UCL Université catholique de Louvain

# LINMA2415

*2014-2015*

# Quantitative Energy Economics

| 5.0 credits | 30.0 h + 22.5 h | 2q |
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| Teacher(s) : | Papavasiliou Anthony ; |
| Language : | Anglais |
| Place of the course | Louvain-la-Neuve |
| Inline resources: | > http://icampus.uclouvain.be/claroline/course/index.php?cid=LINMA2415 |
| Prerequisites : | --<br>Fluency in English at the level of course LANGL1330.<br>--<br>Optimization (linear programming, KKT conditions, duality)<br>--<br>Microeconomic theory (not necessary but helpful)<br>--<br>Mathematical programming languages AMPL and/or Mosel (not necessary, but helpful) |
| Main themes : | --<br>Energy market design<br>--<br>Economics of energy markets<br>--<br>Operations research applications in energy markets<br>--<br>Contemporary problems (renewables, demand response, capacity investment and risk management) |
| Aims : | With reference to the AA (Acquis d'Apprentissage) reference, this course contributes to the acquisition of the following learning outcomes:<br>--<br>AA1.1, AA1.2, AA1.3<br>--<br>AA2.2, AA2.5<br>At the end of the course, students will have learned to :<br>--<br>explain the architecture of energy markets, ranging from real-time to forward markets<br>--<br>formulate mathematical programming models that describe energy markets and regulatory interventions in these markets<br>--<br>formulate mathematical programming models that describe risk management practices in the energy sector<br>--<br>implement mathematical programming models that describe energy markets and risk management practices using AMPL<br>--<br>implement algorithms that can be used for solving quantitative problems that arise in the energy sector using AMPL<br>*The contribution of this Teaching Unit to the development and command of the skills and learning outcomes of the programme(s) can be accessed at the end of this sheet, in the section entitled "Programmes/courses offering this Teaching Unit".* |
| Evaluation methods : | --<br>Written exam<br>--<br>Course project and homework assignments |
| Teaching methods : | 2 hours of magistral courses per week, and 2 hours of training sections per week. Homeworks and term projects will be evaluated by the instructor and/or the teaching assistant. |
| Content : | --<br>Introduction to energy market modeling<br>--<br>Electricity markets (unit commitment, transmission constraints, system security and reserves)<br>--<br>Equilibrium models<br>--<br>Investment planning |

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| | --<br>Smart grid topics (wind / solar power integration, demand response)<br>--<br>Quantitative methods (KKT conditions, mixed integer linear programming (MILP) models, modeling of risk aversion, stochastic programming) |
| Bibliography : | --<br>Course notes<br>--<br>Printouts from textbooks or archived journals will be provided during lectures. A few textbooks that might be helpful as supporting material: Steven S. Stoft, "Power System Economics" / Daniel S. Kirschen, Goran Strbac, "Power System Economics" |
| Other infos : | None |
| Cycle and year of study : | > Master [120] in Mathematical Engineering |
| Faculty or entity in charge: | MAP |