

IE 443 Multi-objective Decision Analysis Fall 2021

Very Important:

As per the university-wide precautionary health guidelines all students are asked:

1. ***To sit in the same seat each lecture.*** Once students' seating plans are finalized, all students will be asked to use an SRS service to enter the Bilkent ID numbers of their colleagues seated immediately around them in all of their courses. This is very important for effective testing and tracing.
2. ***To keep their masks on their faces at all times during a class.*** Please note that according to a Senate decision, faculty members can initiate a disciplinary investigation for those students who refuse to follow this precaution strictly.
3. ***Not to come to class if they are "not allowed on campus"*** due to HES code risk, positive diagnosis, and in the case of unvaccinated students, failure to provide a negative test result in a timely manner. Such prohibited students ***can not be present*** in the classroom, and if they are, they will be asked to leave the campus immediately and the incident will be reported to the department.

Instructor: Özlem Karsu, Ext: 1960, Office: EA331, E-mail: ozlemkarsu@bilkent.edu.tr

Course Web Page: <https://courses.ie.bilkent.edu.tr/ie443>

Office Hours: By appointment

Teaching Assistant: Egemen Elver (egemen.elver@bilkent.edu.tr)

Office: EA327 Office hours: TBA.

Recommended Textbooks: There is no required textbook for this course. A set of articles will be provided, and additional readings will be distributed as needed.

Optional Textbooks:

- Strategic Decision Making: Multiobjective Decision Analysis with Spreadsheets, C. W. Kirkwood, Brooks/Cole, Cengage Learning, 1997.
- Multicriteria Optimization, M. Ehrgott, Springer Berlin, 2005.
- Decisions with Multiple Objectives: Preferences and Value Tradeoffs, R. Keeney and H. Raiffa, New York: Wiley, 1976

Course Summary:

Quantitative decision analysis. Structuring of objectives and value hierarchies, and determination of value functions. Introduction to consistent characterization of preferences under certainty. Value analysis under uncertainty including expected value analysis, utility theory, multi-attribute risk aversion, certainty equivalent calculations and the analytical hierarchy process.

Homework Assignments: A set of exercises will be assigned and graded.

Project: The course project involves applying one or more of the methods discussed in the class and conducting quantitative analysis on a bi-objective programming application. You will work on the project in groups of 3.

Exams: There will be one in-class midterm and one in-class comprehensive final exam. The exams will be closed-books and closed notes. The exact dates and places will be announced during the semester.

Grading Policy: The overall score will be computed based on the following scheme:

Homeworks: 24% (4×6 each)

Midterm Exam: 26 %

Final Exam: 35 %

Project: 15 %

Tentative Course Outline:

- Introduction to multicriteria decision making and multiobjective decision analysis
- Preferences Under Certainty: Value function based approaches, multiobjective value analysis
- Preferences Under Certainty: Methods not relying on value function evaluations
- Multi-objective Optimization Problems (MOPs): Categorization
- Solution concepts for MOPs
- Weighted Sum-Scalarization and its use for various biobjective programming problems
- Epsilon-Constraint Scalarization and its use for various biobjective programming problems
- Pascoletti-Serafini Scalarization and its use for various biobjective programming problems
- Decisions with Uncertainty, Utility Theory
- Multi-attribute Risk Aversion, Certainty Equivalent
- Multi-criteria Decision Making Applications in Operations Research