes in societal expectations.
Laboratory

4. Learning outcomes

	Learning outcomes description	Reference to the learning outcomes of the WUT DS	Learning outcomes verification methods*
Knowledge			
K01	Be able to define the purpose and subject of research and formulate a research hypothesis	SD_W1/P8S_WK	Evaluation of activities, evaluation of presentations
K02	Be able to use the acquis to develop existing and develop new research methods, techniques and tools and apply them creatively in practice	SD_W2/P8S_WG	Evaluation of activity, evaluation of homework
K03	Be able to design legal and organisational conditions conducive to the development of their activities	SD_W4/P8S_WK	Evaluation of activity, evaluation of homework
Skills			
S01	Be able to plan and carry out an individual and team research project	SD_U5/P8S_UK	Evaluation of activities, evaluation of presentations
S02	Apply knowledge from a variety of fields to creatively identify, formulate and innovatively solve complex problems or perform tasks of a research nature	SD_U1/P8S_UW	Evaluation of activity, evaluation of homework
S03	Be able to communicate on specialised subjects to the extent necessary for active participation in the national and international scientific community	SD_U4/P8S_UK	Evaluation of activity, evaluation of homework
Social competences			
SC01	Creative contribution to quality improvement and a culture of cooperation	SD_K1/P8S_KK	Evaluation of activity, evaluation of homework
SC02	Thinking and acting in a creative and entrepreneurial way	SD_K4/P8S_KO	Evaluation of activity, evaluation of homework

5. Assessment criteria
Credit will be given on a graded basis. The student will be required to prepare an individually indicated topic and present it during the class.

6. Literature
Basic literature:: 1. EU Energy Law vol. I-X 2. Helmut Schmitt von Sydow (red.), EU Energy Law & Policy: Yearbook 2014; 3. R. Zajdler, Electricity and natural gas market network codes in the legal order of the post-Lisbon European Union, Warszawa 2019. Complementary literature: 1. IEA, World Energy Outlook, 2022 2. D. Yergin, The Prize: The Epic Quest for Oil, Money & Power, 2008. 3. D. Yergin, The Quest: Energy, Security, and the Remaking of the Modern World, 2012. 4. D. Yergin, The New Map. Energy, Climate, and the Clash of Nations, 2020.

7. PhD student's workload necessary to achieve the learning outcomes**		
No.	Description	Number of hours
1	Hours of scheduled instruction given by the academic teacher in the classroom	30
2	Hours of consultations with the academic teacher, exams, tests, etc.	5
3	Amount of time devoted to the preparation for classes, preparation of presentations, reports, projects, homework	10
4	Amount of time devoted to the preparation for exams, test, assessments	10
	Total number of hours	**55**
	ECTS credits	**2**

** 1 ECTS = 25-30 hours of the PhD students work (2 ECTS = 60 hours; 4 ECTS = 110 hours, etc.)

** 1 ECTS of work = 25-30 hours of doctoral student workload (e.g. 2 ECTS = 60 hours; 4 ECTS = 110 hours