UCLouvain

linma2491

2018

Operational Research

5 credits	30.0 h + 22.5 h	Q2

Teacher(s)	Aghezzaf El-Houssaine (compensates Papavasiliou Anthony) ;Papavasiliou Anthony ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	How to formulate an optimization problem in which data are prone to uncertainty? How to take into account disclosed information and revealed values of the parameters during the stages of the optimization process? How to solve the optimization models thus obtained? Stochastic optimization is the ideal framework for dealing with such issues. Various solution techniques for large-scale problems will also be discussed: Benders decomposition, Nested Bendersdecomposition, Lagrangian methods, ... Applications: Production, logistics, finance, ...
Aims	. Formulate problems of decision-making under uncertainty as mathematical programs, 1 • Identify mathematical structures in large-scale mathematical programs that enable their decomposition, • Design algorithms for solving large-scale optimization problems under uncertainty, • Implement algorithms for solving large-scale stochastic optimization problems, • Evaluate the quality of alternative policies for problems of decision-making under uncertainty - - - - *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	• Written exam • Regular homework assignments
Teaching methods	2 hours of magistral courses per week, and 2 hours of training sessions per week. Homeworks will be evaluated by the instructor and/or the teaching assistant.

Content	• Modelling in stochastic programming
	• Value of information and value of the stochastic solution
	• Two-Stage Recourse Problems
	• Multistage Stochastic Programs
	• Stochastic Integer Programs
	• Decomposition techniques:
	  • Benders decomposition
	  • Nested Benders decomposition
	  • Lagrangian relaxation
	• Stochastic dual dynamic programming algorithm
	• Approximation and sampling methods

Inline resources	Moodle link

Bibliography	• Reference Book (Course Textbook): "Introduction to Stochastic Programming", John Birge and Francois Louveaux, (2011), Springer Series in Operations Research and Financial Engineering.
	• Other references:
	  • "Modeling with Stochastic Programming", King, A.J. and Wallace, S.W., (2012), Springer Series in Operations Research and Financial Engineering.
	  • "Stochastic Programming ", Kall, P. and Wallace, S.W., (1995), John Wiley and Sons.
	  • "Lectures on Stochastic Programming: Modeling and Theory", Alexander Shapiro, Darinka Dentcheva, Andrzej Ruszczynski, (2009), MPS-SIAM Series on Optimization.

Faculty or entity in charge	MAP

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Aims
Master [120] in Data Science Engineering	DATE2M	5		
Master [120] in Mathematical Engineering	MAP2M	5		
Master [120] in data Science: Information technology	DATI2M	5		