

Program	09TT- Engineering in Telecommunication Technologies and Services
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Course number and name	
Number	95000034
Name	Energy Systems Sistemas de Energía
Semester	Y3-S6

Credits and contact hours	
ECTS Credits	4.5
Contact hours	36

Coordinator's name	Carolina Sánchez Urdiaín
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Specific course information

Description of course content

The objectives are:

- To show the importance of energy for economic and technological development of a country. Problems and solutions
- To acquire fundamental knowledge about the power system, in particular the generation of electricity from classics and alternative energy such as solar photovoltaic
- To understand the operation of electromagnetic converters that allow the generation of electricity, its transport and possible modification by electronic converters, adapting their characteristics to the chargers' needs.
- The students should be able to apply the concepts obtained for optimally feed their equipment and systems, despite their different characteristics. Also should be able to complement those concepts with communications for use in other fields, for example in smart grids

List of topics to be covered

- 1.- Introduction: Energy, problems and solutions. Classics and alternative energy sources. Spanish Electricity Market
- 2.- The generation of electric energy. Electrical power systems essentials. Power plants
- 3.- Auxiliary systems: Batteries. Backup Diesel Generators
- 4.- Three-phase systems. Phasor diagrams. Power in a.c circuits. Power Factor correction. Measurements in a.c. power circuits
- 5.-The transformer. Electromechanical energy conversion.
- 6.-Fundamentals of Power electronics. Semiconductor switches. Rectifier circuit. Switching dc/dc converters. Inverters dc/ac converter.
- 7.- Photovoltaic effect. The solar cell characterization Electric association cell.
- 8.-Solar resource estimation. Sunlight. Trajectories of the sun. Calculation of irradiation on an arbitrarily oriented surface

9.- Applications of solar photovoltaic energy. Photovoltaic systems connected to the grid. Photovoltaic autonomous systems. Sized. Legislation

Prerequisites or co-requisites

None

Course category in the program

<input checked="" type="checkbox"/> R (required)	<input type="checkbox"/> E (elective)	<input type="checkbox"/> SE (selective elective)
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Specific goals for the course

Specific outcomes of instruction

- RA262- Energy . Problems and solutions
- RA263- Electric energy and development of a country
- RA264- Generation of electric energy.-Power plants. Power systems. Auxiliary systems
- RA265- Three-phase systems
- RA266- Electromechanical energy conversion
- RA267- Power electronics. Semiconductor switching
- RA268- Rectifiers, Inverters, Switching dc/dc converters. Applications
- RA269.- Measurements in ac circuits. Standards professionals. Software PSIM
- RA270- Fundamentals photovoltaic effect. Solar cell characterization
- RA271- Solar resource estimation. Calculation of irradiation
- RA272- Applications of photovoltaic energy

Student outcomes addressed by the course

CECT1, CECT22, CECT15, CET2, CET3, CET6, CG12, CG2, CG4, CG9.

Bibliography and supplemental materials

- Energy systems.- Provided of students materials made by teachers. Theory and exercise
- PSIM.- Exercises made by teachers
- Laboratory. Equipment
- Power Electronics Converter, Applications and design. N.Mohan, T.M. Underland , W.P. Robbins . John Wiley and Sons 2003
- Electric machines.- J.Fraile. Mac-Graw-Hill 2008
- Electric Machines and Power Electronic.- T. Wildi. Prentice Hall 2007
- Planning and Installing Photovoltaic Systems Deutsche Gesellschaft fur Sonnerenergie.2º edition, Esrthscan 2008
- Designing with Solar Power-a source book for Building Integrated Photovoltaics. D. Prasad, M. Snow. Images Publishing 2005

Teaching methodology

<input checked="" type="checkbox"/> lectures	<input checked="" type="checkbox"/> problem solving sessions	<input type="checkbox"/> collaborative actions	<input type="checkbox"/> laboratory sessions
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Other: