COURSE OUTLINE

1. GENERAL

SCHOOL	NATURAL SCIENCES		
DEPARTMENT	MATHEMATICS		
LEVEL OF COURSE	UNDERGRADUATE		
COURSE CODE	MAT_ST435	**SEMESTER OF STUDIES**	7th
COURSE TITLE	OPERATIONS RESEARCH MODELS		

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: MATHEMATICAL PROGRAMMING
TEACHING AND ASSESSMENT LANGUAGE:	Greek
THE COURSE IS OFFERED TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	https://eclass.upatras.gr/courses/MATH1118/

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 Network Flows, Dynamic Programming and Game Theory. 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 Transportation and Assignment Problems, Network Flows, Decision Analysis, Game Theory and Dynamic Programming.
- Demonstrate advanced knowledge and understanding of the core concepts and theories behind the solution.
- 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

The Transportation and Assignment Problems. A Simplex method for the Transportation Problem. Hungarian algorithm, a special algorithm for the Assignment Problem.

Network Model. Shortest-Route Problem. Minimal Spanning Tree Algorithm. Maximal Flow Model. CPM and PERT.

Decision Analysis.

Game Theory. Optimal Solution of Two-Person Zero-Sum Games. Solution of Mixed Strategy Games.

Dynamic Programming. Recursive Nature of Dynamic Programming (DP). Computations. Forward and Backward Recursion. Selected DP Applications: Equipment Replacement Model, Workforce Size Model, Traveling Salesperson Problem, Inventory Models.

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*	
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

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***

5. RECOMMENDED LITERATURE

(*in Greek*)

- Taha A. Hamdy. *Εισαγωγή στην Επιχειρησιακή Έρευνα.* 10η Έκδοση, Εκδόσεις Τζιόλα, 2017.
- Hillier Frederick S. and Lieberman Gerald J. *Εισαγωγή στην Επιχειρησιακή Έρευνα.* 10η Έκδοση, Εκδόσεις Τζιόλα, 2017.
- Φακίνος Δημήτριος και Οικονόμου Αντώνιος. *Εισαγωγή στην Επιχειρησιακή Έρευνα: Θεωρία και Ασκήσεις.* Εκδόσεις Συμμετρία, 2003.
- Anderson David R., Sweeney Dennis J., Williams Thomas A. and Martin Kipp. *Διοικητική Επιστήμη*. Εκδόσεις Κριτική, 2014.
- Κολέτσος Ιωάννης και Στογιάννης Δημήτριος. *Εισαγωγή ατην Επιχειρησιακή Έρευνα*. 3η Έκδοση, Εκδόσεις Καλαμαρά, 2017.

(*in English*)

- Taha Hamdy A. *Operations Research*. *An Introduction.* 10th ed., Pearson, 2017.
- Hillier Frederick S. and Lieberman Gerald J. *Operations Research*. *An Introduction.* 10th ed., McGraw-Hill, 2015.