

COURSE OUTLINE

(1) OVERVIEW

SCHOOL	MARITIME & INDUSTRY		
DEPARTMENT	INDUSTRIAL MANAGEMENT & TECHNOLOGY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	TEMA033	SEMESTER	4
COURSE TITLE	OPERATIONS RESEARCH I		
DISCRETE TEACHING ACTIVITIES <i>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</i>		WEEKLY TEACHING HOURS	ECTS
Lectures		4	5.5
<i>Please add additional rows if needed. A detailed description of the teaching organization and instructional methods is provided in Section (4).</i>			
COURSE TYPE <i>core (C), core elective (CE), elective (E) - background, specialization, skill development</i>	C - 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 <i>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.</i> <i>Please refer to Appendix A</i> • 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 familiarize students with the basic concepts of decision making using Operations Research. Upon successful completion of the course, the students will be able to: • 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 Competences <i>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?</i>	
<i>Searching, analyzing, and synthesizing data and information, using the necessary technologies</i> <i>Adaptation to new situations</i>	<i>Project design and management</i> <i>Respect for diversity and multiculturalism</i> <i>Respect for the natural environment</i>

<i>Decision making</i> <i>Autonomous work</i> <i>Teamwork</i> <i>Working in an international environment</i> <i>Working in an interdisciplinary environment</i> <i>Generation of new research ideas</i>	<i>Demonstration of social, professional, and ethical responsibility and sensitivity to gender issues</i> <i>Exercising critical and self-critical thinking</i> <i>Promotion of free, creative, and inductive thinking</i> ... <i>Other competences: ...</i>
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- 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	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	Sensitivity analysis – Mathematical presentation of sensitivity analysis, sensitivity analysis as per the available resources, sensitivity analysis as per the coefficients of the objective function, interpretation of variables in economic terms
8	Sensitivity analysis – Solving sensitivity analysis problems, supporting decision making for the introduction of activities/products
9	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.
10	Optimization software – Presentation of software solutions for problem formulation and solving, use of MS Excel for solving simple optimization problems. Evaluation and interpretation of results and metrics, interpretation of variables in economic terms
11	Game theory – Introduction to games, dominant strategy, Nash equilibrium, games of constant (zero) sum, conservative strategy, max-min and min-max
12	Game theory – Formulation of games using linear programming, solving games with the Simplex method
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 <i>Face-to-face, in-class lecturing, distance teaching and distance learning etc.</i>	• Face-to-face in a classroom • Distance teaching & learning (if required)															
USE OF INFORMATION AND COMMUNICATION TECHNOLOGY <i>Use of ICT in Teaching, Laboratory Education, Communication with students</i>	Teaching: Lectures using modern audiovisual equipment, learning support through the eClass electronic platform, synchronous distance teaching via MS Teams. Communication with students: face-to-face during office hours, email, eClass platform, MS Teams tools															
Organization of Teaching <i>A detailed description of the teaching methods and approach is provided.</i> <i>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.</i> <i>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</i>		<table><tr><th>Activity</th><th>Semester Workload</th></tr><tr><td>Lectures</td><td>52</td></tr><tr><td>Case studies / exercises</td><td>26</td></tr><tr><td>Self-study of lecture material and exercises</td><td>57</td></tr><tr><td>Consultation Support</td><td>0.5</td></tr><tr><td>Exams (written)</td><td>2</td></tr><tr><td>Course Total</td><td>137.5</td></tr></table>	Activity	Semester Workload	Lectures	52	Case studies / exercises	26	Self-study of lecture material and exercises	57	Consultation Support	0.5	Exams (written)	2	Course Total	137.5
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STUDENT ASSESSMENT <i>Description of the assessment process</i> <i>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)</i> <i>Explicitly state assessment criteria and information on whether and where these criteria are accessible to students are included.</i>	Language of Assessment: Greek (English for ERASMUS students) Assessment Mode: Face-to-face and/or distance learning (if required) Assessment Methods: The final grade of the course is determined 100% by the written exams during the spring semester examination period and, in case of failure, during the September resits. The written exam includes problem-solving exercises and short-answer questions. It is conducted with closed books. Students are allowed to bring a two-page formula sheet containing any mathematical expressions they consider necessary. 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 - Journals: - Other educational material: • Lecture Notes and Supporting Material provided by the Instructor
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