ECTS

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM IN THE EUROPEAN UNION

General course information:

Course title:	**Optimization Techniques**	**Course code:**	**ΓΚ4230**
Credits:	5	**Work load (hours):**	150
Course level:	Undergraduate ☑	Graduate ☐	
Course type:	Mandatory ☐	Selective ☑	
Course category:	Basic ☐	Orientation ☐	
Semester:	8th	**Hours per week:**	4

Course objectives (capabilities pursued and learning results):

Course Contents:
Linear Programming Problems
Theory of linear programming, Dual Problem
Simplex Algorithm
Integer Linear Programming
Branch and Bound Method
Transportation Problems – Assignment
Network Optimization
Local search Methods
Non Linear Programming
Dynamical Programming
Computational Problems in MATLAB and R

Optimization has many applications in engineering. The optimal route design problem, the optimal construction design, water network design, workplace organization and time programming, logistics are some examples of operational research and optimization. During this course, the principles of operational research are presented and optimization techniques are applied for operational research at scientific and/or professional level.
The aim of the course is to make students familiar with modeling problems of optimization and solving them by using different optimization algorithms techniques. It emphasizes on theory of linear and nonlinear programming and applies algorithmic techniques for piecewise or approximated solutions. As a result, students can take basic knowledge about Operational Research and System's Optimization especially on Civil Engineering problems including Decision Making.

Prerequisites:

Numerical Analysis

Instructor's data:

Name:	
Level:	
Office:	
Tel. – email:	
Other tutors:	

Specific course information:

Week No.	**Course contents**	**Hours**	
		Course attendance	**Preparation**
1	Operational Research – Introduction in systems Optimization	**4**	**2**
2	Linear Programming (LP)	**4**	**2**
3	Linear Programming. Simplex Algorithm	**4**	**2**
4	Special Issues on LP (B Phase Method, Big M Method, Dual problem, Sensitivity analysis	**4**	**2**
5	Problem Solving (LP on Computer)	**4**	**2**
6	Integer Linear Programming	**4**	**2**
7	Branch and Bound method	**4**	**2**
8	Transportation problems	**4**	**2**
9	Network Optimization	**4**	**2**
10	Local Optimization Methods	**4**	**2**
11	Constrained Nonlinear programming	**4**	**2**
12	Dynamical Programming	**4**	**2**
13	Computational Problems. Applications on Matlab and R.	**4**	**2**
14	Computational Problems. Applications on Matlab and R.	**4**	**2**

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
60	3	3	-

Suggested literature:

Karatzas G., and Papadopoulou M., 2016. Optimization Methods in Environmental Systems, Disigma Publ., Thessaloniki (in Greek).

Karlaftis M. G. and Lagaros N. D., 2010. Operational Research and Optimization for Engineers, Symmetria Publ. [Eudoxus Code Number: 35475] (in Greek).

Protopapas A., 2015. Technical Systems Optimization [e-book] Athens: SEAB, Available at: http://hdl.handle.net/11419/5906 (in Greek).

Rovithakis G.A., 2007. Optimization Techniques, Tziola Publ. [Eudoxus Code Number: 18549025] (in Greek).

Bronson R., and Naadimuthu G., 2010. SCHAUM'S Operational Research. Kleidarithmos Publ., (in Greek).

Taha H.A., 2012. Introduction to Operational Research, 9th Edition, Tziola Publ., (in Greek).

Bartholomew-Biggs M., 2008. Nonlinear Optimization with Engineering Applications, Springer.

Beck A., 2014. Introduction to Nonlinear Optimization: Theory, Algorithms, and Applications with MATLAB, SIAM.

Lopez C.P., 2014. MATLAB Optimization Techniques, Springer.

Venkataraman P., 2009. Applied Optimization with MATLAB Programming, 2nd Edition, Wiley.

Teaching method *(select and describe if necessary* - **weight***):* Course Lectures are in combination with Laboratory exercises, which are very important in course evaluation. Moreover a semester subject is taking place which emphasizes in utilization of the presented methods and techniques.

Teaching	☑	50%
Seminars	☐	-
Demonstrations	☐	-
Laboratory	☑	30%
Exercises	☑	20%
Visits at facilities	☐	-
Other *describe):*……	☐	-
Total		100%

Evaluation method *(select)*- **weight:**

	written	*%*	*Oral*	*%*
Homework	☑	20	☐	
Class project	☑	30	☐	

Interim examination	☐		☐	
Final examinations	☑	50	☐	
Other *(describe):* ……	☐		☐	