EASTERN MEDITERRANEAN UNIVERSITY
COURSE OUTLINE
SPRING 2025-2026

COURSE CODE	*CMPE538* **COURSE LEVEL** *GRADUATE*
COURSE TITLE	EVOLUTIONARY MULTI-OBJECTIVE OPTIMIZATION
COURSE TYPE	*Area Elective*
LECTURER(S)	Asst. Prof. Dr. Ahmet Ünveren
CREDIT VALUE	3 **ECTS VALUE** *6*
PREREQUISITES	-
COREQUISITES	-
DURATION OF COURSE	One semester
WEB LINK	Cmpe.emu.edu.tr

CATALOGUE DESCRIPTION

This graduate-level course introduces the basic concepts of evolutionary multi-objective optimization techniques. The course starts with an introduction to multi-objective optimziation basics and spends almost 10% of the course on theory and 30% of the course on classical multi-objective optimization techniques. The remaining 60% of the course is spent on discussing evolutionary multi-objective optimization (EMO) methods in detail. This is a unique course where students get an exposure to both theory and numerical optimization methodologies involving classical and evolutionary methods. Strengths and weaknesses of each approach are highlighted. The course also discusses a number of current research issues, besides discussing a number of interesting case studies. Active student participation is necessary in lectures. The students, by the end of this course, are expected to identify the uses of basic evolutionary optimization techniques in different fields of engineering.

AIMS & OBJECTIVES

- To present the motivation for and basic concepts of optimization according to multiple criteria as opposed to traditional single-criterion optimization
- To introduce evolutionary algorithms as a well-suited methodology for multiobjective optimization
- To teach the participants how to apply the methodology to multiobjective optimization problems and evaluate the obtained results

GENERAL LEARNING OUTCOMES (COMPETENCES)

On successful completion of this course, all students will have developed **knowledge** and **understanding** of:

- How to use Evolutionary mutiobjective Algorithms
- Choose the most appropriate optimization method for the problem at hand
- Interpret multiobjective optimization outcomes

ASSIGNMENTS

There will be 1 or 2 Assignments

METHOD OF ASSESSMENT

Midterm I 35 %
Final 45 %
Assignments 20 %

TEXTBOOK

Coello Coello, Carlos A.; Van Veldhuizen, David A. & Lamont, Gary B., *Evolutionary Algorithms for Solving Multi-Objective Problems*, 2nd Ed. Springer,
, 2007

The lecture topics within the semester are as in the following schedule:

WEEK		TOPICS
1		**Basic Concepts**
2		**MOP Evolutionary Algorithm Approaches**
3		**MOP Evolutionary Algorithm Approaches (Cont.)**
4		**MOEA Local Search and Coevolution**
5		**MOEA Local Search and Coevolution (Cont.)**
6		**MOEA Test Suites**
7		**Metrics**
8		**MOEA Theory and Issues**
9		**MOEA Theory and Issues (Cont.)**
10		**Applications**
11		**Parallel Multiobjective Evolutionary Algorithms**
12		**Multi-Criteria Decision Making**
13		**Multi-Criteria Decision Making (Cont.)**
14		**Alternative Metaheuristics for Multiobjective Optimization**
15		**Some Promising Paths of Future Research**
16		**Review**

PLAGIARISM

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