


5.00 credits

30.0 h + 22.5 h

Q2

Teacher(s)	de Maere d'Aertrycke Gauthier (compensates Papavasiliou Anthony) ;Papavasiliou Anthony ;
Language :	English
Place of the course	Louvain-la-Neuve
Prerequisites	<ul style="list-style-type: none"> <li>• Fluency in English at the level of course LANGL1330.</li> <li>• Optimization (linear programming, KKT conditions, duality)</li> <li>• Microeconomic theory (not necessary but helpful)</li> </ul>
Main themes	<ul style="list-style-type: none"> <li>• Electricity market design</li> <li>• Modeling of energy markets</li> <li>• Operations research applications in energy markets</li> <li>• Contemporary problems (renewable energy integration, demand response integration, capacity investment and risk management)</li> </ul>
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <p>With reference to the AA (Acquis d'Apprentissage) reference, this course contributes to the acquisition of the following learning outcomes:</p> <ul style="list-style-type: none"> <li>• AA1.1, AA1.2, AA1.3</li> <li>• AA2.2, AA2.5</li> </ul> <p>At the end of the course, students will have learned to:</p> <p>1</p> <ul style="list-style-type: none"> <li>• explain the architecture of energy markets, ranging from real-time to forward markets</li> <li>• formulate mathematical programming models that describe energy markets and regulatory interventions in these markets</li> <li>• formulate mathematical programming models that describe risk management practices in the energy sector</li> <li>• implement mathematical programming models that describe energy markets and risk management practices using AMPL</li> <li>• provide economic interpretations to the results of mathematical programming models for energy markets</li> </ul>
Evaluation methods	<ul style="list-style-type: none"> <li>• Written and/or oral exam   Regular assignments</li> </ul>
Teaching methods	2 hours lecture per week and 2 hours working exercises. Assignments will be evaluated by the teacher or the teaching assistant.
Content	<ul style="list-style-type: none"> <li>• Place of energy system in the economy, energy mix and public objectives of decarbonization : solutions and challenges</li> <li>• Organisation and modelisation of electricity market : production, transmission, investissement</li> <li>• Social cost of carbon. Organisation and modelisation of CO2 emission market. Introduction to general equilibrium model.</li> <li>• Economic : Corporate finance and computation of investment financing . Economic Equilibrium theory (perfect and imperfect competition) Impact of externalities, Risk quantification, coalition theory and stability</li> <li>• Mathematics: Optimisation/Duality (complementarity conditions), Nash equilibrium, Convex hull</li> </ul>
Inline resources	<a href="https://moodleucl.uclouvain.be/course/view.php?id=5003">https://moodleucl.uclouvain.be/course/view.php?id=5003</a>
Bibliography	<ul style="list-style-type: none"> <li>• Impressions de manuels ou articles fournis au cours. Quelques lectures qui pourraient être utiles en tant que support : Steven S. Stoft, "Power System Economics" / Daniel S. Kirschen, Goran Strbac, "Power System Economics"</li> </ul>
Other infos	None
Faculty or entity in charge	MAP

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		