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
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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. • Term paper of the course (optional).	- Concept understanding - Application of concepts to the analysis of real situations - Presentation and written communication	**20%**

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.

(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