









Teacher(s)	De Jaeger Emmanuel ;Gerin Patrick (coordinator) ;Jeanmart Hervé ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	Background in physics and (bio)chemistry Dedicated introductory modules are available for ENVI students (self learning) Dedicated modules are available for EPL/AGRO students (self learning)
Main themes	The course aims at providing the students with a broad, diversified and multidisciplinary background on renewable energy. It gives a global view of the various renewable energy sources and uses, with emphasis on the available resources, conversion technologies, environmental impacts, and socio-economical aspects of their development.
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <p><b>Contribution of the course to the program objectives (N°)</b></p> <p>EPL :</p> <p>Partim A and B : AA1.1, AA1.2, AA1.3, AA6.1, AA6.3</p> <p>Partim B : AA2.1, AA2.2, AA2.3, AA6.2</p> <p>AGRO :</p> <p>Partim A and B : AA2.1, AA2.3, AA2.4, AA7.3</p> <p>Partim B : AA4.1, AA4.2, AA4.3, AA4.4, AA4.5</p> <p><b>Specific learning outcomes of the course</b></p> <p>Partim A:</p> <p>1</p> <ul style="list-style-type: none"> <li>• Utilize the main orders of magnitude and units in the field of renewable energy</li> <li>• Master the main physical, chemical, biological, technical and environmental aspects of renewable energy systems and technologies</li> <li>• Calculate the preliminary sizing of renewable energy technologies</li> <li>• Compare the conversion technologies from different perspectives (technical, energy, and environmental)</li> </ul> <p>Critique scientific documents on renewable energy related topics.</p> <p>Partim B :</p> <ul style="list-style-type: none"> <li>• Select the right conversion technologies for an application considering technical, environmental and economic aspects</li> <li>• Model the components of renewable technologies towards their simulation and optimization</li> <li>• Design (optimize) a renewable energy system for a specific application</li> </ul>
Evaluation methods	Written examination (Partim A&B) + continuous assessment (Partim B)
Teaching methods	<ul style="list-style-type: none"> <li>• Formal lectures</li> <li>• Seminar by experts</li> <li>• Reading of scientific papers</li> <li>• Problem based learning (Partim B)</li> </ul>
Content	<p><b>Partim A</b> - Introduction to renewable energy</p> <p>General introduction (energy outlook, energy efficiency, place of renewable energy) (3h)</p> <p>Solar energy (solar resource characterisation, photovoltaic effect, PV panels, Converters, etc.) (8h)</p> <p>Wind energy (mechanical aspects, Betz law, BEM, electrical aspects) (4h)</p> <p>Hydro power (types of turbines, efficiency, fluid aspects) (3h)</p> <p>Biomass (solar to biomass conversion, biomass composition, thermochemical conversion, biological conversion) (5h)</p> <p>Energy storage (electrical, mechanical, thermal) (3h)</p> <p><b>Partim B</b> - Advanced topics in renewable energy</p> <p>Concentrated solar Power CSP / solar drying (4h-4h)</p> <p>Design and control of wind turbines (4h-4h)</p> <p>Design of a small hydraulic turbine (4h-4h)</p>

	Mass and energy balance of biomass conversion routes (4h-4h) Design of an energy storage unit (4h-4h)
Inline resources	Moodle
Faculty or entity in charge	ENVI

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Mechanical Engineering	MECA2M	5		
Master [120] in Agricultural Bioengineering	BIRA2M	5		
Master [120] in Chemical and Materials Engineering	KIMA2M	5		
Master [120] in Electrical Engineering	ELEC2M	5		
Master [120] in Environmental Bioengineering	BIRE2M	5		
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Chemistry and Bioindustries	BIRC2M	5		
Interdisciplinary Advanced Master in Science and Management of the Environment and Sustainable Development	ENVI2MC	5		
Master [120] in Environmental Science and Management	ENVI2M	4		