

SUBJECT TEACHING GUIDE

G883 - Further Renewable Energies

Degree in Electrical Engineering

Academic year 2023-2024

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					

3.1 LEARNING OUTCOMES

- Students will learn about solar thermal and photovoltaic energy installations, wind energy, geothermal energy, wave and tidal energy.

4. OBJECTIVES

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

6. COURSE ORGANIZATION	
CONTENTS	
1	WIND ENERGY
1.1	Origin and wind potential (wind measurement, processing of wind's data, effect of the height on wind resource)
1.2	Extracting Wind Power (power coefficient, specific speed, moment coefficient, torque density, power curve, legislation and regulation)
1.3	Energy produced by a wind turbine (energy correction coefficients, capacity factor, equivalent full load hour)
1.4	Types and components of wind turbine (gathering, mechanical transmission, orientation, regulation and control, support)
2	SOLAR ENERGY
2.1	Solar thermal energy (solar resource assessment, components of solar thermal systems, design, dimensioning and installation of low temperature solar thermal systems, legislation and regulation)
2.2	Solar photovoltaic (photoelectric effect, cells' components, types of photovoltaic installations)
2.3	Thermal solar power (types of power plants, energy balance)
3	OCEAN ENERGY
3.1	Tidal energy (dams, ocean currents)
3.2	Waves (wave energy distribution, extraction technologies)
3.3	Ocean thermal energy (thermodynamic efficiency, conversion systems)
3.4	Blue energy (definition, techniques of blue energy harvesting)
4	BIOMASS ENERGY
4.1	Definition, classification (natural, residual, industrial crops, other sources)
4.2	Biomass in industry (combustion, thermochemical processes, biological processes, other processes)
4.3	Biomass in building (storage, boiler sizing, legislation and regulation)
5	GEOTHERMAL ENERGY
5.1	Geothermal resource assessment (types of geothermal reservoirs, methods for the estimation of the energy stored)
5.2	Harnessing geothermal energy (dry steam plants, flash steam plants, binary-cycle plants , others)
5.3	Geothermal heat pump (description, heat pump sizing, legislation and regulation)
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	No	Yes	60,00
EXAM	Written exam	Yes	Yes	40,00
TOTAL				100,00
Observations				
Observations for part-time students				
<p>PART-TIME STUDENTS MUST TAKE AN EXAM OF ALL THE CONTENTS OF THE SUBJECT IN THE ORDINARY OR EXTRAORDINARY CALL. TO PASS THE COURSE IT IS NECESSARY TO OBTAIN A SCORE OF 50% OR MORE OF THE MAXIMUM SCORE.</p> <p>REMOTE EVALUATION OF WORK, LABORATORY PRACTICAL EXERCISES AND WRITTEN TESTS IS EXPECTED, IN THE CASE THAT A NEW HEALTH ALERT FOR COVID-19, MAKE IT IMPOSSIBLE TO CARRY OUT AN ON-SITE EVALUATION.</p>				

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.