MATHEMATICAL PROGRAMMING

- **Course code**

  8116
- **Type of course (compulsory, optional)**
- Compulsory
- **Level of course** (e.g. first, second or third cycle; sub-level if applicable)

  N/A
- **Year of study**

  2013-2014
- **Semester**

  4th semester
- **Number of credits allocated**

  6 ECTS Credits
- **Name of lecturer**

  Ioannis Mourtos, Assistant Professor
- **Learning outcomes**

  This course examines the theory and the algorithms of Mathematical Programming and their relations to other areas (e.g., Game Theory). In particular, the course includes the Linear Programming problem, Duality Theory, basic algorithms for Linear Programming, introductory concepts of Non-Linear Programming and Integer Programming, problem formulation in Mathematical Programming, Dynamic Programming and Linear Programming's relation with Game Theory. The expected outcome is the solid understanding of all the above and, in addition, the applications of Mathematical Programming arising from real-life settings. More specific outcomes include the in-depth knowledge of mathematical structures and properties of classes of problems, the use of algorithms but also the design of variants for special cases and, last, the modeling and solving of relevant practical problems.

  The purpose of this course is the in-depth understanding of the theory and applications of Mathematical Programming. More specific learning outcomes include:

  I. The understanding of mathematical structure and properties of fundamental problem classes (e.g., linear, non-linear and integer programming, dynamic programming)
  II. The use of Mathematical Programming algorithms for problem solving but also the design of their variants for special problem cases.
  III. The formulation and solving of problems arising from practical, real-life settings.

- **Mode of delivery (face-to-face, distance learning)**

  Face-to face teaching in the form of lectures and classes, case study discussion
- **Prerequisites and co-requisites**

  N.A.
- **Recommended optional programme components**

  N.A.

- **Course contents**

The course material includes the following topics:

- Preliminaries in Linear Algebra and equation systems
- The Simplex Method: description, geometric interpretation and special cases
- Sensitivity analysis and economic meaning
- The Karush-Kuhn-Tucker conditions, description and proof
- Duality Theory
- Introduction to Non-Linear Programming
- The transportation problem and the Network Simplex Algorithm
- Model building and formulation, applications and case-studies
- Integer Programming, modeling and solution methods
- Linear Programming and Game Theory
- Dynamic Programming: formulations, solution approach and applications

- **Recommended or required reading**

  📖 P. Miliotis: Introduction to Mathematical Programming (in Greek)

  📖 K. Paparizos: Linear Programming, Algorithms and Applications

  Further textbooks that are recommended and available at the library:

  1. D. Bertsimas and J. Tsitsiklis: Introduction to Linear Optimization, Athena Scientific, 1997.
  2. G. L. Nemhauser and L. A. Wolsey: Integer and Combinatorial Optimization, Wiley, 1988
  3. D. Alevras and M. W. Padberg: Linear Optimization and Extensions: Problems and Solutions, Springer, 2001.
  4. L. A. Wolsey: Integer Programming, Wiley-Interscience, 1998.

  Additional notes, exercise and teaching material are available on the Department's educational portal (Eduportal)

- **Planned learning activities and teaching methods**

  N.A.

- **Assessment methods assessment methods and criteria**

  Assessment is determined solely by the final written examination

- **Language of instruction**

  Greek

- **Work placement(s)**

  N.A.