SUBJECT TEACHING GUIDE

M872 - Advances in Renewable Energies

Master's Degree in Industrial Engineering Research

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Master's Degree in Industrial Engineering Research			Type and Year	Optional. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Research in Electrical and Energy Technology Module - Sustainable Design in Industrial Systems Electroenergetic Module Electromechanic / Mechatronics Module				
Course unit title and code	M872 - Advances in Renewable Energies				
Number of ECTS credits allocated	5	Term		Semester based (1)	
Web	https://aulavirtual.unican.es/				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA
Name of lecturer	INMACULADA FERNANDEZ DIEGO
E-mail	inmaculada.fernandez@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO PROFESOR (S3027)
Other lecturers	DELFIN SILIO SALCINES

3.1 LEARNING OUTCOMES

- This course has a theoretical and applied approach in the field of electro-energy technology. It is expected that the student will get knowledge of the techniques of power generation from renewable sources, and will be able to handle research material.
- It is expcted that will participate actively in class and in the laboratories with development of critical thinking and efficiently using ICT.

4. OBJECTIVES

The course aims to review the different techniques of harvesting and conversion of renewable energy , showing the current level of development, analyzing the issues for the advancement of each of the sources, exposing the scientific and technological developments

6. COURSE ORGANIZATION

CONTENTS	
1	Block 1
1.1	Energy Scenario of R.E.S. in the EU.
1.2	Small hydro power.
1.3	Tides and waves energy, ocean thermal energy and salinity gradient power:
1.4	Geothermal energy.
2	Block 2
2.1	Wind energy: wind resource.
2.2	Wind energy: electric machines.
2.3	Solar thermal energy.
2.4	Photovoltaic energy.
2.5	Solar thermal-electric energy.
3	Block 3
3.1	Biofuels and biomass.
3.2	Waste energy.
3.3	Hydrogen energy.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Continuous assessment. The minimum attendance of 80% of the sessions (theory, classroom practice and laboratory practices) is required. In qualifying the following aspects are taken into account: the attitude demonstrated during development of the course.	Others	No	No	30,00
Course work and oral presentation.	Work	No	Yes	70,00
TOTAL				100,00

Observations

The specific subject of each work must be previously authorized by a professor of the subject, who will act as tutor.
The work must be original, and it has to review 5/10 impact articles published on a topic related to one of the themes studied in class (most cited articles, latest articles published, reviews, ...). It should include: Introduction, Content, Conclusions, and References or Bibliography. The format must be: Arial letter 11, Single spacing, Margins (2.5 top, bottom, left and right), photos, diagrams, figures, ... all of them must have a reasonable size, and if they are not authored by the student, they must be conveniently referenced.

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.

This subject is taught in Spanish; but work and work presentation could be done in English.

Observations for part-time students

Partial time students should make a research work (50 pg, 20-25 minutes of oral presentation).
The work must be original, and it has to review 15/25 impact articles published on a topic related to one of the themes studied in class (most cited articles, latest articles published, reviews, ...). It should include: Introduction, Content, Conclusions, and References or Bibliography. The format must be: Arial letter 11, Single spacing, Margins (2.5 top, bottom, left and right), photos, diagrams, figures, ... all of them must have a reasonable size, and if they are not authored by the student, they must be conveniently referenced.
In the extraordinary evaluation the student would be evaluated in a exam.

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.

This subject is taught in Spanish; but work and work presentation could be done in English.

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Energy and environment in the European Union. Tracking progress towards integration. Luxemburgo: OPOCE, 2006. ISBN: 92-9167-877-5
Solar engineering of thermal processes, J.A. Duffie & W.A. Beckman; Ed. John Wiley & Sons; 2006, ISBN 0-471-69867-9
The biodiesel handbook, G. Knothe, J. van Gerpen, J. Krahl; Urbana (Illinois): AOCS Press, cop. 2005. ISBN 1-893997-79-0
Photovoltaic solar energy generation, A. Goetzberger, V.U. Hoffmann, Berlin: Springer, 2005; ISBN 3-540-23676-7
Ocean wave energy conversión, M.E. MacCormick; Mineola (New York): Dover, 2007, ISBN 978-0-486-46245-5
Aprovechamiento de los residuos forestales como uso energetico, B. Velázquez, Ed Universidad Politécnica de Valencia; 2006, ISBN:84-8363-049-4
Handbook on bioethanol: production and utilization, C. E. Wyman. Ed: Taylor & Francis, cop. 1996. ISBN: 1-56032-553-4
Wind energy handbook, T. Burton.Ed: John Wiley & Sons, 2002. ISBN: 0-471-48997-2
Grid integration of wind energy conversion systems, S. Heier. Ed: John Wiley & Sons, 2006. ISBN 978-0-470-86899
Handbook of energy efficiency and renewable energy, F. Kreith, D. Y. Goswami. Ed.: CRC Press, 2007. ISBN: 978-0-8493-1730-9
Fuel cell fundamentals / Ryan P. O'Hayre et al., 2nd. ed., New York : Wiley, 2009.
Energy harvesting: solar, wind, and ocean energy conversion systems, Alireza Khaligh, Omer C. Onar.: Taylor & Francis, cop. 2010.
Biomass to renewable energy processes / edited by Jay Cheng, Taylor & Francis, cop. 2010
Power conversion of renewable energy systems / Ewald F. Fuchs, Mohammad A.S. Masoum. New York : Springer, cop. 2011
Centrales de Energías Renovables: Generación Eléctrica con Energías Renovables, J.A. Carta, R. Calero, A. Colmenar, M.A. Castro. Ed.: Pearson Prentice Hall, 2009. ISBN: 978-84-362-5878-3
Wind Power Generation, P. Breeze. Ed.: Elsevier, 2016. ISBN: 978-0-12-804038-6
https://www.ren21.net/reports/global-status-report/
https://www.eurobserv-er.org/