

INSTITUTION	NATIONAL AND KAPODISTRIAN UNIVERSITY OF ATHENS						
SCHOOL	SCHOOL OF SCIENCE						
DEPARTMENT	INFORMATICS AND TELECOMMUNICATIONS						
COURSE LEVEL	UNDERGRADUATE						
COURSE TITLE	Algorithmic Operations Research						
COURSE CODE	ΘΠ09	Semester	7	ECTS	6		
TEACHING HOURS per week	THEORY	3	SEMINAR.	1	LABORATORY		
COURSE TYPE	Elective Specialization (ΠΜ)						
	K	E1	E2	E3	E4	E5	E6
	A B	B	B	E			B
URL	https://eclass.uoa.gr/courses/D40/						
EXPECTED PRIOR KNOWLEDGE/ PREREQUISITES AND PREPARATION:	K17 Algorithms and Complexity						
TEACHING AND EXAMINATIONS LANGUAGE:	GREEK						
THE COURSE IS OFFERED TO ERASMUS STUDENTS	YES						

COURSE CONTENT

The course covers mathematical decision making models and presents algorithmic techniques for solving them. It focuses on Linear programming and the simplex algorithm, dual theory and transportation problems. In integer programming it describes branch and bound techniques for packing, covering and knapsack problems, and generalized linear programming for cutting stock problems. It describes techniques for algorithms evaluation (empirical evaluation, approximation ratio). It develops Local Search Algorithms and studies the Neighborhood Structure and Neighborhood search methods for the Traveling Salesman (k-OPT neighborhoods), max cut and graph bipartitioning problems .

STUDENT LEARNING OBJECTIVES

Teaching-Learning Goals-Expected Learning Outcomes

Introduces students to key mathematical decision models and to algorithmic techniques to solve them.

Upon successful completion of the course the student will be able to:

- formulate practical problems as linear, integer or mixed integer programming models
- recognize the difficulty of solving optimally some practical problems such as integer programming problems
- use suitable algorithmic resolution techniques for some models such as linear programming or transportation
- evaluate the performance of an algorithm and decide its suitability for solving a model
- mention and describe the characteristics of the algorithms: simplex, vogel, Reduced Costs, branch and bound, Local Search

TEACHING AND LEARNING METHODS - ASSESSMENT															
TEACHING METHOD	In Class (Face to Face)														
USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES	Learning process supported by the e-class platform: course description, provision of material, announcements, assignment and upload Contact via e-mail Live transmission of lectures Ability to track recorded lectures														
TEACHING ORGANIZATION <i>Describe in detail the way and methods of teaching: Enhanced Lectures, Online Lectures, Seminars, Tutorial, Laboratory, Laboratory Exercise, Study & analysis of literature, Practice (Positioning), Interactive teaching, Developing a project, Individual / group work Telework (reference to tools) etc.</i> <i>Details of the student's study hours for each learning activity and hours of non-guided study are shown to ensure that the total workload at the semester corresponds to the ECTS</i>	Use of slides in lectures. Support provided to familiarize with the GLPK package that solves large linear / integer programs. There are 2 individual assignments on modeling and the development of algorithmic techniques for NP-hard problems. <table border="1" data-bbox="771 1318 1421 1713"> <thead> <tr> <th>Activity</th> <th>Student Workload (hours)</th> </tr> </thead> <tbody> <tr> <td>Lectures (in class)</td> <td>39</td> </tr> <tr> <td>Tutorial (in class)</td> <td>13</td> </tr> <tr> <td>Assignment 1 (individual)</td> <td>26</td> </tr> <tr> <td>Assignment 2 (individual)</td> <td>26</td> </tr> <tr> <td>Final written exam</td> <td>46</td> </tr> <tr> <td>Total Course (25 hours of workload per unit of credit)</td> <td>150</td> </tr> </tbody> </table>	Activity	Student Workload (hours)	Lectures (in class)	39	Tutorial (in class)	13	Assignment 1 (individual)	26	Assignment 2 (individual)	26	Final written exam	46	Total Course (25 hours of workload per unit of credit)	150
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ASSESSMENT OF STUDENTS

Description of the assessment process

Assessment Methods, Formative or Concluding, Multiple Choice Test, Quick Response Questions, Test Development Questions, Problem Solving, Written Work, Report / Report, Oral Examination, Public Presentation, Laboratory Work, Other / Other

Fully defined evaluation criteria are mentioned and if and where they are accessible to students.

Students are assessed with 2 assignments and a final written examination

Assessment methods	Number	Percentage
Written examination	1	80%
Assignments	3	20%

Evaluation criteria are accessible to students through e-class

LITERATURE AND STUDY MATERIALS / READING LIST

- F.S. HILLIER and G.J. LIEBERMAN, *Introduction to Operations Research*, 8th ed., McGraw-Hill, New York, 2004
- Γιάννης Κολέτσος- Δ. Στογιάννης, *Εισαγωγή στην Επιχειρησιακή Έρευνα*, 3η Έκδοση, Εκδ. Συμεών., Κωδ. **50656312**, 2017 (Εύδοξος).
- Βασίλης Κώστογλου, *Επιχειρησιακή Έρευνα*, 2η Έκδοση, Εκδ. Τζιόλα, Κωδ. **50655958**, 2016 (Εύδοξος).
- Notes, *Algorithmic Operations Research*, 2016, 2d ed, Β. Ζησιμόπουλος
<https://eclass.uoa.gr/modules/document/index.php?course=D40&openDir=/4c2b3151ye79>
- Slides,
<https://eclass.uoa.gr/modules/document/index.php?course=D40&openDir=/59cab0d9gRUH>