COURSE OUTLINE

1. GENERAL INFORMATION

SCHOOL	MARITIME AND INDUSTRIAL STUDIES		
DEPARTMENT	INDUSTRIAL MANAGEMENT AND TECHNOLOGY		
LEVEL OF STUDY	UNDERGRADUATE		
COURSE UNIT CODE	ΤΕΜΑΘ34	**SEMESTER OF STUDY**	5th
COURSE TITLE	OPERATIONS RESEARCH II		

INDEPENDENT TEACHING ACTIVITIES *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*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	4	5.5
Add rows if necessary. The organization of teaching and the teaching methods used are described in detail at section 4.		

COURSE TYPE *general background, special background, specialized general knowledge, skills development*	Special 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/BDT214/

2. LEARNING OUTCOMES

LEARNING OUTCOMES

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:

APPENDIX A

- *Description of the level of learning outcomes for each qualifications' cycle, according to the European Higher Education Area's Qualification Framework.*
- *Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and APPENDIX B*
- *Guidelines for writing Learning Outcomes*

The aim of the course is to present the basic mathematical programming problems.

Upon successful completion of the course, the students will be able to:

- Understand administrative problems as an optimization problem
- Understand the decision-making process
- Model with appropriate mathematical or graphical formulation various problems related to administrative and operational research
- Solve linear, integer and mixed integer programming problems.
- Use combined optimization to solve problems that are formatted using graphs.
- Use dynamic programming to resolve complex in formatting problems
- Interpret optimization results

General Competences

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 II** - Introduction: Course content, course relation to Operations Research I, the process of analysis, design and validation of system optimization, Models, their usefulness and level of analysis, review of learning outcomes and solving processes used in the course.
2	**Introduction to Integer Programming -** Definition of integer programming, different types (binary, mixed), relation to linear programming, introduction to integer programming.
3	**Formulation of Integer Programming Problems** – The modeling process, definition of decision variables, formulation of objective function, determination of constraints, logical limitations, if/else constrictions.
4	**Formulation of Integer Programming Problems** – Classical integer programming problems (matching, knapsack, combined auction, problem of a traveling vendor), study of production problems, adding binary decision variables.
5	**Methods for Solving Integer Programming** – Brief presentation of exact and approximation methods.
6	**Problem Solving Using Suitable Methods-** Study of the branch and bound method. Use of suitable software for solving simple integer programming problems
7	**The Transportation Problem** – definition of the transportation problem, formulation as linear program, solving with the transportation algorithm.
8	**The Transportation Problem** – Explanation of the relation between the transportation algorithm with the Simplex method, solving transportation problems.
9	**The Transportation Problem –** Use of the transportation algorithm for sensitivity analysis as well as for supporting decisions for addition/offer change or/and demand.
10	**Formulation of Problems with Networks** – Introduction to graphs and networks, basic modes for network representation, flow networks. The generalized transportation problem, transforming a transportation problem into a minimal cost flow problem.

11	**The Problem of the Minimal Path** – Graphical description of the problem, the Dijkstra algorithm, cost to nodes rather than edges, applications.
12	**The Problem of Maximum Flow –** Graphical description of the problem, residual graph and its use, the Ford-Fulkerson maximum flow algorithm, the maximum flow-minimum cut theorem.
13	**Revision**

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

3. TEACHING METHODS - ASSESSMENT

TEACHING MODE *Face-to-face, in-class lecturing, on distance teaching and distance learning etc.*	In-class lecturing
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY *Use of ICT in Teaching, Laboratory Education, Communication with students*	**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 *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*	

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 *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.*	**Language of exams:** Greek **Assessment Methods:** After the last lecture, the exam material is posted at eclass. The final course grade is formed as follows: • By written exams (90%) taken in the examination period of the winter semester and, in case of failure, in the September resits. • By the project (10%) that will be provided during the semester The written examination includes problem solving / exercises and short-answer questions. It is conducted with closed books. Students may use a 2-page note with the mathematical expressions they think necessary. 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.

4. SUGGESTED BIBLIOGRAPHY

-Suggested Bibliography :

- Book [12518837]: Quantitative Analysis for Administrative Decisionmaking, Vol. B; [in Greek], Economou G., Georgiou A.
- Book [11031]: Applied Mathematical Programming [in Greek], Vaseiliou P.-C.

-Scientific Journals: not applicable

-Lecture Notes