# COURSE OUTLINE

## (1) GENERAL

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| **SCHOOL** | SCHOOL OF SCIENCES | | |
| **ACADEMIC UNIT** | DEPARTMENT OF MATHEMATICS | | |
| **LEVEL OF STUDIES** | UNDERGRADUATE PROGRAM | | |
| **COURSE CODE** | | **SEMESTER** | **D** |
| **COURSE TITLE** | LINEAR PROGRAMMING | | |
| **INSTRUCTOR** | | | |
| **INDEPENDENT TEACHING ACTIVITIES** | | **WEEKLY TEACHING HOURS** | **CREDITS** |
| | | 4 | 6 |
| **COURSE TYPE** | Special background | | |
| **PREREQUISITE COURSES:** | NO | | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | GREEK | | |
| **IS THE COURSE OFFERED TO ERASMUS STUDENTS** | YES | | |
| **COURSE WEBSITE (URL)** | http://www.math.aegean.gr/index.php/en/academics/undergraduate-programs | | |

## (2) LEARNING OUTCOMES

| **Learning outcomes** |
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| This course aims at introducing students into linear optimization theory and its applications. The field of linear programming provides the appropriate methods for the efficient computation of optimal solutions of a problem which is modeled by a linear objective function and a set of linear constraints. At the end of this course, the students will be ready to model a problem as a linear programming problem and to apply the appropriate method in order to find an optimal solution. |
| **General Competences** |
| Working independently. Team working. Working in an interdisciplinary environment. |

## (3) SYLLABUS

- Linear Programming (LP) as a tool of Operational Research (OP). The history of LP and the contribution of G. Dantzig. Modelling a problem as an LP problem by defining the objective function, the set of linear constraints that determines its feasible solutions. Forms of an LP problem.
- The geometry of an objective function. The geometry of a feasible solutions set. Solving a two dimensional LP problem by the use of a graphical method. Unique optimal solution and infinite many optimal solutions. Incompatible constraints, unbounded feasible solution set and unbounded variables. Redundant constraints.
- Hyperplanes and Hyperspaces defined by the linear constraints. Extreme points of the polytope defined by the hyperspaces and hyperplanes of the problem. Basic feasible solution and its relation with extreme points. Degenerated basic feasible solutions. The Extreme Point Theorem. Finding the optimal solution by the use of Linear Algebra.
- The simplex method. The theorem of optimal value. The theorem of unbounded objective function. Entering and Departing variables, Dantzig optimality criterion. Examples where the simplex method is used. Defining an initial basis.
- The big M method and its application on various problems.

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| • The two phase method and its application on various problems. LP Problems with Unbounded variables.<br>• The Dual LP problem. Economic Interpretation of the Dual LP problem. Duality theorem. Dual Simplex method and its application on various problems.<br>• Sensitivity Analysis after adding a new variable and a new constraint. Apply sensitivity analysis to various problems.<br>• Integer and mixed LP problems. The assignment problem. The transportation problem. | |
| **TEACHING MATERIAL DISTRIBUTION** | The teaching material of the course is uniformly distributed during the semester. |

## (4) TEACHING and LEARNING METHODS - EVALUATION

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| **DELIVERY** | Face-to-face lectures |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** | • Use of ICT in teaching<br>• Communication with students via e-mail |
| **TEACHING METHODS** | |

| ***Activity*** | ***Semester workload*** |
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| Lectures | 39 |
| Tutorials | 13 |
| Independent study | 98 |
| Course total (25 per ECTS) | ***150*** |

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| **COURSE COMMITMENTS** | Attending course and tutorial sessions is not obligatory. |
| **STUDENT PERFORMANCE EVALUATION** | Student's evaluation is done in Greek through a written examination which includes short-answers questions and problem solving. For students with disabilities, evaluation takes place via oral exams. |

## (5) ATTACHED BIBLIOGRAPHY


1. Linear Programming, Kounias Stratis, Fakinos Dimitrios, Zhth Editions.
2. Operational Research, Subject and Methodology: Linear Programming, Xirokostas Dimitrios, Symmetria Editions.
3. Linear Programming, G. Siskos, New Technology Editions LTD.
4. Linear Programming, Dimitrios Despotis, Despotis Editions.
5. Linear Programming, Manolis Loukakis, Sofia Editions.