COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

GUÍA DOCENTE
2019 - 2020

FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura	
Nombre completo	Environmental and renewable energy policy
Código	DIM-IND-523
Título	Máster Universitario en Sector Eléctrico / Master in the Electric Power Industry
Créditos	3,0 ECTS
Carácter	Optativa
Departamento / Área	Máster Universitario en Sector Eléctrico Máster Universitario en Sistemas de Energía Eléctrica

Datos del profesorado	
Profesor	
Nombre	Pedro Linares Llamas
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DATOS ESPECÍFICOS DE LA ASIGNATURA

Contextualización de la asignatura

Aportación al perfil profesional de la titulación

Este curso contribuirá al perfil profesional del alumno capacitándole para entender los principales impactos ambientales de la producción y uso de electricidad; conocer los métodos de evaluación física y económica de estos impactos; y ser capaz de comparar los instrumentos regulatorios disponibles para controlar el impacto ambiental de la industria eléctrica, así como familiarizarse con las distintas tecnologías renovables de generación eléctrica. Estos conocimientos le serán de utilidad tanto para trabajar en empresas eléctricas (de generación, transporte, distribución o comercialización) o en empresas de servicios relacionadas, como para actuar como regulador en dicho sector.

Prerequisitos

No tiene

Competencias - Objetivos

Competencias

GENERALES

CG02	Saber aplicar e integrar sus conocimientos, la comprensión de estos, su fundamentación científica y sus capacidades de resolución de problemas en entornos nuevos y definidos de forma imprecisa, incluyendo contextos de carácter multidisciplinar tanto investigadores como profesionales altamente especializados.

Resultados de Aprendizaje	
RA1	Integrar el conocimiento de esta área multidisciplinar en la que los aspectos técnicos de funcionamiento de la generación renovable debe ser considerados en la definición de políticas y regulaciones ambientales.
RA2	Entender por qué el impacto ambiental de la electricidad tiene que ser tenido en cuenta
RA3	Ser capaz de priorizar los principales impactos medioambientales del sector eléctrico, y comprender su base física.
RA4	Conocer los mejores métodos de cuantificación de los impactos medioambientales.
RA5	Aprender los elementos básicos, ventajas y desventajas de los diferentes instrumentos reguladores disponibles para controlar el impacto medioambiental del sector.
RA6	Familiarizarse con el uso actual de estos instrumentos reguladores en todo el mundo.
RA7	Mantener un conocimiento actualizado sobre el estado de desarrollo de las principales tecnologías sostenibles relacionadas con la producción y el uso de la electricidad.

BLOQUES TEMÁTICOS Y CONTENIDOS

Contenidos – Bloques Temáticos

Tema 1: LA ELECTRICIDAD Y EL MEDIO AMBIENTE

1.1 Introducción.

1.2 Contaminación atmosférica y otros impactos ambientales.

1.3 Cambio climático.

Tema 2: EVALUACIÓN DE IMPACTO AMBIENTAL.

2.1 Evaluación de impacto ambiental.

2.2. Valoración económica del impacto ambiental

Tema 3: INSTRUMENTOS DE REGULACIÓN AMBIENTAL.

3.1 Teoría de regulación ambiental.

3.2 Regulación ambiental en la práctica.

3.3 Políticas climáticas.

3.4 Políticas tecnológicas

3.5 Políticas de eficiencia energética

Tema 4: ENERGÍAS RENOVABLES.

4.1 Solar fotovoltaica.

4.2 Eólica.

4.3 Solar termoeléctrica

4.4 Otras tecnologías

METODOLOGÍA DOCENTE

Aspectos metodológicos generales de la asignatura	
El objetivo es favorecer la adquisición de conocimientos e incentivar la autonomía y el espíritu crítico del alumno. Los recursos docentes requieren la participación activa del alumno. Es imprescindible que la actividad en el aula se complemente con el trabajo personal del alumno y, en coherencia, se tendrá en cuenta a la hora de evaluar al alumno.	
Metodología Presencial: Actividades	
Lecciones magistrales. Presentación de los principales conceptos y procedimientos, por el instructor o profesionales del sector. Incluirán presentaciones dinámicas, casos de estudio, y la participación e interacción con los estudiantes **(30 horas).**	CG02
Metodología No presencial: Actividades	
1. **Trabajo personal del alumno.** Estudio de los contenidos impartidos en las lecciones magistrales y del material de apoyo (**60 horas)** 2. **Proyecto final.** Trabajo individual en el que el alumno realizará una investigación personal o comentarios de distintos materiales. **(20 horas, opcional).**	CG02

RESUMEN HORAS DE TRABAJO DEL ALUMNO

HORAS PRESENCIALES
Clases magistrales y discusiones en clase: Presentación de los principales conceptos y procedimientos por parte del profesor y, en muchas ocasiones, profesionales del sector eléctrico. Incluirán estudios de casos, presentaciones dinámicas, participación de los alumnos en discusiones de contenidos en clase e interacciones grupales.

30.00
HORAS NO PRESENCIALES
Estudio personal: Estudio personal del contenido del curso. Dentro de esta actividad individual, los alumnos revisarán y analizarán los contenidos proporcionados como material básico con los que podrán prepararse para discutir con otros alumnos, profesores y conferenciantes en el aula.
60.00
CRÉDITOS ECTS: 3,0 (90,00 horas)

EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN

Actividades de evaluación	Criterios de evaluación	Peso
Exámenes: Se realizarán dos exámenes, que cubrirán los aspectos teóricos del curso. Las preguntas serán abiertas y de tipo test 1. El primer test cubrirá la primera parte del curso (temas 1-2) y tendrá lugar en la semana 8. Los alumnos deben obtener al menos un 3,5 en este examen para tenerlo en cuenta en la nota final. Supondrá un 40% de la nota final. 2. El segundo test tendrá lugar el último día de clase y cubrirá la segunda parte del curso (temas 3-4). Los alumnos deben obtener al menos un 3,5 en este examen para tenerlo en cuenta en la nota final. Supondrá un 40% de la nota final. Los alumnos que no lleguen a un 5 en la nota final, o que no hayan llegado a un 3,5 en cada uno de los exámenes parciales deberán realizar un "retake" del total de la asignatura (en caso de no llegar al aprobado) o de una de sus partes (en caso de no haber llegado a la nota mínima de una de ellas).	Grado de conocimiento de los conceptos examinados	80 %
Tareas • Participación activa en clase	• Entendimiento de los conceptos • Aplicación del los conceptos	20 %

• Resúmenes de presentaciones invitadas	aprendidos a situaciones reales	
Trabajo final (opcional) Aplicación de los conceptos aprendidos a un caso real escogido por el alumno	• Grado de aplicación de los conceptos aprendidos en clase • Calidad de la presentación escrita • Se utiliza para subir nota, hasta 2 puntos adicionales	20 %

PLAN DE TRABAJO Y CRONOGRAMA

Actividades	Fecha de realización	Fecha de entrega
Lecciones magistrales	Semanal	
Evaluación de la participación activa	Semanal	
Examen intermedio	Semana 8	
Examen final	Último día de clase	
Lectura y estudio de los contendidos teóricos en transparencias y materiales de lectura	Semanal	
Preparación del proyecto final de la asignatura		Último día de clase

BIBLIOGRAFÍA Y RECURSOS

Bibliografía Básica

(R): Lecturas obligatorias; (O): Lecturas opcionales

(R) Ventosa, M., P. Linares, I.J. Pérez-Arriaga (2013). Power system economics, section 2.7. In Pérez-Arriaga, I.J. (ed.) (2013). Regulation of the power sector. Springer.

(R) Lechón, Y., N. Caldés and P. Linares (2013). Environmental implications of energy production. In Dyer, H. and J. Trombetta (eds.). International handbook of energy security. Edward Elgar.

(R) Joskow, P.L. (1992). Weighing Environmental Externalities: Let's Do It Right. The Electricity Journal, May.

(R) Holdren, J.P., and K.R. Smith (1999). Energy, the environment and health. World Energy Assessment: Energy and the challenge of sustainability.

(R) European Environmental Agency (2007). Air pollution in Europe 1990-2004.

(R) IPCC 4th Assessment Report. Summary for Policy Makers / Synthesis

(O) Real Climate. A simple recipe for greenhouse effect. http://www.realclimate.org/index.php/archives/2010/07/a-simple-recipe-for-ghe/

(O) M. Rubinstein. A beginner's guide to climate models. http://blogs.ei.columbia.edu/2010/08/26/a-beginners-guide-to-climate-models/

(O) Skeptical Science. http://www.skepticalscience.com

(R) European Commission (2003). External Costs: Research results on socio-environmental damages due to electricity and transport.

(O) ExternE Methodology 2005 Update. http://www.externe.info

(R) Linares, P. and C. Romero (2008). Economía y medio ambiente: Herramientas de valoración ambiental. En Becker, F., L.M. Cazorla, J. Martínez-Simancas (Dir.). Tratado de Tributación Medioambiental, pp: 1189-1225. Aranzadi, Cizur Menor.

(R) World Bank (2005). Estimating the cost of environmental degradation.

(R) Linares, P., C. Batlle, I.J. Pérez-Arriaga (2013). Environmental regulation, sections 11.1, 11.2, 11.3. In Pérez-Arriaga, I.J. (ed.) (2013). Regulation of the power sector. Springer.

(O) Stavins, R.N. (2001) Experience with market-based environmental policy instruments. In Maler, K-G, and J. Vincent, The Handbook of Environmental Economics. North-Holland/Elsevier Science

(O) OECD (1997). Evaluating economic instruments for environmental policy

(R) Labandeira, X. and P. Linares. Second-best instruments for energy and climate policy. In Markandya, A., I. Galarraga, M. González (Eds.). Handbook of Sustainable Use of Energy, Edward Elgar. (to be published)

(R) Goulder, L.H., and I.W.H. Parry (2008). Instrument choice in environmental policy. Review of Environmental Economics and Policy, 2:152–174

(R) Keohane, N., R. Revesz, R., R. Stavins (1998). Choice of Regulatory Instruments in Environmental Policy, The. Harv. Envtl. L. Rev., 22, 313.

(R) Aldy, J.E., W.A. Pizer (2009). Issues in designing US climate change policy. The Energy Journal, 30: 179-210.

(R) Hanemann, M. (2009). The role of emissions trading in domestic climate policy. The Energy Journal, Volume 30 (Special Issue 2). Climate Change Policies After 2012.

(O) Linares, P. A discussion of "Climate Change Policies, Competitiveness and Leakage", by Philippe Quirion. In Cerdá, E., X. Labandeira (Eds). Climate change policies: Global challenges and future prospects, pp: 133-137. Edward Elgar, Cheltenham, UK. 2010.

(O)Ellerman, A.D., and P.L. Joskow (2008). The European Union's Emission Trading System in perspective. Pew Center on Global Climate Change.

(R) Linares, P., C. Batlle, I.J. Pérez-Arriaga (2013). Environmental regulation, sections 11.4, 11.5. In Pérez-Arriaga, I.J. (ed.) (2013). Regulation of the power sector. Springer.

(R) Batlle, C., I.J. Pérez-Arriaga, P. Zambrano-Barragán (2011). Regulatory design for RES-E support mechanisms: Learning curves, market structure and burden –sharing. IIT Working Paper.

(R)Linares, P., F.J. Santos, M. Ventosa (2008). Coordination of carbon reduction and renewable energy support policies. Climate Policy, 8: 377- 394.

(R) Linares, P., I.J. Pérez Arriaga (2009) Promoting investment in low-carbon energy technologies. European Review of Energy Markets, 3: 9- 21.

(0) Schmalensee, R. (2012) Evaluating policies to increase electricity generation from renewable energy. Review of Environmental Economics and Policy, 6: 45–64

(R) Labandeira, X. and P. Linares (2010). Energy efficiency: economics and policy. Journal of Economic Surveys (2010) Vol. 24, No. 3, pp. 573–592

(R) Gillingham, K., R.G. Newell, K. Palmer (2009). Energy efficiency economics and policy. Resources for the Future DP 09-13.

(O) Conchado, A., and P. Linares (2012) The economic impact of demand-response programs on power systems. A survey of the state of the art. In Pardalos, P., M. V.F. Pereira, N. A. Iliadis, S. Rebennack, A. Sorokin (Eds.). Handbook of networks in power systems, pp.281-302. Springer.

(O) http://www.robertstavinsblog.org/2013/06/19/thinking-about-the-energy-efficiency-gap

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"
https://servicios.upcomillas.es/sedeelectronica/inicio.aspx?csv=02E4557CAA66F4A81663AD10CED66792

UNIVERSIDAD PONTIFICIA ICAI ICADE COMILLAS MADRID

COURSE SYLLABUS
2019-20

GENERAL INFORMATION

Course Information	
Name	Environmental Impact and Renewable Energy Policy
Code	XXXXX
Degree	Official Master's Degree in Electric Power Industry (MEPI)
Year	2019-20
Semester	2
ECTS Credits	3
Type	Elective
Department	Industrial Engineering
Area	Economics
Coordinator	Pedro Linares

Instructor	
Name	Pedro Linares Llamas
Department	Industrial Engineering
Area	
Office	IIT – Santa Cruz de Marcenado 26
e-mail	pedro.linares@comillas.edu
Telephone	91 5406257
Tutoring hours	Check the professor's website (www.comillas.edu/personal/pedrol)

DETAILED INFORMATION

Contextualization of the course

Contribution to the professional profile of the degree

This course will contribute to the professional profile of the student by enabling him/her to become knowledgeable about the major environmental impacts of electricity production and use; to be familiar with the methods used to quantify these environmental impacts; to understand and be able to compare the regulatory instruments available to control environmental impact in the power industry; and to learn the different renewable electricity production technologies. This knowledge will be very useful to work in power utilities, consulting companies, or to become a regulator in the power sector.

Prerequisites

CONTENTS

Contents

Competences and Learning Outcomes

Competences

General Competences

CG2. Know how to apply and integrate knowledge, the understanding of it, its scientific basis, and problem-solving capabilities in new and loosely defined environments, including multidisciplinary contexts, both for research and highly-specialized professions

Specific Competences

CE11. Acquire a clear criterion about the different regulatory instruments to improve the environmental impact of electricity, and to know the major sources of renewable electricity.

CE12. Be able to carry out an informed assessment of the environmental impact of electricity generation technologies.

Learning outcomes

At the end of the course the students must be able:

RA1. To integrate the knowledge of this multidisciplinary area in which technical aspects of renewable energy have to be considered when defining environmental policy and regulation.

RA2. To understand why the environmental impact of electricity has to be taken into account.

RA3. To be able to prioritise the major environmental impacts of electricity, and understand their physical basis.

RA4. To know the best methods for quantification of environmental impacts.

RA5. To learn the basic elements, advantages and disadvantages of the different regulatory instruments available to control environmental impact.

RA6. To become familiar with the current use of these regulatory instruments across the world.

RA7. To keep an updated knowledge on the state of development of the major sustainable technologies related to electricity production and use.

TEACHING METHODOLOGY

General methodological aspects	
Classroom Methodology: Activities	**Competences**
The teaching method is focused on easing the learning of knowledge and increasing the student critical thinking. 1. **Lectures.** Description of the course contents by the course instructor and professionals from the power sector. They will include dynamic presentations, case studies, and open discussion of concepts **(30 hours).**	**CB2, CE11 and CE12**
Non-Classroom Methodology: Activities	**Competences**
Teaching resources require the active participation of the student. In addition, the classroom activity should be complemented by the individual student work performed out of class. Both aspects are taken into account in the evaluation method. 1. **Personal work of the student.** Study of the course content, including both lectures and required readings (**60 hours)**. 2. **Term paper.** Individual research by the student in which the concepts learnt will be applied to a real case **(20 hours, optional)**.	**CB2, CE11 and CE12** **CB2, CE11 and CE12**

ASSESSMENT AND GRADING CRITERIA

Assessment activities	Grading Criteria	Weight
Exams: There will two tests, which will cover the theoretical concepts of the course. Questions will be open-format and multiple-choice. 1. The first test will cover the first part of the course (chapters 1-2) and will take place in week 8. Students must achieve at least a 3.5 to pass the course. It will account for 40% of the final grade. 2. The second test will be given in the last day of the course, and will cover the second part of the course (chapters 3-4). Students must get at least a 3.5 (over 10) in this test to pass the course. It will account for 40% of the final grade.	- Concept understanding - Presentation and written communication	**80%**
Performance evaluation. • Participation in class. • Summaries of invited lectures	- Concept understanding - Application of concepts to the analysis of real situations -	**20%**
Optional term paper	- Degree of application of the concepts learned in the course - Quality of the written presentation	**Up to additional 2 points**

GRADING AND COURSE RULES

Grading

The student has two periods of final evaluation during the 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 final grade of the course will be obtained by addition of the following criteria for any evaluation period:

- 40% intermediate exam (with a minimum grade of 3.5 over 10)
- 40% final exam (with a minimum grade of 3.5 over 10)

The average grade of these two exams must be higher than 4 over 10

- 20% participation in class and solution of cases
- Up to two additional points with the optional term paper

In case the student fails the first evaluation period, there will be a retake test, after which the final grade will be 80% the grade of the test (with a minimum grade of 4 over 10) and 20% the participation in class and solution of cases.

Course rules

- Class attendance is mandatory according to Article 93 of the General Regulations (Reglamento General) of Comillas Pontifical University and Article 6 of the Academic Rules (Normas Academicas) of the ICAI School of Engineering. Not complying with this requirement may have the following consequences:
  - Students who fail to attend more than 15% of the lectures may be denied the right to take the final exam during the regular assessment period.
  - Regarding laboratory, absence to more than 15% of the sessions can result in losing the right to take the final exam of the regular assessment period and the retake. Missed sessions must be made up for credit.

  Students who commit an irregularity in any graded activity will receive a mark of zero in the activity and disciplinary procedure will follow (cf. Article 168 of the General Regulations (Reglamento General) of Comillas Pontifical University).

WORK PLAN AND SCHEDULE[1]

In and out-of-class activities	Date/Periodicity	Deadline
Lectures	Weekly	
Performance evaluation	Weekly	
Intermediate exam	Week 8	
Final exam	Last day of class	–
Required readings and study of the materials of the course	Weekly	–
Term paper		Last day of class

STUDENT WORK-TIME SUMMARY			
IN-CLASS HOURS			
Lectures	**Exams**		
29	1		
OUT-OF-CLASS HOURS			
Personal work of the student	**Term paper**		
60	20 (optional)		
		ECTS CRÉDITS:	**3 (90 hours)**

[1] A detailed work plan of the subject can be found in the course summary sheet (see following page). Nevertheless, this schedule is tentative and may vary to accommodate the rhythm of the class.

BIBLIOGRAPHY AND RESOURCES

Bibliography

Articles and websites

(R): Required readings; (O): Optional readings

(R) Ventosa, M., P. Linares, I.J. Pérez-Arriaga (2013). Power system economics, section 2.7. In Pérez-Arriaga, I.J. (ed.) (2013). Regulation of the power sector. Springer.

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