COURSE OUTLINE

1. GENERAL

SCHOOL	ENGINEERING		
DEPARTMENT	PRODUCT AND SYSTEMS DESIGN ENGINEERING		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	**3301**	**SEMESTER**	**5th**
COURSE TITLE	**Operation Research**		

INDEPENDENT TEACHING ACTIVITIES *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits*	**WEEKLY TEACHING HOURS**	**CREDITS**
Lectures	**3**	**6**
Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).		

COURSE TYPE *general background, special background, specialised general knowledge, skills development*	Special Background
PREREQUISITE COURSES:	NONE
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK/ENGLISH
COURSE DELIVERED TO ERASMUS STUDENTS	YES
MODULE WEB PAGE (URL)	https://eclass.uowm.gr/

2. LEARNING OUTCOMES

Learning outcomes

The purpose of this course is to introduce the students to the processes and methods of operation research. The students are introduced to the following concepts: problem modeling, methods of optimization, linear programming and decision analysis.

On successful completion of this module the learner will be able to:

1. Knows the basic concepts of optimization theory.
2. Recognizes and analyzes decision problems.
3. Creates templates / models of linear programming problems.
4. Knows techniques / methodologies for solving them.
5. Model, solve and interpret linear programming problems.
6. Model, solve and interpret decision theory problems.

General Skills

Upon successful completion of the program students will:

- have the theoretical and practical background on the field of product and systems design engineering and the corresponding profession.
- utilize scientific knowledge to understand, analyze and solve problems.
- apply a wide range of scientific and technical knowledge concerning the design and development of products and systems.

3. COURSE CONTENTS

- *Introduction and history of Operation Research*
- *Overview of the Operation Research Modeling Approach*: Defining the problem, Formulating a mathematical model, Deriving solutions, Testing the model, Preparing to apply the model, Implementation. Examples.
- *Linear Programming*: Prototype examples, The linear programming model.
- *Graphical LP Solution*: Two-variable LP model, Solution, Sensitivity Analysis.
- *Simplex method*: LP model, Optimal solution, Sensitivity Analysis, Special cases in the Simplex method.
- *Duality*: Dual problem, Primal-Dual relationships.
- *Integer Linear programming*: Branch and Bound algorithm
- *Binary Integer Linear programming*
- *Transportation problem*: Transportation algorithms, Determination of the starting solution (Northwest corner method, Least cost method, Vogel method), Iterative computations of the transportation algorithm (method MODI).
- *The assignment model*: Hungarian method.
- *Decision Analysis*: Decision making under certainly, risk and uncertainty, Decision tree, Game theory.

4. TEACHING METHODS - ASSESSMENT

MODE OFDELIVERY	In class, face to face
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	• Video and slide presentations via projector • Support of teaching process via the electronic platform e-class • Communication with students.
TEACHING METHODS	
ASSESSMENT METHODS	Projects (they are counted with 20% each in the final score) Final written exam which includes: i. Short-answer questions ii. Problem solving

Activity	***Semester workload***
Lectures	80
Projects	40
Non-directed study	30
Course total	**150**

5. ATTACHED

- Suggested bibliography:

- Taha H. *Operations research.* Maxwell Macmillan International Editions, New York.
- Hillier F., Lieberman G. *Introduction to Operation Research.* 7th edition, McGraw-

Hill, New York.

- Ahuja R.K., Magnanti T.L., Orlin J.B. “Network Flows,” in G.L. Nemhauser, A.H.G. Rinnooy Kan, and M.J. Todd (eds.), *Handbooks in Operations Research and Management Science, Vol 1: Optimization*, North-Holland, Amsterdam, the Netherlands.
- Brickman L. *Mathematical Introduction to Linear Programming and Game Theory*, Springer-Verlag, Berlin and New York.
- Diwckar U. *Introduction to Applied Optimization*, Kluwer Academic Publishers, Boston.