

University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Electrical and Computer Engineering
 Graduate Program in Electrical Engineering

Course Syllabus

1. General Information:	
Alpha-numeric codification: INEL 6025 Course Title: Advanced Energy Conversion Number of credits: 3 Contact Period: 3 hours of lecture per week	
2. Course Description:	
English: Theory and design of processes for direct energy conversion. Thermoelectric, thermionic, and photovoltaic conversion. Fuel cells. Introduction to irreversible thermodynamics and its application to describe operations. MHD equations and generators.	
Spanish: Teoría y diseño de procesos de conversión directa de energía. Conversión termoelectrónica, termiónica y fotovoltaica. Celdas de combustible. Introducción a termodinámica irreversible y su aplicación para describir operaciones. Ecuaciones magnetohidrodinámicas (MHD) y generadores.	
3. Pre/Co-requisites and other requirements:	
Permission from the Director	
4. Course Objectives:	
Students will describe a variety of processes for direct energy conversion of energy in one form to electric energy. Describe and evaluate renewable electric energy sources and their associated energy conversion methods to obtain electrical energy as well as needed electric energy storage. Explain important technical and social considerations regarding use and application of renewable energy sources.	
5. Instructional Strategies:	
<input checked="" type="checkbox"/> conference <input checked="" type="checkbox"/> discussion <input checked="" type="checkbox"/> computation <input type="checkbox"/> laboratory <input type="checkbox"/> seminar with formal presentation <input type="checkbox"/> seminar without formal presentation <input type="checkbox"/> workshop <input type="checkbox"/> art workshop <input type="checkbox"/> practice <input type="checkbox"/> trip <input type="checkbox"/> thesis <input type="checkbox"/> special problems <input type="checkbox"/> tutoring <input type="checkbox"/> research <input type="checkbox"/> other, please specify:	
6. Minimum or Required Resources Available:	
Strong emphasis will be given to the use of professional journals available to UPRM students through internet in http://ieeexplore.ieee.org .	
7. Course time frame and thematic outline	
Outline	Contact Hours
Energy Sources and Technologies Solar, MHD, Wind, Hydrogen, and other sources, Storage technologies	18

Interconnection Issues Power electronics & power quality Net metering & DG Standards Economic analysis	15
Social Implications of Energy Energy Policy Public perception Environment and compliance technologies Life cycle analysis	10
Exams	2
Total hours: (equivalent to contact period)	45

8. Grading System

Quantifiable (letters) Not Quantifiable

9. Evaluation Strategies

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2	40
<input type="checkbox"/> Final Exam		
<input type="checkbox"/> Short Quizzes		
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	2	50
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Homework	varies	10
TOTAL:		100%

10. Bibliography:

1. M. R. Patel. Wind and Solar Power Systems: Design, Analysis and Operation, CRC Press, 2006.
2. S. Heier. Grid Integration of Wind Energy Conversion Systems, Wiley, 2006.
3. J. A. Duffie and W. A. Beckman. Solar Engineering of Thermal Processes, Wiley, 2006.
4. Photovoltaics Design And Installation Manual: Renewable Energy Education for a Sustainable Future by "Solar Energy International", Berkley Press, 2004.
5. J. Brooke. Wave Energy Conversion, Elsevier Ocean Engineering Series, 2003.
6. Vaclav Smil, Energy at the Crossroads : Global Perspectives and Uncertainties, 2003.
7. International Energy Agency, Renewables for Power Generation -- Status & Prospects, OECD, 2003.
8. C. Humphrey, T. Lewis, F. Buttel, Environment, Energy and Society: A New Synthesis, Wadsworth, 2003.

11. According to Law 51

Students will identify themselves with the Institution and the instructor of the course for purposes of assessment (exams) accommodations. For more information please call the Student with Disabilities Office which is part of the Dean of Students office (Chemistry Building, room 019) at (787)265-3862 or (787)832-4040 extensions 3250 or 3258.

Person who prepared this description and date of preparation:

Agustín Irizarry, August 2007