UCLouvain

linma2415

2024

Quantitative Energy Economics

5.00 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Lété Quentin ;
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 • Homework and/or project
Teaching methods	2 hours of lecture per week and 2 hours of training sessions per week. The course will also include a project and/or homeworks (to be clarified during the first lecture). This course will address questions related to sustainable development and the transition through the discussion of the decarbonation of the electricity system, both during the lectures and the training sesions.
Content	• Mathematical background (duality) • Power system and power market operations • Competitive equilibrium models • Short-term electricity market operations (economic dispatch, optimal power flow, unit commitment, reserves) • Hedging risk through financial instruments • Long-term energy system planning • Integration of renewable energy into the electricity system
Inline resources	https://moodle.uclouvain.be/

Bibliography	• Notes on Moodle
	• Textbook: Anthony Papavasiliou, "Optimization Models in Electricity Markets"
	• Textbooks that can be used as a support (relevant sections will be mentioned on Moodle and during the lecture):
	  • 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		