

COURSE OUTLINE

1. GENERAL INFORMATION

SCHOOL	MARITIME AND INDUSTRIAL STUDIES		
DEPARTMENT	INDUSTRIAL MANAGEMENT AND TECHNOLOGY		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	TEMA033	SEMESTER OF STUDY	4 th
COURSE TITLE	OPERATIONS RESEARCH I		
INDEPENDENT TEACHING ACTIVITIES <i>in case in which credits are awarded for separate components/parts of the course, e.g. in lectures, laboratory exercises, etc. If credits are awarded for the whole of the course, give the weekly teaching hours and the total credits</i>		WEEKLY TEACHING HOURS	CREDITS
Lectures		4	5.5
<i>Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at section 4.</i>			
COURSE TYPE <i>general background, special background, specialized general knowledge, skills development</i>	General background		
PREREQUISITE COURSES:	None		
LANGUAGE OF INSTRUCTION and EXAMINATION/ASSESSMENT:	Greek		
THE COURSE IS OFFERED TO ERASMUS STUDENTS	No		
COURSE WEBSITE (URL)	https://eclass.unipi.gr/courses/BDT231/		

2. LEARNING OUTCOMES

<p>LEARNING OUTCOMES</p> <p><i>The course learning outcomes, specific knowledge, skills and competences of an appropriate (certain) level, which students will acquire upon successful completion of the course, are described in detail. It is necessary to consult:</i></p> <p>APPENDIX A</p> <ul style="list-style-type: none"> • <i>Description of the level of learning outcomes for each qualifications' cycle, according to the European Higher Education Area's Qualification Framework.</i> • <i>Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and APPENDIX B</i> • <i>Guidelines for writing Learning Outcomes</i>
<p>The aim of the course is to familiarize students with the basic concepts of decision making using Operations Research.</p> <p>Upon successful completion of the course, the students will be able to:</p> <ul style="list-style-type: none"> • Describe real decision making problems and determine the steps that they are going to use in order to solve these problems (problem modeling, methodological approaches and algorithms, interpretation of results, decision implementation) • Describe how they will use the results of the problem data processing • Identify previous cases that are relevant and can help solve the problem • Analyze decision making problems and construct mathematical models describing them, taking into account all the parameters and constraints governing the problem of decision • Choose and apply methodologies appropriate to each case to solve decision problems • Use the right mathematical software and develop applications on the specific software

- tools to solve the problems
- Analyze the results of the solution of the mathematical model and propose the solution or solutions to the problem
- To argue for the choice of solution or decision

General Competencies

Taking into consideration the general competences that students/graduates must acquire (as those are described in the Diploma Supplement and are mentioned below), at which of the following does the course attendance aims

Search for, analysis and synthesis of data and information, by the use of technologies that are necessary according the case

Adapting to new situations

Decision-making

Independent work

Team work

Working in an international environment

Working in an interdisciplinary environment

Introduction of innovative research

Project planning and management

Respect for difference and multiculturalism

Environmental awareness

Social, professional and ethical responsibility and sensitivity to gender issues

Critical consciousness, criticism and self-criticism

Development of free, creative and inductive thinking

- Search for, analysis and synthesis of data and information, by the use of technologies that are necessary according the case
- Adapting to new situations
- Decision-making
- Independent work
- Social, professional and ethical responsibility and sensitivity to gender issues
- Critical consciousness, criticism and self-criticism
- Development of free, creative and inductive thinking

2. COURSE CONTENT

The course includes the following topics:

Week	Topic
1	Introduction to Operations Research I - Introduction: Course content, the process of analysis, design and validation of system optimization, introduction to linear programming, applications, basic structures and properties, introduction to problem formulation.
2	Formulation of linear programming problems - Models, their usefulness and level of analysis, the modeling process, definition of decision variables, formulation of the objective function, determination of constrictions, basic principles of linear programming.
3	Formulation of linear programming problems – Case studies of Linear programming problems, problems in production, transport, content, mixing, production process, multi-period problems.
4	Methods for Linear Programming Solving – Brief presentation of the graphical method, Simplex method, Ellipsoid method, internal point method.
5	The mathematics of the Simplex method – Basic elements of linear algebra mathematical analysis of the Simplex method, explanation of the basic concepts, calculations and variables.
6	Simplex method - Solving problems with the Simplex method
7	Duality theory – Farkas' lemma, necessary and sufficient condition of linear programming, duality theory and explanation of a relation with the necessary condition, primary-binary problem relation, symmetrical dual problems, symmetrical conditions, limitations, practicing the creation of a dual problem when the primary is provided.
8	Duality theory –Duality through practical examples, economic interpretation of dual problem. Building the dual problem when the primary is given.

9	Sensitivity analysis – Mathematical presentation of sensitivity analysis to Linear Programming, sensitivity analysis as per the available resources, sensitivity analysis as per the coefficients of the objective function, interpretation of variables in economic terms.
10	Sensitivity analysis – Solving sensitivity analysis problems, supporting decision making for the introduction of activities/products.
11	Sensitivity analysis – Sensitivity analysis through applications.
12	Networks- A Special Case for Linear Programming Problems: Transportation Problem and Assignment Problem.
13	Revision

In addition, articles, audiovisual lecture material, web addresses, useful information and exercises are posted at eclass.

3. TEACHING METHODS - ASSESSMENT

TEACHING MODE <i>Face-to-face, in-class lecturing, on distance teaching and distance learning etc.</i>	In-class lecturing	
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY <i>Use of ICT in Teaching, Laboratory Education, Communication with students</i>	Teaching: Lectures with audiovisual media, support of the learning process through the eclass platform Communication with students: face-to-face at office hours, email, eclass	
COURSE DESIGN <i>Description of teaching techniques, practices and methods: Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, clinical practice, Art Workshop, Interactive teaching, Educational visits, project, Essay writing, Artistic creativity, etc. The study hours for each learning activity as well as the hours of non- directed study are given according to the principles of the ECTS</i>	Activity / Method	Semester Workload
	Lectures	52
	Case studies/Exercises	26
	Self-study of lecture material and exercises	57
	Counselling	0.5
	Exams (written)	2
	Course Total	137.5
STUDENT PERFORMANCE EVALUATION/ASSESSMENT METHODS <i>Detailed description of the evaluation procedures: Language of evaluation, assessment methods, formative or summative (conclusive), multiple choice questionnaires, short- answer questions, open-ended questions, problem solving, written work, Essay/report, oral exam, public presentation, laboratory work, art interpretation, other.....etc Evaluation criteria are specifically defined and given as well as if and where they are reported and accessible to students.</i>	Language of exams: Greek Assessment Methods: After the last lecture, the exam material is posted at eclass. The final course grade is formed by the written exams (100%) taken in the examination period of the spring semester and, in case of failure, in the September resits. The written examination includes problem solving / exercises and/or short-answer questions. The exam is closed book. The evaluation of students with special learning difficulties in writing and reading (as certified and qualified by a competent institution) is performed according to the relevant procedure decided by the Department Assembly. Notification of the Assessment Criteria: The evaluation criteria are made known during the first lecture and are clearly stated on the course website and e-class. The answers to the exam questions are posted at eclass after the exam	

	date. Students have the opportunity to discuss their exam paper with the course instructor (at the posted office hours) after the announcement of the course grades.
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4. SUGGESTED BIBLIOGRAPHY

-Suggested Bibliography :

- Book [12518837]: Quantitative Analysis for Administrative Decision Making, Vol. A [in Greek], G. Economou, A. Georgiou
- Book [12999151]: Operations Research [in Greek], Ch. E. Mpotsaris
- Book [23153]: Quantitative Analysis of Administrative Decisions, Vol. A [in Greek], N.P. Blesios
- Book [59415056]: Introduction in Operations Research, 10th Edition [in Greek], T.A. Hamdy

-Scientific Journals: not applicable

-Lecture Notes