Energy Policy, Markets and Economics

Basic information

Field of study Renewable Energy and Energy Management **Speciality** All **Department** Faculty of Energy and Fuels **Study level** Second-cycle (engineer) programme **Study form** Full-time studies **Education profile** General academic	**Didactic cycle** 2021/2022 **Subject code** EiPEOZS.IIi2S.5ecf6e8f1ef49.21 **Lecture languages** English **Mandatory** Obligatory **Block** Major Modules **Subject related to scientific research** Yes

Subject coordinator	Wojciech Suwała
Lecturer	Wojciech Suwała, Artur Wyrwa

Period Semester 2	**Examination** Exam **Activities and hours** Lecture: 30, Project classes: 30, Seminars: 15	**Number of ECTS points** 7.0

Goals

C1	The programme aims to provide a basic knowledge of the energy economics, markets and policy development.

Subject learning outcomes

Code	Outcomes in terms of	Directional learning outcomes	Examination methods

Knowledge – Student knows and understands:			
W1	the basics of the theoretical background of energy policy development (including principles, objectives, legal aspects, entities responsible for energy policy). Student can use the knowledge on how energy policy instruments contribute to the development of energy systems.	EOZ2A_W03, EOZ2A_W04, EOZ2A_W05	Test, Examination
W2	general market structures and in particular possible structures of energy markets. In addition, in case of electricity knows differences between spot and technical markets, knows the main mechanisms of price creation.	EOZ2A_W06	Test, Examination
W3	basics of microeconomics required to understand and solve problems in energy sectors.	EOZ2A_W06	Test, Examination
Skills – Student can:			
U1	describe key objectives of the global and EU energy policy and justify the selection of energy policy instruments to achieve these objectives.	EOZ2A_U05, EOZ2A_U07	Test, Project, Examination, Report
U2	justify the need for energy policy development, list and describe the functioning of key energy and envirinment policy instruments. Is able to list and describe the renewable energy development support schemes, calculate selected indicators of energy security and energy intensity of GDP and interpret the results.	EOZ2A_U05, EOZ2A_U07	Test, Project, Examination, Report
U3	assign a given fuel and energy market to a given market structure and justify the consequences of such a structure for fuel and energy companies and consumers as well as assess the effects of implementing market reforms (liberalisation) on fuel and energy markets.	EOZ2A_U05, EOZ2A_U07	Test, Project, Examination, Report
U4	describe important economic relations and apply methods of economic evaluation of the processes in the fuels and energy systems.	EOZ2A_U02, EOZ2A_U05	Test, Project, Examination, Report
Social competences – Student is ready to:			
K1	constructively discuss in classes and logically formulate arguments. Student understands the social aspects of the use of energy technologies, the role of dialogue in formulating the energy policy development.	EOZ2A_K01, EOZ2A_K02	Activity during classes

Programme content that ensure achieving learning outcomes for the module

The programme consists of the lectures, project and seminar classes. Lectures begin with setting up the global energy perspective and challenges followed by discussions on regional and national political and economical processes in energy systems. Next are the basics of microeconomics and industrial organization. They ends with entering into details, such as day-ahead and balancing electricity and capacity markets, methods for pricing and economic assessment of investments, or design of policy instruments, such as systems supporting the development of renewable energy sources. The games-based learning method will be used in addressing the electricity balancing market. In project classes students will work on projects related to analysis of the energy situation and perspectives of a given country. Seminars will consist of a series of Oxford debates related to the energy policy, markets and economics problems. The course contains a specialized language that allows you to verify English language skills at B2 + level

Calculation of ECTS points

Activity form	Average amount of hours* needed to complete each activity form
Lecture	30
Project classes	30
Seminars	15
Preparation for classes	35
Examination or Final test	2
Preparation of project, presentation, essay, report	60
Contact hours	5
Student workload	**Hours** 177
Workload involving teacher	**Hours** 75

* hour means 45 minutes

Study content

No.	Course content	Subject learning outcomes	Activities

1.	Lectures: 1. Theoretical background of energy policy development – definitions, objectives, principles, legal aspects, entities responsible for development of energy policy. 2. Relations energy – environment – economics, energy and the development of the world. 3. Elements of microeconomics ad industrial organization. 4. Economic efficiency measures, economic evaluation of development processes. 5. Economics of regulation, policy instruments in energy and environment. 6. Principles of energy economics: economics of exhaustible resources and fuels production, economics of energy transformation processes. 7. Energy policy instruments. 8. Energy security and key energy security indices. 9. Energy intensity of GDP. 10. Energy policy aimed to support the development of Renewable Energy Sources. 11. Introduction to energy markets, structures and price formation. 12. Fossil fuel markets. 13. Renewable energy markets. 14. Energy policy aimed to liberalise energy markets. 15. Electricity markets. Games-based learning method will be used in addressing the electricity balancing market.	W1, W2, W3	Lecture

2.	Project: Students will work on projects related to analysis of the energy situation and perspectives of a given country. They will determine the geopolitical situation and its impact on national energy policy. They will describe instruments of energy policy that are introduced in a given country and analyse their effectiveness through the analysis of the change of the selected indicators calculated based on the time series data. The data can be obtained e.g. from Eurostat, International Energy Agency (IEA), BP Statistics, US Energy Information Administration (US EIA) databases and materials available on the governmental websites of individual countries. They will also describe important economic relations e.g. relation between GDP and electricty and primary energy consumption. The main outcomes of the analysis are presented in form of the report.	U1, U2, U3, U4, K1	Project classes
3.	Seminars: Seminars will consist of a series of Oxford debates. Examples of debates' topics are: decarbonization of energy systems, need of supporting mechanisms dedicated to selected energy technologies, carbon taxation, external cost of energy technologies, clean coal technologies, electricity market coupling, scarcity pricing, capacity markets. The seminar classes will be finalised by a multiple-choice questions test.	U1, U2, U3, K1	Seminars

Course advanced

Teaching methods:

Lectures, Discussion, Project based learning, Gamification, Oxford debate

Activities	Examination methods	Credit conditions
Lecture	Examination	Oral exam, in order to pass the exam it is necessary to obtain positive partialmarks (at least 3.0).
Project classes	Project, Report	Accepted projects have to obtain positive partial marks from the case study assignments, project execution and report (at least 3.0).
Seminar classes	Activity during classes, Test	Main part of the score is avtivity during seminars, quality of presentation and discussion.

Requirements and method of completing particular forms of classes

Project classes:
- at most one absence from classes,
- positive grade for the project report
- positive grade from the assigmnents related to case study
Seminar classes:
- at most one absence from classes,
- positivly evaluated activity in the classes
Lectures:
In order to take the exam, students must get the possitive grade from the Project and Seminar classes.
There three exam dates - first exam and two retakes.

Method of calculating the final grade

The final grade (FG) is determined based on AGH regulations regarding the grade thresholds and using the equation below:
FG= 0,4*L*R +0,3*P*R + 0,3*S
L - grade from lectures,
P - grade from project classes,
S - grade from seminar classes,
R: 1 - for 1st evaluation 0,9 - for 1st retake, 0,8 - for 2nd retake.
The final grade is determined to two decimal places without rounding, in accordance with the following rule depending on the numerical value: 1) from 3.00 verbal rating: sufficient (3.0) 2) from 3.21 verbal mark: plus sufficient (3.5) 3) from 3.71 verbal mark: good (4.0) 4) from 4.21 verbal mark: plus good (4.5) 5) from 4.71 verbal mark: very good (5.0).
Grades indicate that a student (in reference to OLO 1):
5,0 - student has the ability to identify short- and long-term future consequences of a given energy policy, can describe structures of energy markets and economic relations,
4,5 - student has the ability to identify major short- and long-term future consequences of a given energy policy, can describe major structures of energy markets and important economic relations,
4,0 - student has the ability to identify some short- and long-term future consequences of a given energy policy, can describe some structures of energy markets and some economic relations,
3,5 - show awareness of the some short- and long-term future consequences of a given energy policy, and some structures of energy markets and economic relations,
3,0 - show only limited awareness of the some short- and long-term future consequences of a given energy policy, can give an example of selected marekt structure and economic relation,
2,0 - no evidence of the Learinig Outcomes shown.

Method and procedure for compensating for missed coursework resulting from student absence from classes

One non-attendance is allowed in obligatory classes, which requires the student to independently master the material processed at that time. In the case of a student's absence two times, the student is required to independently master the material being taught during the class and pass it in the form and date specified by the teacher (latest in the last week of the course). A student who, without justification, missed more than two compulsory classes may not be clasified.

Entry requirements

No special requirements, any knowledge of economics would be an asset.

Attendance requirements for particular classes, with indication whether student attendance is compulsory

Lectures: students attendance is highly recommended but not mandatory.
Students attendance and activity in the project classes is mandatory.
Students attendance and activity in the seminar classes is mandatory.

Literature

Obligatory

1. Renewable Energy Market & Policy Trends in IEA Countries. OECD/IEA, Paris 2004. (www.iea.org)
2. Energy Policies of IEA Countries. International Energy Agency (IEA/OECD). Paris 2011. (www.iea.org)
3. Pearce D., Turner R., Economics of natural resources and the environment, Simon & Schuster, 1990
4. Subhes C. Bhattacharyya Energy Economics: Concepts, Issues, Markets and Governance – Springer 2011 (available at AGH main library e-book Springer repostories)
5. Zweifel Peter, Praktiknjo Aaron, Erdmann Georg, Energy Economics Theory and Applications, Springer Texts in Business and Economics, 2017

Optional

1. Panos Konstantin, Margarete Konstantin, Power and Energy Systems Engineering Economics, Springer 2020
2. Wyrwa A. Climate change mitigation game, IEEE global engineering education conference, 2018, Santa Cruz de Tenerife, Canary Islands, Spain.

Research and publications

Research

1. Costs and properties of energy technologies.
2. Economics of electricty market.
3. Economics of coal industry, demand balancing and restructuring.

Publications

1. Economic issues of biomass-based small-scale energy systems / Artur WYRWA, Wojciech SUWAŁA, Marcin PLUTA // W: Biomass in small-scale energy applications : theory and practice / ed. by Mateusz Szubel, Mariusz Filipowicz. — Boca Raton : Taylor & Francis, CRC Press, 2019. — (Energy Systems: From Design to Management). — ISBN: 978-0-367-20105-5 ; e-ISBN: 9780429286063. — S. 21–37. — Bibliogr. s. 36–37
2. Suwala W., 2008, Modeling adaptation of the coal industry to sustainability conditions, Energy, Volume: 33, Issue: 7, July, 2008, pp. 1015-1026
3. Suwala W., Modeling development of the Polish coal industry, 2nd World Congress of Environmental and Resource Economics, Monterey USA, June 2002,
4. Suwala W., Labys W.C., Market transition and regional adjustments in the Polish coal industry, . Energy Economics, 2002, v. 24, No 3, str. 285-303

Directional learning outcomes

Code	Content
EOZ2A_K01	Is aware of the need to critically assess the information received and knowledge acquired, recognizes the importance of knowledge in addressing cognitive and practical problems, in particular in the field of energy.
EOZ2A_K02	Is aware of responsibility for the tasks performed, is willing to think and act in an entrepreneurial and professional manner, is aware of compliance with the principles of professional ethics and the cultivation and dissemination of appropriate practices, as well as initiation of actions for the benefit of the social community and public interest, including the rational use of energy and provision of the national energy security.
EOZ2A_U02	Is able to use knowledge to plan and conduct research on energy processes using various methods, including experimental ones, is able to use available software and create own computer codes for the purpose of analysis of the solution, is able to perform a critical analysis of results and prepare a synthetic compilation presenting the results of conducted research in terms of economic and environmental analysis.
EOZ2A_U05	Is able to carry out critical, from the technical, economic, environmental and social point of view - analysis of the functioning of any element of the energy system and develop a project of improvement in the construction and operation of renewable and classic energy equipment and installations.
EOZ2A_U07	Is able also to assess the impact of energy systems on the global functioning of civilization, including society, natural environment, economic and social development and related issues, is able to present own point of view to a wide range of audiences, also using a foreign language and presentations illustrating advanced technical and non-technical problems in the field of energy.
EOZ2A_W03	Knows and understands development trends in fields related to renewable energy, such as processing of energy resources, co-generation, environmental protection technologies and modern information and optimization methods that broaden the application horizon of RES.
EOZ2A_W04	Knows and understands dilemmas related to the development of RES: ensuring energy security, environmental protection and sustainable energy development as well as rational utilization of energy and use of energy resources.
EOZ2A_W05	Knows and understands the norms and legal regulations applied in the power industry, the concepts in the field of industrial property protection, copyrights and patent information, the basis of economics and management in renewable energy and environmental protection.
EOZ2A_W06	Knows and understands the general principles for developing individual entrepreneurship, including: principles of business plan development and business management, economics and management in the energy sector and environmental protection.