MAK 408 OPTIMIZATION TECHNIQUES AND APPLICATIONS IN MECHANICAL ENGINEERING		**Mechanical Engineering Department**	
Credit Hours	3	**Theory**	3
ECTS	6	**Application/Recitation**	0
Year/Term	2020-21 / Summer	**Laboratory**	0
Compulsory/Elective	Elective		
Prerequisite(s)	MAT 201 Linear Algebra		
Instructors	Dr. Erdem Acar Room: 119, Phone: 4257, E-mail: acar@etu.edu.tr		
Assistants	To be announced		
Class/Laboratory Schedule	Monday 16:30 - 18:20 Thursday 10:30 - 12:20		
Catalog Description	Introduction and basics of optimization. Linear Programming. Unconstrained optimization. Analytical methods, numerical methods and algorithms for unconstrained optimization. Constrained optimization. Analytical methods, numerical methods and algorithms for constrained optimization. Sensitivity analysis.		
Course Learning Outcomes	-- ability to formulate an optimization problem and understand its mathematical basics -- ability to identify the most appropriate optimization techniques (or tools) for a given optimization problem -- ability to apply optimization techniques to maximize the performances of mechanical systems		
Text Book(s)	There is no unique textbook for this course.		
References and Other Course Material	-- R.T. Haftka, Z. Gürdal, Elements of Structural Optimization, 3rd Edition, Kluwer Academic Publishers, 1992. -- S.S. Rao, Engineering Optimization: Theory and Practice, 4th Edition, John Wiley & Sons, 2009. -- J.S. Arora, Introduction to Optimum Design, 3rd Edition, Elsevier, 2012. -- G.N. Vanderplaats, Numerical Optimization Techniques for Engineering Design, VR&D, 1998.		

Contribution to the Curriculum (%)		
	Mathematics and Basic Sciences	20
	Engineering Topics	50
	Engineering Design	30
	General Education	-

Expected Performance Measures and Tentative Grading	**Performance Measures**	**Quantity**	**Contribution (%)**
	Midterms	1	25
	Quiz	4	15
	Term Project	1	25
	Final	1	35
	Other ( )	-	-

COURSE OUTLINE	
Week	**Topics**
1	Introduction
2	Basics of Optimization
3	Unconstrained Optimization
4	Unconstrained Optimization (continued)
5	Unconstrained Optimization with MATLAB
6	Surrogate Based Optimization
7	Constrained Optimization
8	Constrained Optimization (continued)
9	Constrained Optimization with MATLAB
10	Global Optimization Methods
11	Multi-objective Optimization
12	Applications

RELATIONSHIP TO PROGRAM OUTCOMES		
1	An ability to apply knowledge of mathematics, science, and engineering	X
2	An ability to design and conduct experiments, as well as to analyze and interpret data	
3	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	X
4	An ability to function on multidisciplinary teams	
5	An ability to identify, formulate, and solve engineering problems	X
6	An understanding of professional and ethical responsibility	
7	An ability to communicate effectively in English and in Turkish	
8	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
9	A recognition of the need for, and an ability to engage in life-long learning	X
10	A knowledge of contemporary issues	
11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	X

Prepared by : Dr. Erdem Acar **Date:** 17/05/2021