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26311 - MEIO1 - Stochastic Models of Operational Research 1

Coordinating unit: 200 - FME - Faculty of Mathematics and Statistics

Teaching unit: 715 - EIO - Department of Statistics and Operations Research

Academic year: 2011

Degree: DEGREE IN STATISTICAL SCIENCES AND TECHNIQUES, PLAN 99 (Syllabus 1999). (Teaching unit Compulsory)
MASTER IN STATISTICS AND OPERATIONS RESEARCH (Syllabus 2006). (Teaching unit Optative)
DOCTORATE IN STATISTICS AND OPERATIONAL RESEARCH (Syllabus 2007). (Teaching unit Optative)
MASTER IN MATHEMATICAL ENGINEERING (Syllabus 2006). (Teaching unit Optative)

ECTS credits: 5 Teaching languages: Catalan

Teaching staff

Coordinator: JORDI CASTRO PÉREZ

Others:
JORDI CASTRO PÉREZ - A
CRISTINA CORCHERO GARCIA - A

Prior skills

Basic knowledge of Operations Research / Optimization / Mathematical Programming and Modelling .

Teaching methodology

Theory:
The contents of the course will be presented and discussed by combining explanations on the board and with transparencies.

Problems:
Problems will be interspersed with the theory along with case studies, which will be presented and solved.

Training:
Laboratory sessions in which the use of software will be demonstrated for solving stochastic programming problems.

Learning objectives of the subject

The goal of this course is to introduce the student to the problems of system modeling in the presence of uncertainty, and familiarization with techniques and algorithms for dealing with them. The course deals with the case of stochastic programming, i.e. the optimization of problems with random variables . Stochastic modelling and programming bases are provided and it is hoped that upon completion of the course the student will be able to identify, model, formulate and solve decision-making problems with both deterministic and as random variables.

Abilities to Be Acquired:
* Identifying when a problem is suitable to be modeled and solved as a stochastic optimization problem.
* Formulation of stochastic optimization problems, determining decisions in the first, second and next stages.

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* Knowledge of the basic properties of stochastic optimization problems.
* Knowledge of specialized solution methods for stochastic problems.
* Knowledge and use of software for the solution of stochastic problems.

Content

Introduction.

Learning time: 60h

Theory classes: 38h
Practical classes: 10h
Laboratory classes: 12h

Description:
Presentation. Stochastic Programming in OR. Relation to other stochastic methods.

Stochastic modelling.

Description:
Introduction to Stochastic Programming. Examples of models: two-stage, multi-stage, chance constraints, non-linear models.
Modeling with uncertainty. Formulation of stochastic problems, risk aversion, chance constraints..

Basic Properties.

Description:
Basic Properties of Stochastic Programming Problems and Theory. Feasible Sets, Recourse Function.

Solution methods.

Description:
(Two-stage Recourse Problems. Decomposition Methods: Primal Problem Solutions (L-shaped method, multicut version); Dual approaches (Dantzig-Wolfe method). Matrix Factorization Methods with exploitation of structure. Interior Point Methods for Stochastic Problems.

Qualification system

Exam and completion of classwork. The final mark is 65% of exam and 35% classwork.

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Bibliography

Basic:

Birge, J.R.; Louveaux, F.. *Introduction to stochastic programming.* Springer, 1997.

Kall, P.; Wallace, S.W.. *Stochastic programming.* Wiley, 1994.

Prékopa, András. *Stochastic programming.* Kluwer Academic Publishers, 1995.