COURSE SYLLABUS 2019-20

GENERAL INFORMATION

Course information	
Name	Regulation of the electric power industry
Code	REG
Degree	Official Master's Degree in the Electric Power Industry (MEPI)
Year	2019-2020
Semester	1
ECTS Credits	6
Type	Compulsory
Department	-
Area	Electric power systems regulation
Coordinators	Carlos Batlle and Pablo Rodilla

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DETAILED INFORMATION

Course context

Contribution to the professional profile of the degree

The course presents an in-depth interdisciplinary perspective of the electric power sector, with regulation providing the link among the engineering, economic, legal and environmental viewpoints.

Electricity markets, incentive regulation of networks, reliability of service, renewable

energy sources, contemporary network issues, retail competition, tariff design, distributed generation, multinational electricity markets, environmental impacts, future of utilities and strategic sustainability issues will be addressed under both traditional and competitive regulatory frameworks.

The course will make available the economic and legal basis to critically evaluate the regulatory instruments that are used worldwide for electricity supply activities that are performed as regulated monopolies or under competitive conditions. Most of these regulatory approaches are also of application in other industrial sectors.

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.

Pre-requirements

CONTENTS

Competences and learning outcomes

Competences

Basic Competences

CB3. Know how to evaluate and select the appropriate scientific theory and precise methodology of their field of study to make judgments based on incomplete or limited information including, where necessary and appropriate, a critical review on the social and ethical responsibilities linked to the solution proposed in each case

Specific Competences

CE5. Understand the regulatory role and instruments available to regulate monopolies and to promote competition.

CE6. Knowing the market economic principles and different approaches to the regulation of monopolies and oligopolies and the differential aspects of the electricity sector.

Learning outcomes

At the end of the course, the students will have to be able to:

RA1. Assess and to select the most appropriate approach for regulating the electric power business, considering its social and economic implications.

RA2. Understand the regulatory function and the economic principles underlying the different regulatory schemes and the instruments to regulate monopolistic and competitive activities.

RA3. Understand the differential aspects of the electric power industry.

RA4. Know the most appropriate regulatory scheme for each one of the electric power activities, considering the particularities of each system.

RA5. Be able to properly discuss and analyze regulatory design in the context of real-life case examples.

TEACHING METHODOLOGY

General methodological aspects of the course	
The teaching method is focused on easing the learning of knowledge and increasing the student critical thinking on electric power regulation theory.	
Classroom Methodology: Activities	**Competences**
Lectures. Description of the course contents and open discussion of concepts. The students have also to try to respond to the numerous questions posed by the instructors throughout the lecture (60 hours).	**CB3, CE4, CE5**
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.	
Personal work of the student. Study of the course contents (80 hours). **Term task**. Regulatory analysis of a power system chosen among a list of suggestions developed by the instructor. The student has to face her own research, in order to develop the ability to first investigate the current state of the regulation of a real case, and also to apply the critical skills acquired to build regulatory recommendations (40 hours).	**CB3, CE4, CE5** **CB3**
Tutorial activities. Available according to the need of the student. (up to 10 hours)	**CB3, CE4, CE5**

EVALUATION ACTIVITIES AND GRADING CRITERIA

Evaluation activities	Grading criteria	Weight
Mid-term exam (after half of the material has been covered).	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	**30%**
Final term (rest of the contents, although it might include questions about the material included previous exam)	- Understanding of the theoretical concepts - Application of concepts to the solution of practical problems	**35%**
Participation in the class	- Contribution to the class discussions	**5%**
Term paper	The term paper will be evaluated from two points of view: - The quality of the document itself, the clarity and comprehensiveness of the description of the regulation implemented in the power system assigned. The soundness of the references used are also pondered. - The oral presentation of the work, the way the students build up their discussions, and their ability to back their proposals and to respond to the questions received.	**30%**

GRADING AND COURSE RULES

Grading

Regular assessment

- Theory accounts for 65%: mid-term exam (30%) + final exam (35%).
- Participation in the class grade accounts for 5%.
- Term paper accounts for 30%.

In order to pass the course, the grade in the theory part must be greater or equal than 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 marks.

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:

- 65% New exam covering the whole course.
- 5% Participation in class
- 30% 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 marks.

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]

Session		In-class activities		Out-of-class activities		
#	hours	Lectures	hours	Self-study	hours	Term paper
1	2	Introduction to electricity regulation	8	Textbook: Chapter 3		
2	2	Introduction to electricity regulation: Principles and institutions				
3	2	Introduction to electricity regulation: Principles and institutions				
4	2	Regulatory models for the electric power industry				
5	2	Regulatory models for the electric power industry				
6	2	Regulatory models for the electric power industry				
7	2	Economic principles of market regulation	4	Slides	4	Power system selection
8	2	Economic principles of market regulation				
9	2	Regulatory models for the electric power industry	10	Textbook: Chapter 3 and 7		
10	2	Regulatory models for the electric power industry				
11	2	Regulatory models for the electric power industry				
12	2	Distribution	6	Textbook: Chapter 5	20	Networks
13	2	Distribution				
14	2	Transmission	6	Textbook: Chapter 6		
15	2	Transmission			8	Day Ahead Markets
16	2	Wholesale electricity markets design: day-ahead markets	10	Textbook: Chapter 7		
17	2	Wholesale electricity markets design: day-ahead markets			8	AASS
18	2	Wholesale electricity markets design: ancillary services				
19	2	1st mid-term exam (regulatory models and network regulation)				
20	2	Wholesale electricity markets design: capacity mechanisms	6	Textbook: Chapter 12	8	Capacity Mechansims

[1] This schedule is tentative and may vary to accommodate the rhythm of the class.

21	2	Wholesale electricity markets design: capacity mechanisms				
22	2	Tariff design	6	Textbook: Chapter 8		
23	2	Tariff design			8	Tariffs
24	2	Tariff design				
25	2	Retail markets design	6	Textbook: Chapter 9	8	RM review
26	2	Retail markets design				
27	2	Renewables	2	Slides	4	RES
28	2	2nd mid-term exam				
29	2	Term papers discussion				
30	2	Term papers discussion				

SUMMARY OF WORKING HOURS OF THE STUDENT			
CLASSROOM HOURS			
Lectures and class discussions			
60			
NON-CLASSROOM HOURS			
Personal work of the student	Out-of-class assignments	Tutoring	
80	40	Up to 10	
		ECTS CRÉDITS:	6 (180 hours)

BIBLIOGRAPHY AND RESOURCES

Bibliography

Textbook

"Regulation of the electric power sector". Pérez-Arriaga Ed., Springer Verlag, 2013.

Readings

- Body of Knowledge on Infrastructure Regulation
  - http://regulationbodyofknowledge.org/
- Schweppe, F.C., Caramanis, M.C., Tabors, R.D., Bohn, R.E., 1988. Spot pricing of electricity. Kluwer Academic Publishers.
- Kahn, A.E., 1988. The economics of regulation: Principles and institutions. The MIT Press.
- Stoft, S., 2002. Power System Economics, Wiley-IEEE Press.
- Joskow, P. L., 2003. "The difficult transition to competitive electricity markets in the U.S." May 2003. Available at http://dspace.mit.edu/handle/1721.1/45001.
- Al-Sunaidy, A., R. Green, 2006. "Electricity deregulation in OECD (Organization for Economic Cooperation and Development) countries. Energy, vol. 31, pp. 769–787.
- www.iit.upcomillas.es/batlle/Publications.html
  - Batlle, C., Barroso, L. A. and Pérez-Arriaga, I, J., 2010. "The changing role of the State in the expansion of electricity supply in Latin America". Energy Policy, vol. 38, iss. 11, pp. 7152-7160, November 2010.
  - Rodilla, P. & Batlle, C. 2010. "Security of electricity supply at the generation level: problem analysis". Working Paper IIT-10-027A, Energy Policy, vol. 40, pp. 167.185.
  - Batlle, C., Pérez-Arriaga, I. J., Zambrano-Barragán, P., 2011. "Regulatory design for RES-E support mechanisms: Learning curves, market structure, and burden-sharing". MIT CEEPR 2011-011 Working Paper, May 2011. Energy Policy, vol. 41, pp. 212-220.