ESOGU ELECTRICAL-ELECTRONICS ENGINEERING DEPARTMENT
COURSE INFORMATION FORM

Course Title	Course Code
OPTIMIZATION METHODS FOR ENGINEERING APPLICATIONS	**151228621**

Semester in Program	Number of Course Hours per Week		ECTS Credit
	Theory	Practice	
8	3	0	5

Course ECTS Credit Distribution				
Basic Sciences	**Engineering Sciences**	**Design**	**General Education**	**Social**
0	5	0	0	0

Language of Instruction	Course Level	Course Type
English	Undergraduate	Elective

Prerequisite	None
Objectives of the Course	To introduce the fundamental concepts of mathematical modelling and optimization. To teach how to solve constrained and unconstrained optimization problems. To teach how to apply meta-heuristics to an optimization problem.
Brief Course Content	Formulation of Optimization Problems, Concept of Constrained and Unconstrained Optimization, Search Methods, Linear Programming, Simplex Method, Genetic Algorithm, Differential Evolution Algorithm, Particle Swarm Optimization, Simulated Annealing Algorithm, Tabu Search Algorithm.

	Learning Outcomes of the Course	Contributed POs	Teaching Methods *	Assessment Methods **
1	They will have fundamental knowledge about optimization concept.	1c,	1	A
2	They will be able to obtain the mathematical model of an optimization problem.	1c, 2	1	A
3	They will be able to choose and apply the proper search method to solve constrained and unconstrained optimization problems.	1c, 2	1	A
4	They will be able to solve linear problems by using simplex method.	1c, 2	1	A
5	They will have fundamental knowledge about meta-heuristics.	1c,	1	A, D, E, G
6	They will be able to select and apply an appropriate metaheuristic to solve an optimization problem.	1c, 2	1	A, D, E, G

***Teaching Methods** **1:**Lecture, **2:**Discussion, **3:**Experiment, **4:**Simulation, **5:**Question-Answer, **6:**Tutorial, **7**:Observation, **8**:Case Study, **9:**Technical Visit, **10:**Problem Solving, **11:**Induvidual Work, **12**:Team/Group Work, **13**:Brain Storm, **14:**Project Design / Management, **15:**Report Preparation and/or Presentation

****Assessment Methods** **A:**Exam, **B:**Quiz, **C:**Oral Exam, **D:**Homework, **E:**Report, **F:**Article Examination, **G:**Presentation, **I:**Experimental Skill, **J:**Project Observation, **K**:Class Attendance; **L**:Jury Exam

Main Textbook	Ken M. Ragsdell, A. Ravindran, Gintaras V. Reklaitis, Engineering Optimization: Methods and Applications, 2nd Edition, John Wiley & Sons, 2006.
Supplementary Resources	(1) Singiresu S. Rao, Engineering Optimization: Theory and Practice, 5/e, John Wiley & Sons, 2019. (2) Omid Bozorg-Haddad, Mohammad Solgi, Hugo A. Loáiciga , Meta- heuristic and Evolutionary Algorithms for Engineering Optimization, John Wiley & Sons, 2017. (3) Xin-She Yang, Engineering Optimization: An Introduction with Metaheuristic Applications, John Wiley & Sons, 2010.
Necessary Course Material	None

Course Weekly Schedule	
1	Introduction

2	Mathematical Modelling
3	Unconstrained Optimization
4	Search Methods – *Gradient Search, Steepest Descent, Newton's Method,*
5	Constrained Optimization
6	Linear Programming – *Fundamentals*
7	Linear Programming – *Simplex Method*
8	Mid-Term Exams
9	Genetic Algorithm – *Fundamentals*
10	Genetic Algorithm – *Applications*
11	Differential Evolution Algorithm
12	Particle Swarm Optimization
13	Simulated Annealing Algorithm
14	Tabu Search Algorithm
15	Multiobjective Optimization
16,17	Final Exams

Calculation of Course Workload			
Activities	**Count**	**Time (Hour)**	**Total Workload (Hour)**
Weekly classroom time	14	3	42
Weekly study time (review, reinforcing, preparation)	14	3	42
Homework			
Taking a quiz			
Studying for a quiz			
Oral exam			
Studying for an oral exam			
Report writing (Preparation and presentation time included)			
Project (Preparation and presentation time included)	1	20	20
Presentation (Preparation time included)			
Mid-Term Exam	1	2	2
Studying for Mid-Term Exam	1	25	25
Final Exam	1	2	2
Studying for Final Exam	1	25	25
		Total workload	**158**
		Total workload / 30	**5.27**
		Course ECTS Credit	**5**

Assessment	
Activity Type	**%**
Mid-term	30
Project Observation	30
Final Exam	40
Total	100

COURSE CONTRIBUTION TO THE PROGRAM OUTCOMES (5: Very high, 4: High, 3: Middle, 2: Low, 1: Very low)		
NO	**PROGRAM OUTCOMES**	**Contribution**
1	a. Sufficient knowledge of mathematics	
	b. Sufficient knowledge of basic sciences	
	c. Sufficient basic engineering and Electrical-Electronics engineering knowledge	5
	d. Skill of applying all these knowledge and experience to complicated Electrical-Electronics engineering problems	
2	Skill of defining, identifying, formulating and solving the complicated problems in Electrical-Electronics engineering and related areas by applying appropriate analysis and modelling methods.	5
3	Skill of designing a complicated process, system, equipment or product by applying modern design methods under realistic constraints and conditions.	
4	To analyze and solve the complicated engineering problems: a. skill of developing, selecting and applying the required techniques and devices	
	b. skill of using information technologies effectively	
5	To study the complicated on the complicated Electrical-Electronics engineering problems and research subjects: a. skill of experimental design	
	b. skill of performing the experiments, collecting the data and analyzing and interpreting the results	
6	a. Skill of performing individual studies	
	b. Skill of performing intra and interdisciplinary and multidisciplinary teamwork and studies	
7	a. Skill of effective oral and writing communication in Turkish	
	b. Skill of improving and using foreign language knowledge	
	c. Skill of effective reporting, understanding the reports and preparing the design and production reports	
	d. Skill of effective presentation and giving and getting clear and understandable instructions.	
8	Awareness of the necessity of life-long learning and skill of accessing to information and following the improvements in contemporary science and technology	
9	a. Awareness of necessity of behaving in accordance with the ethical principles and awareness of the importance of having professional ethical responsibilities	
	b. Knowledge about legal regulations and standards of engineering	
10	a. Knowledge about project management, risk management and change management	
	b. Awareness of the significance of entrepreneurship and innovation	
	c. Knowledge about sustainable development	
11	Knowledge about the effects of engineering applications and practices on the global and social health, ecology and safety, knowledge about the current problems in relation to the working areas of Electrical-Electronics engineering; and awareness of the legal issues resulting from engineering solutions	
12	Knowledge about modern problems in local and universal scale	

INSTRUCTORS				
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Date: 17.07.2024