FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura

<table>
<thead>
<tr>
<th>Nombre completo</th>
<th>Optativa Complementaria. Energy Economics: Primary Sources, Electric Power Systems and Market</th>
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<td>Código</td>
<td>DOI-OPT-424</td>
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<tr>
<td>Título</td>
<td>Grado en Ingeniería Electromecánica por la Universidad Pontificia Comillas</td>
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<td>Impartido en</td>
<td>Grado en Ingeniería Electromecánica [Cuarto Curso]</td>
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<td>Grado en Ingeniería Telemática [Cuarto Curso]</td>
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<td>Nivel</td>
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<td>Cuatrimestre</td>
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<tr>
<td>Departamento / Área</td>
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<tr>
<td>Responsable</td>
<td>Carlos Batlle López and Pablo Rodilla Rodríguez</td>
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<tr>
<td>Horario de tutorías</td>
<td>Contact with Professor</td>
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Datos del profesorado

Profesor

<table>
<thead>
<tr>
<th>Nombre</th>
<th>Carlos Batlle López</th>
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<tr>
<td>Departamento / Área</td>
<td>Departamento de Ingeniería Eléctrica</td>
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<tr>
<td>Correo electrónico</td>
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Profesor

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<tr>
<th>Nombre</th>
<th>Pablo Rodilla Rodríguez</th>
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<tr>
<td>Departamento / Área</td>
<td>Instituto de Investigación Tecnológica (IIT)</td>
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<tr>
<td>Despacho</td>
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<td>Correo electrónico</td>
<td><a href="mailto:Pablo.Rodilla@comillas.edu">Pablo.Rodilla@comillas.edu</a></td>
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<tr>
<td>Teléfono</td>
<td>2745</td>
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DATOS ESPECÍFICOS DE LA ASIGNATURA

Contextualización de la asignatura

Aportación al perfil profesional de la titulación

The course presents an interdisciplinary perspective of the energy sector, with a special focus on the electric power sector, linking the engineering, economic, legal and environmental viewpoints. The course reviews the whole electricity supply value chain, from the analysis of the key primary energy sources
(hydrocarbons, nuclear and renewable ones) to the description of the main electricity activities (generation, transmission, distribution and retail) and the different regimes in which they operate (regulated monopolies or under competitive conditions), with a special focus on the review of the fundamentals needed to approach the market designs currently implemented worldwide.

The knowledge acquired in the course will provide the comprehensive understanding of electric power systems that will be needed for research in this field, as well as for future professional activities in the energy sector, whether in industry, government or consulting.

**Prerequisitos**

There are not specific prerequisites in this course.

**Competencias - Objetivos**

**Competencias**

CG3. Knowledge of basic and technological subjects, which enables students to learn new methods and theories, and gives them versatility to adapt to new environment.

CG4. Ability to solve problems with initiative, decision, creativity, and critical reasoning; and to communicate and transfer knowledges, abilities and skills in the field of Engineering.

CG5. Knowledges to perform measurements, calculations, valuations, studies, reports, work plans and similar tasks.

CG7. Ability to analyze and assess the social and environmental impact of technical solutions.

CG9. Ability for organization and planning in firms and other institutions.

CG10. Ability to work in a multilingual, multidisciplinary environment.

RI10. Knowledge of basic and technological subjects, environmental and sustainability technologies.

**Resultados de Aprendizaje**

RA1. Be aware of the social, political and economic implications of energy.

RA2. Quantify the orders of magnitude of the different energy vectors.

RA3. Understand the role of primary energy sources and the basic economic principles underlying the energy business.

RA4. Understand the role of markets as tools to help agents pricing and trading the different sources.

RA5. Understand the differential aspects of the electric power business.

RA6. Know the key factors that condition the electricity business and the main techniques to manage them.
### Contenidos – Bloques Temáticos

**Introduction**

Introduction to Energy Economics
Sources, units, sector structure and prospectives

**MODULE 2**

Review of the primary energy sources
Review of the primary energy sources (exploitation, transport, markets)

**MODULE 3**

Energy commodities markets
Spot and futures/forward markets

**MODULE 4**

Financial fundamentals of the energy sector
Project financing.
Portfolio theory.

**MODULE 5**

Electric power systems
System balance: Demand and Generation
Networks: Transmission & distribution

**MODULE 6**

Electric power markets
From monopolies to markets
Operation
Investment

### METODOLOGÍA DOCENTE

**Aspectos metodológicos generales de la asignatura**

**Metodología Presencial: Actividades**

**Breaking news discussion**: Brief discussion on the key energy and especially electric power systems news appearing in the media.
Lectures: The teaching method is structured around a series of modules built first on the basic energy economics principles and then on the different electric power system activities. The lectures are structured as follows (23 hours):

- The theoretical basis are presented and discussed.
- Case studies: The presentations will include the analysis of different case studies. These cases will be geared at allowing the student understanding how the theoretical concepts apply in real electricity systems.

Office hours: the instructors are available for the students to support the students learning process.

**Metodología No presencial: Actividades**

**Personal work of the student:**
- As the course progresses, the students need to keep themselves updated on the news related to the course as they appear in the media. The students are weekly asked to share with their colleagues the pieces of news they find of interested. The instructors choose the most relevant ones, which are briefly discussed at the beginning of the class. (10 hours)
- Study of the course contents (40 hours).

**Term task.** The students have also to complete an individual term task. The students are assigned one particular hot topic related to the issues discussed throughout the course, for which they have to develop a critical analysis. (6 hours).

**RESUMEN HORAS DE TRABAJO DEL ALUMNO**

**SUMMARY OF WORKING HOURS OF THE STUDENT**

**CLASSROOM HOURS**

- News discussion: 5 hours
- Lectures: 23 hours
- Exams: 2 hours

**NON-CLASSROOM HOURS**

- Personal work of the student: 40 hours
- Term task: 6 hours
Evaluation activities

Grading criteria

**Mid-term exam** (after half of the material has been covered) - Weight 30%

Exams are a combination of short questions and a multi-option test.

- Understanding of the theoretical concepts
- Application of concepts to the solution of practical problems

**Final term** (chapters 4 to 6) - Weight 40%

- Understanding of the theoretical concepts
- Application of concepts to the solution of practical problems

**Participation in the class** - Weight 10%

- Contribution to the class discussions

**Term paper** - Weight 20%

The term paper will be evaluated according to the quality of the document itself, the clarity and comprehensiveness of the description. The soundness of the references used are also pondered.

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**Calificaciones**

**Regular asessment period**

- Theory accounts for 70%: mid-term exam (30%) + final exam (40%).
- Participation in the class grade accounts for 10%.
- Term paper accounts for 20%.

In order to pass the course, the averaged mark of the exams must be greater or equal to 4.5 out of 10 points and the mark of the final project must be at least 5 out of 10 points. Otherwise, the final grade will be the lower of the two.

**Retakes**

The student has two periods of final evaluation during one academic year. The first one will be carried out at the end of course (end of the semester). In case that this was not passed obtaining 5 or more points, the student has another opportunity of final evaluation at the end of the academic year. The dates of evaluation periods will be announced in the web page.

The new grade will by obtained as follows:

- 70% New exam covering the whole course.
- 10% Participation in class
- 20% Term task (the student can resubmit to improve the first grade received).
The mark of the retake final exam must be greater or equal to 4.5 out of 10 points and the mark of the final project must be at least 5 out of 10 points. Otherwise, the final grade will be the lower of the two.

**PLAN DE TRABAJO Y CRONOGRAMA**

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<tr>
<th>Actividades</th>
<th>Fecha de realización</th>
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**BIBLIOGRAFÍA Y RECURSOS**

**Bibliografía Básica**

- Material provided in class (presentations)

**Bibliografía Complementaria**


En cumplimiento de la normativa vigente en materia de protección de datos de carácter personal, le informamos y recordamos que puede consultar los aspectos relativos a privacidad y protección de datos que ha aceptado en su matrícula entrando en esta web y pulsando “descargar”

ENERGY ECONOMICS: PRIMARY SOURCES, ELECTRIC POWER SYSTEMS AND MARKET

ECTS: 3
Carácter: Optativa complementaria
Duración: 15 semanas
Ubicación temporal: Cuatrimestral, Curso 4°
Lengua vehicular: Inglés

ADAPTACIONES DURANTE EL PERIODO DE SUSPENSIÓN DE LA ACTIVIDAD DOCENTE PRESENCIAL POR COVID-19
Adaptations during the cancelation of the presential teaching activity due to COVID-19

Metodología docente: • Vídeos realizados por el profesor y vídeos de youtube

Canales de comunicación: • Kaltura
• Moodle Rooms

Actividades formativas teóricas: Competencias y resultados de aprendizaje conformes a la memoria de verificación.
Actividades formativas prácticas: Sin modificaciones a la guía docente.

Sistema de evaluación: El examen inicialmente previsto se sustituye por un trabajo, que tendrá el mismo valor en la nota final.
The test exam initially programmed is replaced by a term task, which will have the same weight in the final grade.