Version 1, 3 January 2018 Periods III-IV 2019

PHYS-C1380 Multi-disciplinary energy perspectives (5cr)

Background

Energy is one of humankind's grand challenges linked to climate change, human development, sustainability, economy, and innovations, among others. Finding effective solutions to these will require stronger systemic thinking and multiple skills, beyond the specific technology knowledge.

Multi-Disciplinary Energy Studies (MES) is a new Aalto-minded approach to the energy and society nexus. It is an elective Master's Minor, with three major perspectives into energy: science & technology, economics & business, and social sciences & human behavior.

The Multidisciplinary Energy Studies (MES) is a collaborative teaching effort between several disciplines of Aalto University, as follows: system analysis (Prof. Ahti Salo, Prof. Afzal Siddiqui), media (Prof. Ramia Maze), energy sciences (Prof. Peter Lund), information technology (Prof. Antti Ylä-Jääski, Prof. Keijo Heljanko), business (Profs. Karlos Artto, Jan Holmström), economics (Prof. Matti Liski).

PHYS-C1380 Multi-disciplinary energy perspectives

PHYS-C1380 "Multi-disciplinary energy perspectives" is an introductory course to modern thinking in energy. The course deals with key factors that influence the way we use and produce energy, how different disciplines approach energy and why, and to apply your own discipline in energy problems.

The course discusses foundational elements and solutions for energy through combining science and engineering, economics and business, social sciences and human behavior. Applying multi-disciplinary thinking to real-life energy case problems and understanding the links between different disciplines and the complexity of energy, through cases such as: Sustainable Energy, Green-ICT, Energy Markets, Green Business, Smart Power, E-Mobility, among others.

Course Outline

The course begins with a pre-reading assignment (DL 14.1., see here).

The first lecture is on Thursday 10 January. Lectures are on Thursdays at 14:15 - 16:00 in building R008 (Otakaari 4), room 213a. Exercises and group work presentations are on Mondays at 14:15 - 16:00 in building R008 (Otakaari 4), room 215.

The detailed course schedule can be found in course pages in MyCourses here.

The course is obligatory to students, who will take the MES Minor, but all students interested in the 'energy and society'-theme is welcome. The course is for Masters or post-graduate students mainly, but advanced Bachelor students are also welcome.

Structure of the course

The course has four learning elements, explained below: lectures, exercises and homework (incl. pre-reading), group work (presentation, report).

0. Pre-reading

The course participants will receive two articles for reading and three questions to which to answer. One article deals with in behavioral economics and social science linked to technology choices and preferences, and the other with Multi-disciplinarily in energy.

1. Lectures

Format: two hours class room; eight lectures: total 16 hours lectures. Schedule:

Thu 10.1. L1 Introduction to Energy & Multi-Disciplinarity (Prof. Peter Lund, SCI)
Thu 17.1. L2 Energy & ICT / "Datacenters and Energy Efficiency" (topic to be confirmed) (Prof. Keijo Heljanko, Helsinki University)
Thu 24.1. L3 Building- and product-integrated photovoltaics (Doc. Janne Halme, SCI)
Thu 31.1. L4 Strategic Use of Storage: The Impact of Carbon Policy, Resource Availability, and Technology Efficiency on a Renewable-Thermal Power System (Prof. Afzal Siddiqui, SCI)
Thu 7.2. L5 Energy, Economics and Markets (topic to be confirmed) (Prof. Matti Liski, BIZ)
Thu 14.2. L6 Energy, domestic heat and consumers (topic to be confirmed) (Prof. of Practice Mikko Jalas, ARTS)
Thu 28.2. L7 Visiting guest lecture (to be confirmed)
Thu 7.3. L8 Energy Perspectives-Business Models and Value Based Performance (topic to be confirmed) (Prof. Jan Holmström and Prof. Karlos Artto, SCI)

The lecture slides will become available MyCourses here.

2. Exercises and homework assignments

Learning and applying methods and cases. Format:

- One pre-reading assignment
- Three 2-hour exercise sessions, each including discussion of the last homework in groups, group work around a key question and unwrapping and discussion.
- Three compulsory home exercises which will be returned by the following Monday.

Exercises and homework assignments become available in MyCourses here.

3. Group presentation

Format:

- Group size 3 - 5 persons
- Well-framed problem with real-life connection (three themes will be given)
- Reading a few articles, plus own search for literature and other information sources
- 3 - 5 questions to be analyzed
- Presenting and debating the outcome in class room
- 2 hours class room per theme
- Act as opponent to two other groups and give feedback

Group presentation themes become available in MyCourses here.

4. **Group report**

Format:

- Group size 3 - 5 persons (same group as in the presentation)
- Analyze a case in multidisciplinary energy applying the know-how learned
- Write a 5 - 10 page report
- Review and assess three reports from other groups and give feedback

Group report themes become available in MyCourses here.

Assessment and grading

The **minimum requirements for passing the course** are:

- Attendance to at least 6/8 of the lectures
- All three homework assignments accepted
- Group presentation and two opponent reports accepted
- Group report accepted
- Both peer assessments of group members' performance submitted

Grading and assessment principle

The course grade is combination of the students' grade (30 %) and group grade (70 %) and consists of the following parts:

Individual work	**Weight**	**Scale**
Pre-reading assignment	7,5 %	0 - 2
Homework 1	7,5 %	0 - 2
Homework 2	7,5 %	0 - 2
Homework 3	7,5 %	0 - 2
Individual grade	30 %	

Teamwork		
Group presentation	20 %	0 - 5
Group report	50 %	0 - 5
Group grade	70 %	
Total	**100 %**	

- Note: Poor opponent performance can affect the group's presentation score.

Within-the-group peer assessment

Peer-assessment will be used also to estimate the amount and quality of the individuals' contributions to the group's work. Each member of the group evaluates his/her own as well as other group members' contributions anonymously. The result of the peer assessment can increase or decrease the individual's grade compared to the group's grade.