NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS

Course Syllabus for "The Future of Energy"

Approved by Academic
Council
of the Master's Programme
Minutes AC2

Developer	Liliana Proskuryakova, Leading Research Fellow, Associate Professor, Institute for Statistical Studies and Economics of Knowledge
No. of credits	3ECTC
Classroom hours	32
Self study (hours)	82
Year of study, degree programme	Second year, Master's Program 'Governance of Science, Technology, and Innovation'
Study format	No use of on-line courses

1. Objectives, Results of the Course Study and Pre-requisites

In the beginning of the XXI century the future of energy is anything but clear: the volatility of energy prices, the ongoing and expected technological breakthroughs and the geopolitical shifts are among multitude of factors that shape our energy systems. The students will learn how to identify and analyze the upcoming developments, foresee and forecast the changes, master the trends and approach new energy markets.

More specifically, the learning objectives of the course are to

- Provide students with basic knowledge of energy systems, their key elements, and their future design (outlook);
- Explain and provide examples of the main methods used in energy technology foresight;
- Explain and provide examples the key energy policy tools and best practices, with a particular focus on science, technology and innovation in the energy industry;
- Develop abilities to identify, collect and interpret data and information on energy systems for evidence-based decision-making;
- Develop the abilities for foresee the changes in the energy industry and energy policy.

The students will acquire the following competences:

- Understanding how present and future energy systems are designed and their main components;

- Knowledge of energy systems implications for economic, social and environmental development;
- Basic knowledge of energy systems analysis and energy technology foresight;
- Ability to make a comparative analysis of energy systems strengths and weaknesses;
- Energy security basic analysis skills;
- Understanding the main methods and approaches to identify and analyze new markets, business models and partnerships;
- Applied policy analysis for national, regional, local and corporate decision-making.

This elective course is delivered in one module. There are no study pre-requisites. The course is based on prominent energy research outcomes, as well as analytical and strategic documents from energy companies and government agencies. Theoretical concepts are illustrated with real-life case studies.

The teaching is based on theoretical and methodological publications, strategic national and corporate documents, and outlooks of international organizations. The course director and invited experts will provide a combination of different perspectives: policy, engineering (technology), economic and management. Lectures are designed to provide background knowledge, theoretical concepts, methodological, as well as to give a global and cross-country perspectives. The lectures are mixed with interactive lectures that will allow for discussion of the material with students and tackling real-life case-studies. They are aimed at sharing participant's reflections on the approaches introduced at lectures and in the literature and developing the applied competences listed above.

2. Course Contents

Topic (course section)	**Total hrs[1]** LC ILC onl/sw	**Expected learning outcomes (ELO) to be assessed**	**Assessment formats**
Block 1. Energy policy and its impact for economy, society and environment			
Topic 1. The energy agenda-setting by international institutions	LC 4 ILC 4 SW 16	Applied policy analysis for national, regional, local and corporate decision-making; Energy security basic analysis skills	Individual home assignment (voluntary): an essay or case-study of 1,000 words
Topic 2. National energy policies and their environmental, social and cross-sectoral implications.	LC 4 ILC 4 SW 16	Knowledge of energy systems implications for economic, social and environmental development	Individual home assignment (obligatory): an essay of 2,000 words
Block 2. International and national energy systems			
Topic 3. The introduction to present and future energy systems: key elements and their interrelation.	LC 4 ILC 4 SW 16	Basic knowledge of energy systems analysis; Understanding how present and future energy systems are designed and their main components	Individual home assignment (voluntary): an essay or case-study of 1,000 words
Topic 4. Energy technology foresight: from research to policy advice.	LC 4 SW 18	Basic knowledge of energy technology foresight at national and sectoral level	Individual home assignment (voluntary): an essay of 1,000 words
Topic 5. The transformation of energy companies – new markets, business models and partnerships.	ILC 4 SW 16	Basic knowledge of energy technology foresight at corporate level; Understanding the main methods and approaches to identify and analyze new markets, business models and partnerships	Group home assignment: case study of an energy company that has gone (is going) through a transformation process: identify new markets, business models and partnerships. Format: presentation of maximum 20 slides at the interactive lecture
Hours for types of classes:	**LC 16** **ILC 16** **SW 82**		
Total hours	**114**		

Course formats:
LC – lectures;
ILC – interactive lectures;
Onl. –online lectures and other Internet courses;
SW – student independent work.

[1] Leave blank for syllabi, which are not part of a degree programme curriculum and not planned for a schedule

Interactive lectures consist of new practical material presentation and moderated discussions that will provide students with abilities to use and interpret energy-related data and information. During interactive lectures, students will discuss real-life cases related to energy policy-making, energy study design, and economic (management) decisions. Individual and group home assignments will be discussed during interactive lectures. Topics for discussion will be announced in the beginning of the course for the participants to be informed and prepared for the interactive lectures.

3. Assessments

Home assignment (HA) A written task (obligatory or voluntary) is prepared within three to four days after the announcement of the topic. HA are to be submitted by the beginning of the interactive lecture following the lecture at which the task was announced. Each student is asked to submit two HAs during the course: one prepared as individual assignment (a mini-essay of 2,000 words) and one group assignment prepared together with fellow students - a case study (a presentation of maximum 20 slides). The size of such groups are determined by students themselves. One student can additionally submit no more than three HA during the course on voluntary basis (two highest grades are taken into consideration for final grade calculation) in the form of mini-essay or case-study around 1,000 words following the topics that were provided. HA (if not mentioned specifically) should include: – a short introduction (why the issue matters); – a reasoned (evidence-based) written reply to the question asked; – a short conclusion (the main finding).

Final exam (E) is performed in the form of in-class written task comprising two out of four open-ended questions to be answered in brief within 120 minutes. Full answer value is 2 credits.

The overall course grade G (10-point scale) is calculated by the formula: G = 0.5*E + 0.2*ILC + 0.3*HA, and includes results achieved by students in their exam (E), interactive lectures (ILC), and two home assignments (HA); it is rounded up to an integer number of points.

4. Examples of Assessment Materials

Blocking elements are not present in the course.

Examples of open-ended questions to be given at the examination are as follows:

- *Give examples of the role attributed to energy research and development in the international energy policy agenda*;
- *Discuss pros and cons of selected methods used in energy technology foresight;*
- *Discuss the possible pathways for the future development of energy systems with implications for economy and the society.*

5. Resources

5.1. Key recommended reading

No.	**Name**
1.	Märker C., Venghaus S., Hake J.-F. (2018) Integrated governance for the food–energy–water nexus – The scope of action for institutional change, *Renewable and Sustainable Energy Reviews* 97, pp. 290-330.
2.	Proskuryakova L. (2017) Energy technology foresight in emerging economies, *Technological Forecasting and Social Change* 119, pp.205-210.
3.	Zafar R. et al. (2018) Prosumer based energy management and sharing in smart grid, *Renewable and Sustainable Energy Reviews* 82, Part 1, pp. 1675-1684.
4.	Pradhan, P., Costa, L., Rybski, D., Lucht, W., Kropp, J. P. (2017) A systematic study of sustainable development goal (SDG) interactions, *Earth's Future* 5(11), pp.1169-1179.
5.	Bartelmus, P. (2013) The future we want: Green growth or sustainable development? *Environmental Development* 7, pp.165-170.
6.	International Energy Agency (2018) *World Energy Outlook*. OECD/IEA, Paris.

5.2. Recommended further reading

No.	**Name**
1.	Liobikienė Ge., Butkus M. (2017) The European Union possibilities to achieve targets of Europe 2020 and Paris agreement climate policy, *Renewable Energy* 106, pp. 298-309.
2.	Chan A. (2016) Tackling global grand challenges in our cities, *Engineering* 2(1), pp. 10-15.
3.	Nilsson M., Zamparutti T., Petersen J. E., Nykvist B., Rudberg P., McGuinn J. (2012) Understanding policy coherence: analytical framework and examples of sector–environment policy interactions in the EU, *Environmental Policy and Governance* 22(6), pp. 395-423.
4.	Kosenius A.-K., Ollikainen M. (2013) Valuation of environmental and societal trade-offs of renewable energy sources, *Energy Policy* 2013; 62, pp. 1148-1156.
5.	Equinor (2018) Energy Perspectives: Long-term macro and market outlook. Equinor ASA, Stavanger.

6.	REN21 (2017) Renewables Global Futures Report, URL: http://www.ren21.net/future-of-renewables/global-futures-report/
7.	World Energy Council (2018) *World Energy Issues Monitor 2018. Perspectives on the Energy Transition*, URL: https://www.worldenergy.org/publications/2018/world-energy-issues-monitor-2018-perspectives-on-the-grand-energy-transition/

5.3. Software

No.	**Name**	**Terms for access/downloading**
1.	Microsoft Windows 7 Professional RUS: internal university network	HSE University's internal network (agreement)
2.	Microsoft Windows 10: internal university network	HSE University's internal network (agreement)
3.	Microsoft Windows 8.1 Professional RUS: internal university network	HSE University's internal network (agreement)
4.	Microsoft Office Professional Plus 2010: internal university network	HSE University's internal network (agreement)

5.4. Professional databases, information reference systems, e-resources (eLearning resources)

No.	**Name**	**Terms for access/downloading**
1.	HSE Library e-resources	From HSE University's internal network

5.5. Supplies and technical support for the course

Classrooms for lectures provide proper use and presentations of particular topics, specifically:

- PC with internet access and office software or laptop
- multimedia projector
- screen
- flipchart or black-board

6. Organization of Studies for Persons with Limited Mobility and Disabilities

If necessary, learners with limited mobility or a disability (as per his/her application), as well as per his/her individual rehabilitation programme, may be offered the following

options for receiving learning information with due consideration of his/her individual psycho-physical needs (e.g., via eLearning studies or distance technologies):

6.1.1. *for persons with impaired vision*: enhanced fonts in hard copy documents; e-documents; instructions for the use of free text-to-speech software applications (transfer of study materials to an audio-format); individual consultation with a facilitated communicator; individual assignments and mentoring;

6.1.2. *for persons with hearing impairments*: texts in hard copy; e-documents; individual consultation with a facilitated communicator; individual assignments and mentoring;

6.1.3. *for persons with a muscular-skeleton disorder*: texts in hard copy; e-documents; instructions for the use of free text-to-speech software applications (transfer of study materials to an audio-format); individual assignments and mentoring.