

TOROS ÜNİVERSİTESİ

Faculty Of Engineering
Industrial Engineering (English)

Course Information

OPTIMIZATION METHODS					
Code	Semester	Theoretical	Practice	National Credit	ECTS Credit
		Hour / Week			
INE409	Fall	3	0	3	4

Prerequisites and co-requisites	
Language of instruction	English
Type	Elective
Level of Course	Bachelor's
Lecturer	Asst. Prof. Dr. Türker ERTEM
Mode of Delivery	Face to Face
Suggested Subject	
Professional practise (internship)	None
Objectives of the Course	To build up the mathematical models. To show application areas in real-life. To apply the solution algorithms.
Contents of the Course	Introduction and basic concepts. Unconstrained optimization. Analytic solution, Numerical methods and algorithms in unconstrained optimization. Constrained Optimization: Optimization with equality constraints, Optimization with equality and inequality constraints, Optimization with special constraints. Linear programming and applications.

Learning Outcomes of Course

#	Learning Outcomes
1	Produce to solutions about engineering problems
2	Give information about optimization sciences
3	Produce to solutions about optimization sciences problems
4	Give information about last technologies of optimization sciences

Course Syllabus

#	Subjects	Teaching Methods and Technics
1	Mathematical Review I. Methods of Proof and Some Notation II. Vector Spaces and Matrices III. Transformations	
2	IV. Concepts from Geometry V. Elements of Calculus	lecturing, discussing, problem solving
3	Unconstrained Optimization VI. Basics of Set-Constrained and Unconstrained Optimization 6.1 Introduction 6.2 Conditions for Local Minimizers	lecturing, discussing, problem solving
4	VII. One-Dimensional Search Methods 7.1 Golden Section Search 7.2 Fibonacci Search	lecturing, discussing, problem solving
5	7.3 Newton's Method 7.4 Secant Method	lecturing, discussing, problem solving
6	Nonlinear Constrained Optimization XIX. Problems with Equality Constraints 19.1 Introduction 19.2 Problem Formulation	lecturing, discussing, problem solving
7	19.3 Tangent and Normal Spaces 19.4 Lagrange Condition	lecturing, discussing,

		problem solving
8	19.5 Second-Order Conditions 19.6 Minimizing Quadratics Subject to Linear Constraints	lecturing, discussing, problem solving
9	XXI. Convex Optimization Problems 21.1 Introduction 21.2 Convex Functions 21.3 Convex Optimization Problems	lecturing, discussing, problem solving
10	Linear Programming XV. Introduction to Linear Programming 15.1 A Brief History of Linear Programming 15.2 Simple Examples of Linear Programs 15.3 Two-Dimensional Linear Programs	lecturing, discussing, problem solving
11	15.4 Convex Polyhedra and Linear Programming 15.5 Standard Form Linear Programs 15.6 Basic Solutions	lecturing, discussing, problem solving
12	15.7 Properties of Basic Solutions 15.8 A Geometric View of Linear Programs	lecturing, discussing, problem solving
13	XVII. Duality 17.1 Dual Linear Programs 17.2 Properties of Dual Problems	lecturing, discussing, problem solving
14	XVI. Simplex Method 16.1 Solving Linear Equations Using Row Operations 16.2 The Canonical Augmented Matrix	lecturing, discussing, problem solving
15		
16	Final Exam	

Course Syllabus

#	Material / Resources	Information About Resources	Reference / Recommended Resources
1	Chong E.K.P., Žak S.H. An Introduction to Optimization, Second Edition Wiley (2001)		
2	Griva I., Nash, S.G., Sofer A. Linear and Nonlinear Optimization, Second Edition SIAM (2009)		
3	Luenberger D.G., Ye Y. Linear and Nonlinear Programming, Third Edition Springer (2008)		

Method of Assessment

#	Weight	Work Type	Work Title
1	30%	Mid-Term Exam	Mid-Term Exam
2	30%	Mid-Term Exam	Mid-Term Exam
3	40%	Final Exam	Final Exam

Relationship between Learning Outcomes of Course and Program Outcomes

#	Learning Outcomes	Program Outcomes	Method of Assessment
1	Produce to solutions about engineering problems	1,4,11	1,2,3
2	Give information about optimization sciences	1,4,11	1,2,3
3	Produce to solutions about optimization sciences problems	1,4,11	1,2,3
4	Give information about last technologies of optimization sciences	1,4,11	1,2,3

PS. The numbers, which are shown in the column Method of Assessment, presents the methods shown in the previous table, titled as Method of Assessment.

Work Load Details

#	Type of Work	Quantity	Time (Hour)	Work Load
1	Course Duration	14	3	42
2	Course Duration Except Class (Preliminary Study, Enhancement)	14	1	14
3	Presentation and Seminar Preparation	0	0	0

4	Web Research, Library and Archival Work	0	0	0
5	Document/Information Listing	0	0	0
6	Workshop	0	0	0
7	Preparation for Midterm Exam	2	6	12
8	Midterm Exam	2	2	4
9	Quiz	0	0	0
10	Homework	0	0	0
11	Midterm Project	0	0	0
12	Midterm Exercise	0	0	0
13	Final Project	0	0	0
14	Final Exercise	0	0	0
15	Preparation for Final Exam	1	16	16
16	Final Exam	1	2	2
				90