Universitat de Lleida

DEGREE CURRICULUM

GENERATION AND DISTRIBUTION OF ENERGY

Coordination: BARRAU , JEROME

Academic year 2019-20

Subject's general information

Subject name	GENERATION AND DISTRIBUTION OF ENERGY
Code	14520
Semester	1st Q(SEMESTER) CONTINUED EVALUATION
Typology	<table><tr><th>Degree</th><th>Course</th><th>Character</th><th>Modality</th></tr><tr><td>Master's Degree in Industrial Engineering</td><td>1</td><td>COMPULSORY</td><td>Attendance-based</td></tr></table>
Course number of credits (ECTS)	6
Type of activity, credits, and groups	<table><tr><th>Activity type</th><th>PRAULA</th><th>TEORIA</th></tr><tr><th>Number of credits</th><td>3</td><td>3</td></tr><tr><th>Number of groups</th><td>1</td><td>1</td></tr></table>
Coordination	BARRAU , JEROME
Department	ENVIRONMENT AND SOIL SCIENCES
Teaching load distribution between lectures and independent student work	60 h in the classroom (40%) 90 h self employement (60%)
Important information on data processing	Consult this link for more information.
Language	Language Percentage of use Spanish 0.0 Catalan 100.0 English 0.0
Distribution of credits	Jérôme Barrau: 6 credits
Office and hour of attention	With appointment

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
BARRAU , JEROME	jerome.barrau@udl.cat	3	
ROSELL URRUTIA, JOAN IGNASI	joan.rosell@udl.cat	3	

Subject's extra information

Subject that requires continuous work throughout the semester in order to achieve the same goals.

Subjects to be taken in 1st semester of the 1st year of the program. It belongs to module "Industrial Technologies".

The content of this course focuses on the description of the power system components, including electrical and mechanical dimensioning transport networks in accordance with the rules and the evaluation of different systems for generating electricity.

Learning objectives

This course aims at the acquisition of general knowledge and skills needed to understand and size the components of the power system, from primary sources to distribution of final energy. This objective can be broken down into the following partial objectives :

- Investigate the conventional and unconventional electric power generation systems
- Develop the design and the electric calculation of the components used in the energy transmission and distribution systems
- Dimensions mechanically high voltage cables in energy transmission and distribution systems
- Interpret the general aspects of demand, production and cost of electricity
- Analyse the establishment, functions and use of power generating plants
- Compare the technologies of power generation

Competences

Basic competences set in Royal decree 861/2010 and Order CIN/311/2009:

- CB2 To be able to apply the knowledge gained and to solve problems in new environments in wider contexts (or multidisciplinary) related with the area of study.
- CB4 To be able to communicate conclusions –and knowledge and reasons that support them– to either specialized or not specialised publics in a clear way and without ambiguities.

General competences set in ORDEN CIN/311/2009 and EPS criteri:

- CG4 Capacity to conceive, design and implement projects and/or provide new solutions, using the tools that the engineering offers.

Specific competences set in ORDEN CIN/311/2009:

- CE1 Knowledge and capacity for the analysis and design of systems of generation, transportation and distribution of electrical energy.
- CE6 Knowledge and capacities that allow to understand, analyse, exploit and manage the different energy sources.

Cross-disciplinary competences approved by the Plenary Commission of the Degrees of Industrial Engineering, Computer Engineering and Building Engineering, gathered in June 16th, 2008:

- CT3 Mastering ICT's.

Subject contents

Unit 1. Introduction

1. Definitions and measurement units
2. Energy sources
3. The global and national energy situation
4. From primary source to energy consumption

Unit 2. Transmission and distribution power systems

1. Transmission
2. Mechanical Calculation of transmission anddistribution lines
3. Power transformers stations
4. The Spanish electricity network
5. Tariffs and power factor correction
6. Maintenanceof the transmission and distributionnetworks
7. Environmental impact of transmission and distribution networks
8. Security system of transmission and distribution networks
9. Fossil fuels distribution

Unit 3. Power Generation 1. Energy generation based on unrenewable sources

1. Generation models
2. Conventional power stations
3. Nuclear power
4. Hydraulic power

Unit 4. Power generation 2. Energy generation based on other sources of energy

1. Solar thermal energy
2. Photovoltaics
3. Hydropower
4. Windpower
5. Cogeneration
6. Geothermal
7. Biomass and Biogas
8. Microgeneration

Methodology

The main methodology of the course will be divided into:

- Lectures: In the lectures, the contents of the subject is exposed orally by a teacher without the active participation of students.
- Problems: In the activities of problems solving, the professors present a complex issue that students must solve, whether working individually or in teams.
- External practices/Visits: Visits will be made to illustrate and supplement content, developed classroom in the classroom, in the areas of generation, transportation and management of electrical energy.
- Case study: Students have to study in groups, a technology for generating renewable electricity and present it orally.

Development plan

Week	Methodology	Content	Classroom hours	Independent work hours	Professor
1	Lecture	Unit 1. Introduction	4	6	J.Barrau
2-7	Lecture Problems	Unit 2. Transmission and distribution power systems	24	36	J.Barrau
8	Lecture	Unit 3. Power Generation 1. Energy generation based on unrenewable sources	4	6	J.Barrau
9	Evaluation: Written exam				J.Barrau
10-11	Lecture Problems	Unit 3. Power Generation 1. Energy generation based on unrenewable sources	6	10	J.Barrau
11-12	Visits	Unit 3. Power Generation 1. Energy generation based on unrenewable sources Unit 4. Power generation 2. Energy generation based on other sources of energy	6	6	J.Barrau
13-15	Case study	Unit 4. Power generation 2. Energy generation based on other sources of energy	12	26	J.Barrau
16-19	Evaluation: Written exam Recovery				J.Barrau

Evaluation

Objectives	Evaluation Activities	Criteria	%	Date	O/V(1)	I/G(2)	Observaciones
Units 1-2	Written Exam (PA1)	(*)	40	Week 9	O	I	
Unit 4	Case study + Oral presentation (AA1)	(**)	30	Weeks 11-15	O	G	The activities will be delivered at the proposed date
Units 3-4	Written Exam (PA2)	(*)	30	Week 17	O	I	
Recovery PA1 y PA2: Units 1-4	Written Exam (PA3)	(***)	70	Week 19	O	I	

(1) Obligatory / Voluntary.
(2) Individual / Group.

(*) You have to get at least 3.5 points out of 10 in these tests to average with qualification AA1.

(**) This qualification, conducted in group, represents 30% of the final grade, with the following distribution:

- 20% relative to the evaluation of the final report and track work
- 10% relative to the evaluation of the Oral presentation

A planning of the groups mandatory tracking sessions, with the professor, will be given to students in Week 8.

(***) You have to get at least 3.5 points out of 10 in this test (PA3) to average with qualification AA1. If the condition is met the final grade will be composed of:

- 70% Exam PA3
- 30% Activity Evaluation (AA1)

Bibliography

Basic references

Power generation technologies. Paul Breeze. Elsevier, 2005. ISBN: 0750663138.

Fuentes de energia. José Roldan Viloria. Paraninfo, 2008. ISBN: 9788428331708.

Centros de transformación, centros de control de motores, redes eléctricas. Centro de Estudios de la Energía, 1983. ISBN: 8450092914.

El transporte de la energía eléctrica en alta tensión. Francisco Rodríguez Benito, Antonio Fayos Álvarez. Universidad Politécnica de Valencia, 1998. ISBN: 847721638X.

Complementary references

Gestión de la energía. José Sancho García, Rafael Miró Herrero, Sergio Gallardo Bermell. Universidad Politécnina de Valencia. Departamento de Ingeniería Química y nuclear, 2006. ISBN: 8483630036.

Other ressources

La Energía en el horizonte del 2030. Folch, Ramon. Generalitatde Catalunya, Departament de Treball i Indústria, 2005.

Red Eléctrica de España http://www.ree.es/