

FUEL CELLS TECHNOLOGY

1.1. Identification

University:	Universidad Politécnica de Valencia										
School:	Escuela Técnica Superior de Ingeniería del Diseño										
Course:	Fuel Cells Technology										
ECTS:	4										
Semester:	<i>Winter</i>					<i>Summer</i>				X	
Category	<i>Fundamental course</i>					<i>Specialisation course</i>				X	
Module	<i>MFI</i>		<i>MFII</i>		<i>MFIII</i>		<i>MSI</i>	X	<i>MSII</i>		<i>MSIII</i>
Teachers:	Amparo Ribes, Laura Contat										
Language:	<i>English</i>	X	<i>Italian</i>		<i>Swedish</i>		<i>Spanish</i>				

1.2. Learning-outcomes

- knowledge about the different alternatives for energy generation
- knowledge about the technology of electrical generation by using electrochemical devices
- knowledge about the fundamentals of optimization in energy generation

1.3. Competencies

▪ General

- to have critical understanding of technical and scientific tools
- to work and manage teams
- communication skills (both written and oral)
- to work in an international context

▪ Specific

- to have an overview of the different energy sources.
- to understand the concept and performance of a fuel cell.
- to analyse the different parts of industrial power generation plants using fuel cells.
- to know the different types of fuel cells, their applications, advantages and drawbacks.
- to understand and implement the Laws of Thermodynamics to the fuel cells.
- to study the efficiency of fuel cells and compare them with other systems of power generation.
- to determine the parameters that allow the design of fuel cells in industrial processes
- to study the latest advances in fuel cells science: materials, tests and applications.

1.4. Contents

1. Background of the current energy sources: Fossil fuels. Alternative energies. Introduction to the fuel cells: Concept. Fuel pre-treatments. Applications.
2. Classification of the different fuel cells: Proton Exchange Membrane FC. Alkaline FC. Phosphoric Acid FC. Molten Carbonate FC. Intermediate Temperature Solid Oxide FC. Tubular Solid Oxide FC.
3. Thermodynamics of Fuel Cells: Basic thermodynamics. Reversible cell potential. Gibbs Energy. Ideal performance. Actual performance. Advanced thermodynamics.
4. Last advances in fuel cells: materials and applications.

1.5. Teaching Methodology

- Lecture sessions
- Seminar sessions
- Practical sessions: "cooperative work" for solving problems
- laboratory sessions

1.6. Evaluation

- written exams
- oral evaluation of the contents discussed during the seminar sessions
- oral evaluation of the problems solved by "cooperative work"
- oral evaluation of laboratory work

1.7. Bibliography

- Leo.J.M.J. Blomen, Michael N. Mugerwa, "Fuel Cell Systems", Ed. Plenum Press.
- ,Ed Gregor Hoogers Danvers, "Fuel cell technology handbook": CRC Press
- M.J. Moran, H.N. Shapiro. "Fundamentals of Engineering Thermodynamics". John Wiley & Sons