MGT-483

Optimal decision making

Kuhn Daniel

Cursus	Sem.	Type
Electrical and Electronical Engineering	MA2, MA4	Opt.
Management, Technology and Entrepreneurship minor	E	Opt.
Managmt, tech et entr.	MA2, MA4	Opt.
Robotics, Control and Intelligent Systems		Opt.
Robotics	MA2, MA4	Opt.
Systems Engineering minor	E	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	Written
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

This course introduces the theory and applications of optimization. We develop tools and concepts of optimization and decision analysis that enable managers in manufacturing, service operations, marketing, transportation and finance to transform data into insights for making better decisions.

Content

Fundamental techniques covered in this course include linear, discrete and nonlinear optimization. The underlying theory is motivated through concrete examples across several application areas such as project management, portfolio selection, production planning, revenue management, transportation, etc. We will use Python to model and solve practical decision problems.
The following topics will tentatively be covered in the course:

Part I: Linear Optimization

- Applications
- The Simplex Method
- Duality
- Large-Scale Optimization

Part II: Discrete Optimization

- Applications
- Branch & Bound and Cutting Planes
- Lagrangian Methods (if time)

Part III: Nonlinear Optimization

- Applications
- Optimality Conditions
- Local Optimization

Keywords

Linear optimization, discrete optimization, nonlinear optimization

Learning Prerequisites

Important concepts to start the course

A good background in linear algebra and calculus is required. Basic knowledge of probability theory is useful but not necessary.

Learning Outcomes

By the end of the course, the student must be able to:

- Recognize the power of using optimization methods and models in their careers
- Compare and appraise the basic theories that underlie current thinking in optimization
- Use these theories to structure practical decision-making situations
- Apply the fundamental quantitative methods and tools used in operations research
- Formulate managerial decision problems as optimization models
- Solve linear, nonlinear and discrete optimization models using MATLAB
- Model uncertainty in linear optimization using techniques from stochastic programming
- Solve linear, nonlinear and discrete optimization models using Python

Transversal skills

- Communicate effectively with professionals from other disciplines.
- Use both general and domain specific IT resources and tools
- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Write a scientific or technical report.

Teaching methods

Classical formal teaching interlaced with practical exercices

Assessment methods

- 70% final exam
- 30% group project

Supervision

Office hours	No
Assistant.e.s	Yes
Forum	Yes

Resources

Bibliography

1. Dimitris Bertsimas and John Tsitsiklis, Introduction to Linear Optimization, Dynamic Ideas & Athena Scientific, 2008.
2. Dimitri P. Bertsekas, Nonlinear Programming, Athena Scientific, 2016.

Ressources en bibliothèque

- Find the references at the Library

Moodle Link

- https://go.epfl.ch/MGT-483