Last update: 23-07-2019

820730 - REG - Energy Resources

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 748 - FIS - Department of Physics
Academic year: 2019
Degree: MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
ERASMUS MUNDUS MASTER'S DEGREE IN ENVIRONOMICAL PATHWAYS FOR SUSTAINABLE ENERGY SYSTEMS (Syllabus 2013). (Teaching unit Compulsory)
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MASTER'S DEGREE IN ENERGY ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
ECTS credits: 5 Teaching languages: English

Teaching staff

Coordinator: LLUIS BATET MIRACLE

Opening hours

Timetable: Just after the lectures. Other time frames to be appointed by e-mail.

Prior skills

The typical of the Master's accessing degrees.

Degree competences to which the subject contributes

Specific:

CEMT-1. Understand, describe and analyse, in a clear and comprehensive manner, the entire energy conversion chain, from its status as an energy source to its use as an energy service. They will also be able to identify, describe and analyse the situation and characteristics of the various energy resources and end uses of energy, in their economic, social and environmental dimensions, and to make value judgments.

Transversal:

CT2. SUSTAINABILITY AND SOCIAL COMMITMENT: Being aware of and understanding the complexity of the economic and social phenomena typical of a welfare society, and being able to relate social welfare to globalisation and sustainability and to use technique, technology, economics and sustainability in a balanced and compatible manner.
CT3. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology

The course intends to provide an overarching outlook of the energy systems from different standing points. In order to do so, during the course, transversal concepts complementing and synthetising the contents of other courses will be introduced. Moreover, the analyses will encompass a broad spectrum of disciplines, from science and technology to economics, and to other social sciences and humanities.

The course is structured around a series of conferences and practical sessions, which provide the skeleton supporting the other course activities. The conferences will equip the students with elements of thought and reflection about several aspects of the energy systems. A number of "practical" sessions will be programmed, which will be of two types. In some sessions students (working in teams) will try to solve a set of exercises related to the contents of the course, under the guidance of the teacher. In other sessions, students will participate in workshops, discussions, and debates related to some Social Sciences and Humanties aspect of Energy (this part of the course is aligned with the TEACHENER project, http://www.teachener.eu/, an ERASMUS+ project partnered by UPC).

In parallel, the students will have to follow the non-contact part of the course (readings, essays, exercises, and one project). Students will be proposed a series of exercises and activities to be developed out-of-the-classroom. The statements and guidelines for these activities will be posted in the digital campus ATENEA. One of the activities will be the writing of an article which will be peer-reviewed by fellow students.

During the semester the students will work, in teams of 3 or 4 people, on a tutored project about a specific energy topic, and will write a technical report on that topic, that will defend in front of their tutor. In some cases, depending on the subject, it will be possible to write a general scope article instead of the technical report.

Learning objectives of the subject

General Learning Objectives:

Cognitive. Upon the completion of the course, the student should be able to:

- Explain the need for energy and its relationship to sustainable human development.
- To describe all the transformations that energy suffers from its state as "energy source" to its use as "energy service".
- To highlight the multiple implications (for society, environment, economy, etc.) of an energy system's structure.

Aptitudinal. Upon the completion of the course, the student should be able to:

- Perform basic calculations about the performance of different energy systems: energy balances (input-output), environmental impact, economic cost, energy storage needs, etc.
- Express and support their ideas in an effective manner both in spoken debates and in written communications.

Attitudinal. The course intends:

- To raise students' awareness of aspects such as energy efficiency, environmental impact minimization, security of supply, etc.
- To raise students' awareness of social aspects of energy use.
- To develop in the students the values of justice, solidarity and equality from the fact of relating conflict and underdevelopment situations with the global energy needs.

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Study load

Total learning time: 125h	Hours large group:	30h	24.00%
	Guided activities:	15h	12.00%
	Self study:	80h	64.00%

Content

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Description:
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Related activities:
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Specific objectives:
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Planning of activities

Course lectures	Hours: 36h Theory classes: 36h

Description:

The contact part of the course is organized as a series of conferences and practical sessions, which provide the skeleton supporting the other course activities. The conferences will equip the students with elements of thought and reflection about several aspects of the energy systems. A number of "practical" sessions will be programmed, which will be of two types. In some sessions students (working in teams) will try to solve a set of exercises related to the contents of the course, under the guidance of the teacher. In other sessions, students will participate in workshops, discussions, and debates related to some Social Sciences and Humanties aspect of Energy (this part of the course is aligned with the TEACHENER project, http://www.teachener.eu/, an ERASMUS+ project partnered by UPC).

Support materials:

In the virtual campus the documents with the class presentations will be available to the students.

Descriptions of the assignments due and their relation to the assessment:

At the end of each practical session, the groups will deliver a copy of the work done during the session.

The attendance is mandatory. To be eligible for qualification, a minimum 75% attendance to these activities will be required.

Specific objectives:

The contents of the course are transversal and aimed to summarize a knowledge which, in most of the cases, is the object of other courses. So, listing objectives of low level in Bloom's Taxonomy is unnecessary here. In the context of the course, it is considered important to explore the interrelationships of all the concurrent factors in the structure of the energy system and the implications of this structure

Limiting the list of objectives to those of high level in Bloom's Taxonomy, at the end of this course, students will be able to:

1. Explain a certain energy conversion chain from the source to the product and make calculations of varying complexity related to it (e.g. how much energy is required to produce a tin can?).
2. Determine the suitability of a particular energy solution (expressed as pros and cons) for a particular need (e.g. use of natural gas to produce electricity, future use of electric vehicles vs. hybrid vehicles ...) from global data on energy economy and from environmental impact and energy efficiency analyses.
3. Explain the relationship between the energy use and the human development, providing examples of different World regions (e.g. comparing per capita energy consumption vs. HDI).
4. Compare the environmental impact of different energy solutions.
5. Explain the relationship, expressed in terms of energy intensity, between energy consumption and economy in a country.
6. Analyse the security of energy supply in a region from cyclical and structural data.
7. Give a reasoned opinion on the projections and scenarios of future global and regional trends in energy, considering the demand, production capacity and reserves.
8. Give a reasoned opinion on the energy demand and the adequacy of the present coverage of energy services (e.g. railroad vs. automobile mobility) and on the essence of these services themselves (e.g. mobility vs. urban planning).
9. Draw energy flowcharts (synthesis) combining diverse statistical data.

Tutored course project	Hours: 38h Laboratory classes: 2h Self study: 36h

Description:

The students, in groups of three or four students, will develop a course project throughout the semester.

Support materials:

Students will have a guide relative to the project in the virtual campus. This guide describes the requirements of form and content and of interaction with the tutor, along with the project's evaluation criteria.

Students may choose the topic of the project from a list of subjects that will be available as well on the virtual campus.

Descriptions of the assignments due and their relation to the assessment:

The project will be delivered by the end of the semester. Afterwards, the defence of the project will take place; defence will consist of a group and an individual session. Therefore, the qualification of the project will have a strong individual component.

The detection of plagiarism or copying of this activity will cause the automatic suspension of qualification of the whole course.

Specific objectives:

Students must demonstrate that:
- they have achieved the specific objectives of the various topics of the course related to their project.
- they have achieved higher level objectives in the development of the course project.

It is intended that students develop the following skills by doing the course project:
- Teamwork
- Search and processing of information related to energy and environmental issues
- Writing technical reports
- Identification of the added value
- Evaluation of the quality of a technical report
- Presentation and oral defence of technical reports

It is also intended that students:
- Develop a values matrix regarding issues such as risk, environmental impact, security of supply, access to energy and economic optimization.
- Think about a set of values such as solidarity, dialogue, honesty and justice

Activities and works of reduced scope	Hours: 40h Self study: 40h

Description:

Students will perform activities individually or in teams (depending on the activity) and will deliver a paper before the deadline set for each activity. The expected duration of each activity will depend on its scope.

Support materials:
The description of each activity will be available to the students in the virtual campus. The description will provide information about possible sources of information (if needed) as well as the evaluation criteria.

Descriptions of the assignments due and their relation to the assessment:
A deadline will be set for each activity. Sessions will be scheduled for the defence of the activities. To qualify for the assessment of the activities, students must validate their work during these sessions.

The detection of plagiarism or copying in the activities will cause the automatic suspension of qualification of the whole course.

Specific objectives:
Will be defined for each activity.

Final exam	Hours: 11h Theory classes: 3h Self study: 8h

Description:
Students will do a written test for evaluating the contents of the course. This test will consist of a part based on the concepts explained in the theory sessions and a part with some exercises based on practical sessions.

Qualification system

The course evaluation is based in the student self-learning activities (40%), in the tutored course team project (30%), in small activities done in the classroom (10%) and in a final exam (20%).

The self-learning activities are split into exercises (10% - 20%) and other (20% - 30%). There will be a validation exam (written and oral) of these activities and of the course team project. Only after the validation exam the mark obtained for the activity will be considered definitive (if the result of the validation is positive).

In summary:
20% Final exam
30% Tutored course project
40% Other individual or team activities along the semester
10% Attendance and participation in theoretical and practical sessions

Attendance to contact activities is mandatory. In order to be evaluated of the course, a minimum 75% attendance to the contact sessions (lectures, conferences, exercises) is required. In case this requirement is not fulfilled, the student will be considered as Not Shown. Students not meeting this requirement will have no option to the retake.

The qualification corresponding to the self-learning activities done during the semester (40% in total) will be built as a weighted average of the different marks, using as a weighting factor the time allocated for each activity.

Regulations for carrying out activities

Attendance to contact activities is mandatory. In order to be evaluated of the course, a minimum 75% attendance to the contact activities (conferences and practical sessions) is required. Students failing to comply with this requirement will be graded as Not-Shown and will not have option to retake.

The evaluation of individual and team activities will depend on the results of the validation test. In the case of the course team project, the final defence (in group and individual) will be used as validation test. For other activities suitable controls will be established.

The detection of plagiarism or copying in any learning activity or the final exam will cause the automatic suspension of qualification of the whole course. In this case, students will have no option to retake.

Deadlines will be established for the different activities, that are to be respected.

Bibliography

Complementary:

Smil, Vaclav. Energy at the crossroads : global perspectives and uncertainties. Cambridge, Massachusetts ; London: The MIT Press, cop. 2003. ISBN 0262194929.

Smil, Vaclav. Power Density: A Key to Understanding Energy Sources and Uses. Boston: The MIT Press, 2015. ISBN 9780262029148.

Rifkin, Jeremy. The Third Industrial Revolution: How Lateral Power Is Transforming Energy, the Economy, and the World. New York: Palgrave MacMillan, 2013. ISBN 9780230341975.

Others resources:

Course materials, class-notes, presentations, exercises and additional material will be made available in ATENEA