

<b>Partner University</b>		<b>Universitat Politècnica de Catalunya - BarcelonaTech</b>																									
<b>Degree</b>		MSc Energy Engineering																									
<b>Code</b>	820748	<b>Name</b>	<b>Hydrogen and Fuel Cells</b>																								
<b>ECTS</b>	5	<b>Year</b>	2	<b>Semester</b>	1	<b>Character</b>	Elective																				
<b>Pre-requisites</b>																											
<b>Prior Skills</b>		Basic knowledge in chemistry and physics																									
<b>Objectives</b>		<p>This course aims to:</p> <ul style="list-style-type: none"> <li>• Train students in the development of technical criteria to define an energy system, which involves a fuel cell from chemical data, biological catalysis, materials, heat transfer and flow of matter and energy.</li> <li>• Provide students the skills to analyze any kind of scientific and technological method of obtaining and handling hydrogen for use in fuel cells and express rules for its implementation, optimization and / or modification.</li> <li>• Provide students the skills to identify the problems and deficiencies of energy installations and electrical devices and be able to provide engineering solutions.</li> <li>• Instil in students the scientific spirit to investigate new developments in the field of hydrogen and fuel cell vector.</li> </ul>																									
<b>Learning outcomes</b>		<p>At the end of the course the student will be able to:</p> <ul style="list-style-type: none"> <li>• Demonstrate a good knowledge and understanding on the role of hydrogen as an energy vector in the context of global and regional energy system as well as its connotations and impact economic, social and environmental.</li> <li>• Demonstrate a good knowledge and understanding on the main sources of information, current projects and future challenges related to the processes of obtaining hydrogen and different types of fuel cells.</li> <li>• Demonstrate a good knowledge and understanding on the applications of hydrogen and fuel cells in stationary environments (buildings), mobile (transportation) and laptops (electronic devices).</li> <li>• Perform a basic scale engineering project related to energy system for producing hydrogen and / or fuel.</li> </ul>																									
<b>Course main content</b>		<ol style="list-style-type: none"> <li>1. Hydrogen production technologies</li> <li>2. Storage and transport of hydrogen</li> <li>3. Fuel Cells</li> </ol>																									
<b>Methodology</b>		<p>Lectures, participative sessions, exercises, and assignments.</p> <p>Student workload (hours)</p> <table border="1"> <tr> <td>Lectures</td> <td>15</td> <td>Tutoring sessions</td> <td>15</td> </tr> <tr> <td>Practical sessions</td> <td>15</td> <td>Homework assignments</td> <td>0</td> </tr> <tr> <td>Laboratory</td> <td>0</td> <td>Projects</td> <td>50</td> </tr> <tr> <td>Presentations</td> <td>0</td> <td>Autonomous Study</td> <td>30</td> </tr> <tr> <td colspan="2">TOTAL</td> <td colspan="2">125</td> </tr> </table>						Lectures	15	Tutoring sessions	15	Practical sessions	15	Homework assignments	0	Laboratory	0	Projects	50	Presentations	0	Autonomous Study	30	TOTAL		125	
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<b>Bibliography</b>		<ul style="list-style-type: none"> <li>• J. Llorca "El hidrógeno y nuestro futuro energético". Ed. UPC, 2010.</li> <li>• R.L. Busby "Hydrogen and Fuel Cells. A comprehensive guide". PennWell, 2005.</li> <li>• CLEFS CEA nº 50/51 "L'hydrogène, les nouvelles technologies de l'énergie", 2004.</li> <li>• P. Hoffmann "Tomorrow's Energy: Hydrogen, Fuel Cells, and the Prospects for a Cleaner</li> </ul>																									

	Planet". MIT Press, 2001.
<b>Student assessment</b>	Exam 50% Assignments 50%
<b>Contact person</b>	Jordi Llorca <a href="http://directori.upc.edu/directori/dadesPersona.jsp?id=1049344">http://directori.upc.edu/directori/dadesPersona.jsp?id=1049344</a>
<b>Link</b>	