Course number and name	END 457 / Heuristic Optimization
Credits, contact hours, categorization of credits	3 credits / 42 hours / Engineering topic
Instructor or course coordinator	Seda YANIK
Text book and other supplemental materials	 El-G. Talbi, <i>Metaheuristics: From Design to</i> <i>Implementation</i>, John Wiley & Sons, New York, 2009. D.E. Goldberg, <i>Genetic Algorithms In Search</i>, <i>Optimization And Machine Learning</i>, Addison-Wesley Professional, New York, 1989. (Other References) C.R. Reeves. <i>Modern Heuristic Techniques for</i> <i>Combinatorial Problems</i>, John Wiley & Sons, New York, 1993. A.P. Engelbrecht, <i>Computational Intelligence: An</i> <i>Introduction</i>, John Wiley&Sons, England, 2002.

Course information			
Content	Basics of the Heuristic Search algorithms, Lagrangean Relaxation Heuristics, Simulated Annealing, Tabu Search, Genetic Algorithm, Ant Colony and Swarm Intelligence,		
Prerequisites	END 331 Operations Research I		
Туре	Selected elective		

Course learning outcomes

Students who pass the course will be able:

- I. Use Heuristic optimization when needed;
- II. Mathematics and application fields of Local search algorithms and Simple Heuristics,
- III. Mathematics and application fields Genetic Algorithms,
- IV. Mathematics and application fields Ant Colony and Swarm Intelligence,
- V. Overview of other Population Based Heuristic Methods

Student outcomes	Level of contribution
SO1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.	High
SO2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.	Partial
SO3. An ability to communicate effectively with a range of audiences.	Little
SO4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	Little
SO5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	Little
SO6. An ability to develop and conduct appropriate experimentation, analyse and interpret data, and use engineering judgment to draw conclusions.	Not applicable
SO7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	Partial

Week	Topics	Learning outcome(s)
1	Introduction to Heuristic Algorithms	Ι
2	Modelling, Basic Concepts and Hill Climbing	I, II
3	Classical Construction Heuristics	I, II, IV
4	Classical Improvement Heuristics	I,II, IV
5	Lagrangean Relaxation Heuristics	II, III, IV
6	Simulated Annealing and Example Problems	II, III, IV
7	Tabu Search and Example Problems	II, III, IV
8	Evolutionary Heuristics and Genetic Algorithm	II, III, IV
9	Ant Colony Optimization	II, III, IV
10	Ant Colony Optimization & Particle Swarm Optimization	II, III, IV
11	Particle Swarm Optimization	II, III, IV
12	Artificial Neural Networks	II, III, IV
13	Project Presentations	II, III, IV, V
14	Project Presentations	II, III, IV, V