COURSE DESCRIPTION FORM	
Course Code and Name	CENG368 HEURISTIC OPTIMIZATION ALGORITHMS (TECH. ELECT.)
Course Semester	6
Catalogue Data of the Course (*Course Content*)	Fundamentals of optimization, traditional and gradient-based optimization methods, single-state optimization algorithms, tabu search, iterative local search, genetic algorithm, memetic algorithm, particle swarm optimization, ant colony algorithm, differential evolution algorithm, artificial bee colony algorithm, solving binary problems with optimization algorithms, solving constrained optimization problems
Course Textbooks	Metaheuristics: From Design to Implementation, El-Ghazali Talbi, Wiley, 2009.
Supplementary Textbooks	Essentials of Metaheuristics, Sean Luke, Lulu, 2012. How to Solve It: Modern Heuristics, Zbigniew Michalewicz, David B. Fogel, Springer, 2004.
Credit (*ECTS*)	6
Prerequisites for the Course (*Attendance Requirements*)	Obligatory course attendance
Course Type	Selective
Language of Instruction	English
Course Objectives	To introduce the use of heuristic optimization algorithms in solving optimization problems. To explain the mathematical basis and methodology of heuristic algorithms and to introduce various applications of these algorithms.
Course Learning Outcomes	1. Knows the fundamentals of optimization 2. Knows traditional optimization methods 3. Knows single-state optimization algorithms 4. Learns population-based algorithms 5. Knows the application of genetic algorithms to different problem types 6. Knows the memetic algorithm 7. Knows the differential evolution algorithm 8. Knows swarm-based optimization methods 9. Knows particle swarm optimization 10. Knows ant colony algorithm 11. Knows artificial bee colony algorithm 12. Knows the application of heuristic optimization algorithms to binary problems 13. Explain constrained optimization
Instruction Method *(Face-to-face, Distance education etc.)*	The mode of delivery of this course is face-to-face.
Weekly Schedule of the Course	1. Fundamentals of optimization 2. Traditional optimization methods 3. Solution representation 4. Single-state optimization algorithms (Hill climbing, Local search) 5. Simulated annealing algorithm 6. Tabu search, iterative local search 7. Genetic algorithm 8. Genetic algorithm 9. Differential evolution algorithm, Memetic algorithm 10. Particle swarm optimization 11. Ant colony algorithm 12. Artificial bee colony algorithm 13. Solving binary problems with heuristic optimization algorithms 14. Constrained optimization problems
Teaching Activities *(The time spent for the activities listed here will determine the amount of credit required)*	Weekly theoretical course hours Reading activities Internet search and library work Designing and implementing materials Making a report

	Midterm and revision for midterm Final exam and revision for final exam

Assessment Criteria

	Number(s)	Weight (%)
Midterm exam	1	30
Assignment	0	
Application	0	
Project	1	30
Practice	0	
Quiz	0	
Final exam	1	40
Total	3	100

Workload of the Course

Activity	Number of Weeks	Duration (Weekly Hour)	End of Semester Total Workload
Weekly theoretical course hours	14	3	42
Weekly practical course hours			
Reading activities	14	1	14
Internet search and library work	14	2	28
Designing and implementing materials	3	10	30
Making a report	1	8	8
Preparing and making presentations			
Midterm and revision for midterm	1	15	15
Final exam and revision for final exam	1	15	15
Total workload			152
Total workload/ 25			6,08
Course Credit (ECTS)			6

Contribution Level between Course Outcomes and Program Outcomes

No	Program Outcomes	1	2	3	4	5
1	Knowledge of mathematics, science, basic engineering, computing, and computer engineering; ability to use this knowledge in solving complex engineering problems.					X
2	Ability to define, formulate and analyze complex engineering problems using basic science, mathematics and engineering knowledge and considering the UN Sustainable Development Goals relevant to the problems addressed.					X
3	Ability to design creative solutions to complex engineering problems; ability to design complex systems, processes, devices, software, algorithms or products to meet current and future requirements, considering realistic constraints and conditions.					X
4	Ability to select, use and develop appropriate techniques, resources and modern engineering and informatics tools, including estimation and modeling, for the analysis and solution of complex engineering problems while being aware of their limitations.				X	
5	Ability to use research methods to examine complex engineering problems or research topics in computer engineering, including reviewing the literature, designing experiments, conducting experiments, collecting data, analyzing and interpreting results.				X	

	6	Knowledge of the effects of engineering practices and the standards used in these practices on society, health and safety, economy, sustainability and environment within the scope of the UN Sustainable Development Goals; awareness of the consequences of engineering solutions in the fields of information security and law.					
	7	Acting in accordance with engineering professional principles and knowledge on ethical responsibility; awareness of acting impartially, without discrimination on any issue, and being inclusive of diversity.					
	8	Ability to work effectively individually and as a team member or leader in intradisciplinary and multidisciplinary teams (face-to-face, remote, or hybrid).		X			
	9	Ability to conduct effective verbal and written communication on technical issues in Turkish or English, prepare reports, make effective presentations and prepare software documentation, considering the various differences of the target audience (such as education, language, profession).				X	
	10	Knowledge of business practices such as project, risk and change management and economic feasibility analysis; awareness of entrepreneurship and innovation.		X			
	11	Lifelong learning skill that includes the ability to learn independently and continuously, to adapt to new and developing scientific practices and technologies, and to think inquisitively about technological changes.				X	
Lecturer(s) and Contact Information	Assoc. Prof. Dr. Ümit ATİLA umitatila@gazi.edu.tr						