COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_ST332	**SEMESTER OF STUDIES**	6th
COURSE TITLE	MATHEMATICAL PROGRAMMING		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
Lectures and Tutorials	4	6
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Compulsory course for the specialization *Statistics, Probability Theory and Operational Research* Elective course for each of the other specializations
PREREQUISITE COURSES:	Recommended prerequisite knowledge: LINEAR ALGEBRA I
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH1057/

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- *Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning*

and Appendix B

- *Guidelines for writing Learning Outcomes*

This course aims to provide an advanced understanding of the decision-making process in complicated operational research problems, using the methods of Management Science and particularly, of Linear and Integer Programming. Emphasis is given to understanding and applying each individual concept/method, as well as to their theoretical foundations. By the end of the course, the students should be able to:

- Formulate problems of linear and integer programming.
- Demonstrate advanced knowledge and understanding of the core concepts and theories behind the solution of linear programming problems (reduced cost, dual problem, etc).
- Solve theoretical and problem questions with or without using a relevant software.
- Understand and interpret the results of their projects.
- Present the results of their projects orally as well as in written format and make suggestions to support the process of operational decision making.

General Abilities

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	*Project planning and management*
Adapting to new situations	*Respect for difference and multiculturalism*
Decision-making	*Respect for the natural environment*
Working independently	*Showing social, professional and ethical responsibility and sensitivity to gender issues*
Team work	*Criticism and self-criticism*
Working in an international environment	*Production of free, creative and inductive thinking*
Working in an interdisciplinary environment	*Others…*
Production of new research ideas	

- Search, analyze and synthesize data and information, using the necessary technologies.
- Decision making.
- Autonomous work.
- Adaptation to new situations.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Operations Research (OR). The origins of OR. The Nature of OR. Mathematic modeling and its role in.

Introduction to Linear Programming (LP). The LP Model. Assumptions of LP. Two-Variable LP Model. Graphical LP Solution. Computer Solution (LINDO). Linear Programming Applications.

Solving LP Problems: The Simplex Method. The Essence of the Simplex Method. The Algebra of the Simplex Method. The Simplex Method in Tabular Form. The Big M Method. The Two-Phase Method. Sensitivity Analysis. The Theory of Simplex Method.

Duality Theory. Primal-Dual Relationships. Sensitivity and Post-Optimal Analysis.

Integer Linear Programming. Integer Programming Applications. Using Binary Variables. The Branch-and-Bound Technique. The Branch-and-Cut Approach.

4. TEACHING AND LEARNING METHODS - ASSESSMENT

TEACHING METHOD *Face-to-face, Distance learning, etc*	Lectures (face to face)
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES *Use of ICT in teaching, laboratory education, communication with students*	*eClass* platform of the Department of Mathematics and University of Patras.
TEACHING ORGANIZATION *The manner and methods of teaching are described in detail.* *Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.* *The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS*	

Activity	***Semester workload***
Lectures	52
Solving suggested exercises	65
Personal study by the student	30
Final examination	3
Total number of hours for the Course (25 hours of work-load per ECTS credit)	***150***

STUDENT ASSESSEMNT *Description of the evaluation procedure* *Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other* *Specifically-defined evaluation criteria are given, and if and where they are accessible to students*	**Assessment Language:** Greek **Assessment Language for Erasmus students:** English **Assessment methods** Written final course exam (100%) including: ✓ Comprehensive questions ✓ Exercises and problem solving Minimum passing grade: 5 Maximum passing grade: 10

5. RECOMMENDED LITERATURE

(*in Greek*)

- Βασιλείου Παναγιώτης – Χρήστος και Τσάντας Νικόλαος. *Εισαγωγή στην Επιχειρησιακή Έρευνα.* Εκδόσεις Ζήτη, 2000.
- Μπότσαρης Χαράλαμπος Ε.. *Επιχειρησιακή Έρευνα. Τόμος 1: Γραμμικός Προγραμματισμός και Θεωρία Παιγνίων.* 2η Έκδοση, Εκδόσεις Παπαζήση, 2011.
- Φακίνος Δημήτριος και Οικονόμου Αντώνιος. *Εισαγωγή στην Επιχειρησιακή Έρευνα: Θεωρία και Ασκήσεις.* Εκδόσεις Συμμετρία, 2003.
- Σίσκος Γιάννης. *Γραμμικός Προγραμματισμός*. 2η Έκδοση, Εκδόσεις Νέων Τεχνολογιών, 2000.
- Κουνετάς Κωνσταντίνος. *Εισαγωγή στην Επιχειρησιακή Έρευνα και στον Γραμμικό Προγραμματισμό Λύσεις Προβλημάτων με το Πρόγραμμα R*. (e-book). Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Αποθετήριο "Κάλλιπος", 2016.

(*in English*)

- Bazaraa Mokhtar S., Jarvis John J. and Sherali Hanif D. *Linear Programming and Network Flows*. 4th ed., Wiley, 2010.
- Taha Hamdy A. *Operations Research*. *An Introduction.* 10th ed., Pearson, 2017.