UCLouvain

linma2415

2023

Quantitative Energy Economics

5.00 credits	30.0 h + 22.5 h	Q2

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

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Electro-mechanical Engineering	ELME2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in Energy Engineering	NRGY2M	5		