SUBJECT TEACHING GUIDE

G883 - Further Renewable Energies

Degree in Electrical Engineering

Academic year 2018-2019

1. IDENTIFYING DATA					
Degree	Degree in Electrical Engineering			Type and Year	Optional. Year 4
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Planning and Energy Management Optional Module: Electrical Engineering				
Course unit title and code	G883 - Further Renewable Energies				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA
Name of lecturer	INMACULADA FERNANDEZ DIEGO
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Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO PROFESOR (S3027)
Other lecturers	CARMELA ORIA ALONSO

3.1 LEARNING OUTCOMES

- Students will obtain knowledge of thermal solar and photovoltaic facilities, wind energy, geothermal energy, wave energy and tidal energy.

4. OBJECTIVES

Acquire knowledge about the design of solar, wind, geothermal and tidal power installations.

6. COURSE ORGANIZATION	
CONTENTS	
1	SOLAR ENERGY
1.1	Thermal Solar Energy (open systems, closed circuit, systems' elements)
1.2	Solar photovoltaic (manufacturing cells, types of circuits, environmental impact, applications)
1.3	Thermal solar power (types of power plants, energy balance, applications to solar fuels and industrial processes)
1.4	Legislation
2	WIND ENERGY
2.1	Origin and wind potential (wind measurement, processing of wind's data, effect of the height on wind resource)
2.2	Wind turbine components (blades, brake, controller, gear box, generator, high-speed shaft, low-speed shaft, nacelle, pitch, rotor, tower, yaw drive, yaw motor)
2.3	Legislation
3	GEOTHERMAL ENERGY
3.1	Potential of geothermal energy (types of deposits, methods to estimate geothermal potential)
3.2	Technology to use and exploit geothermal energy (direct conversion systems, systems of sudden expansion of a stage, systems of sudden expansion of two-stage, binary cycle systems)
3.3	Legislation
4	OCEAN ENERGY
4.1	Tidal power (tidal types, types of cycles, economic aspects)
4.2	Waves (distribution of wave energy, calculation of the energy produced by the waves, extraction devices)
4.3	Ocean thermal energy (performance, closed-loop systems, open-loop systems, hybrid systems)
4.4	Marine currents (power of marine currents, turbine technology, environmental impact)
5	BIOMASS ENERGY
5.1	Origin of biomass energy (wild ecosystems, waste biomass, energy crops, biomass fossil)
5.2	Technologies (direct combustion, thermochemical processes, biological processes, other processes)
5.3	Legislation
6	ENERGY STORAGE SYSTEMS
6.1	Systems based on mechanical principles
6.2	Systems based on thermal principles
6.3	Systems based on electromagnetic principles
6.4	Systems based on electrochemical principles
7	INTEGRATION OF RENEWABLE ENERGIES IN THE ELECTRICAL SYSTEM

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
CONTINUOS ASSESSMENT	Others	Yes	Yes	60,00
EXAM	Written exam	Yes	Yes	40,00
TOTAL				100,00

Observations

Observations for part-time students

PART-TIME STUDENTS MUST TAKE AN EXAM OF ALL THE CONTENTS OF THE SUBJECT IN THE JUNE OR SEPTEMBER CALL. TO PASS THE COURSE IT IS NECESSARY TO OBTAIN A SCORE OF 50% OR MORE OF THE MAXIMUM SCORE.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Desarrollo de las energías renovables marinas: condiciones de éxito en las regiones de la RTA del Arco Atlántico

M. Ibáñez Plana, J.R. Rosell Polo, J.I. Rosell Urrutia, Tecnología solar

A. Creus Solé, Energías renovables

E. Conde Lázaro, et al., Guía técnica de bombas de calor geotérmicas, Fundación de la Energía de la Comunidad de Madrid

Guía técnica Instalaciones de biomasa térmica en edificios, IDAE

Manuales de energías renovables 3, Energía eólica, IDAE

J. González Velasco, Energías renovables.