COURSE OUTLINE

(1) OVERVIEW

SCHOOL	MARITIME & INDUSTRY		
DEPARTMENT	INDUSTRIAL MANAGEMENT & TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ΤΕΜΑΘ34	SEMESTER	5
COURSE TITLE	OPERATIONS RESEARCH II		

DISCRETE TEACHING ACTIVITIES *In cases where ECTS credits are awarded to distinct components of the course (e.g., Lectures, Laboratory Exercises, etc.), please indicate them separately. If the credits are awarded as a whole for the entire course, please state the weekly teaching hours and the total number of credits*	WEEKLY TEACHING HOURS	ECTS
Lectures, Project	4	5.5
Please add additional rows if needed. A detailed description of the teaching organization and instructional methods is provided in Section (4).		

COURSE TYPE *core (C), core elective (CE), elective (E) - background, specialization, skill development*	CE - Specialization
PREREQUISITE COURSES:	None.
LANGUAGE OF TEACHING AND EXAMINATIONS:	Greek (English for ERASMUS students)
THIS COURSE IS AVAILABLE TO ERASMUS STUDENTS	Yes
COURSE WEBPAGE (URL)	

(2) LEARNING OUTCOMES

Learning Outcomes

The learning outcomes of the course are described, specifying the particular knowledge, skills, and competencies at the appropriate level that students will acquire upon successful completion of the course.

Please refer to Appendix A

- *Description of the Level of Learning Outcomes for each study cycle according to the Qualifications Framework of the European Higher Education Area.*
- *Descriptive Indicators of Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B.*
- *Concise Guide 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 solve structurally complex problems.
- Interpret optimization results.

General Competences

Taking into account the general competences that a graduate should have acquired (as listed in the Diploma Supplement and outlined below), which of these competences does the course aim to develop?

Searching, analyzing, and synthesizing data and information, using the necessary technologies
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Project design and management
Respect for diversity and multiculturalism
Respect for the natural environment
Demonstration of social, professional, and ethical responsibility and sensitivity to gender issues
Exercising critical and self-critical thinking
Promotion of free, creative, and inductive thinking
…

Generation of new research ideas	*Other competences: …*

- Searching, analyzing, and synthesizing data and information, using the necessary technologies
- Adaptation to new situations
- Decision making
- Autonomous work
- Demonstration of social, professional, and ethical responsibility and sensitivity to gender issues
- Exercising critical and self-critical thinking
- Promotion of free, creative, and inductive thinking

(3) COURSE CONTENT

The course covers the following topics:

Week	Topics
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

Furthermore, articles, audiovisual lecture material, web links to useful resources, exercises, and software are uploaded in electronic format on the eClass platform.

(4) TEACHING and LEARNING METHODS - ASSESSMENT

TEACHING MODE *Face-to-face, in-class lecturing, distance teaching and distance learning etc.*	• Face-to-face in a classroom • Distance teaching & learning (if required)

USE OF INFORMATION AND COMMUNICATION TECHNOLOGY

Use of ICT in Teaching, Laboratory Education, Communication with students

Teaching: Lectures using modern audiovisual equipment, learning support through the eClass electronic platform, synchronous distance teaching via MS Teams.
Laboratory: open-access software for laboratory exercises
Communication with students: face-to-face during office hours, email, eClass platform, MS Teams tools

Organization of Teaching

A detailed description of the teaching methods and approach is provided.
Lectures, seminars, laboratory exercises, fieldwork, study and analysis of literature, tutorials, internships (placements), clinical practice, artistic workshops, interactive teaching, educational visits, project work, writing assignments, artistic creation, etc.

The student's study hours for each learning activity, as well as the hours of independent study, are specified in accordance with the principles of ECTS

Activity	Semester Workload
Lectures	52
Case studies / exercises	26
Project	14
Self-study of lecture material and exercises	43
Consultation Support	0.5
Exams (written)	2
Course Total	137.5

STUDENT ASSESSMENT

Description of the assessment process

Language of assessment, assessment methods, formative or summative evaluation, multiple-choice tests, short-answer questions, essay questions, problem-solving, written assignments, reports, oral examinations, public presentations, laboratory work, clinical patient examination, artistic interpretation, other(s)

Explicitly state assessment criteria and information on whether and where these criteria are accessible to students are included.

Language of Assessment: Greek (English for ERASMUS students)

Assessment Mode: Face-to-face and/or distance learning (if required)

Assessment Methods: The final grade for the course is determined as follows:

- 90% from the written exam, which takes place during the winter examination period or, in case of failure, during the September resits
- 10% from the assignment

The written exam includes problem-solving exercises and short-answer questions. It is a closed-book exam; however, students are allowed to use a formula sheet (up to two pages), which they will have prepared themselves at their own discretion.

Students with Learning Difficulties: Students with certified learning difficulties in reading and writing (as recognized by the competent authority) are assessed according to the procedures established by the Department.

Disclosure of Assessment Criteria: The assessment criteria are communicated during the first class and are clearly stated on the course website and the eClass platform. The exam syllabus is announced on eClass following the final lecture of the semester. The exam answers are posted on eClass after the examinations take place. Students have the right to review their graded exams and receive explanations regarding their grades. In cases of further requests, the procedures outlined in the current Study Regulations apply.

(5) SUGGESTED BIBLIOGRAPHY

- Books:

- Koletsos, I., Stoyiannis, D. (2021). Introduction to Operations Research, Kalamara Publications, ISBN: 9789609400688 [102071126] – in Greek
- Hillier, F.S., Lieberman, G.J., Introduction to Operations Research, 11th Edition, Tziolas Publications, ISBN: 9789604189168 [102072205] – in Greek
- Hamdy, T.A. (2024). Introduction to Operations Research, 11th Edition, Tziolas Publications, ISBN: 9786182210437 [122086451] – in Greek
- Albright, S.C., Winston, W.I. (2024). Business Analytics, Da Vinci Publications, ISBN: 9789609732574 [133028101] – in Greek

- Journals:

- Other educational material:

- Lecture Notes and Supporting Material provided by the Instructor