BLG 545E Discrete Optimization

Fall 2022

Instructor:	Asst. Prof. Sanem Kabadayı
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Course website: `https://ninova.itu.edu.tr/Ders/3399`
Lecture time and location: W 11:30-2:30PM, EEB Z3

Description: This course is an introduction to discrete optimization and exposes students to some of the most fundamental concepts and algorithms in the field. It covers linear programming, local search, heuristics, and integer programming from their foundations to their applications for complex practical problems.

Intended Audience: This course is intended for graduate students. This class is structured to be interesting and relevant to students who are using or plan to use optimization in their research and are interested in solving optimization problems. The target audience is quite broad: graduate students from computer engineering, math, operations research, and related disciplines.

Prerequisites: This class does not assume previous exposure to optimization.

Required texts:

- *Introduction to Operations Research*, by F. S. Hillier, G. J. Lieberman, McGraw Hill, 2009. 9th ed.

- *Stochastic Local Search: Foundations and Applications*, by H. H. Hoos, T. Stuetzle, Elsevier, 2005.

Homework: Three problems will be assigned that you will work on through the semester. You may use any algorithm or general purpose optimization tool. These tools are not tailored to a specific problem. However, you cannot use solvers that are dedicated to solving a specific problem. For example, you MAY use "CPLEX" or "CPOPT", but you are NOT allowed to use the "Concorde TSP Solver". You will submit your solutions to a system, and your solution will be graded. At the end of the semester, there will be demo sessions where you will have to demonstrate and explain your solutions. The homework assignments are individual assignments. You should not discuss your solution approaches and solutions.

Evaluation: The distribution of percentages for the final grade will be as follows:

3 Homework Assignments	50 %
2 Midterms	50 %

Attendance and Absences: As this is a graduate course, it is imperative that you attend every online lecture. To meet the 70% attendance requirement, you must be present for at least 10 lectures (we have a total of 14 lectures this semester). If you do miss class, it is your responsibility to find out (from a classmate) what you missed, including class notes and announcements.
No make-up exams will be given. Absences from any midterm will result in a grade of zero for that exam. The first midterm will be on Wednesday, October 19, 2022. The second midterm will be on Wednesday, December 21, 2022.

Academic Integrity: Follow the Graduate Academic Regulations (`https://www.sis.itu.edu.tr/TR/mevzuat/lisansustu-yonetmelik.php`), Graduate Academic Regulations Senate Rules (`https://www.sis.itu.edu.tr/TR/mevzuat/lisansustu-esaslar.php`), and Departmental Graduate Rules (`https://bb.itu.edu.tr/egitim/lisansustu/bilgisayar-muhendisligi-lisansustu/lisansustu-bildirisi`). Cheating on the exams or on homework/projects will result in disciplinary action. Your homework assignments or project MAY NOT include any copy-paste material (from the Internet or from someone else's paper/thesis/project) EVEN IF they are referenced (This is still plagiarism!). All work must be your own and in your own words.

Tentative course schedule (subject to change):

Week	Day	Date	Topic
1	W	21-Sep	Introduction to course, introduction to optimization
2	W	28-Sep	Terminology, simple heuristics: nearest neighbor, hillclimbers
3	W	5-Oct	Heuristics, HW problems
4	W	12-Oct	Simulated annealing, tabu search, GRASP
5	W	19-Oct	MIDTERM 1
6	W	26-Oct	Introduction to linear programming
7	W	2-Nov	Solving LP: simplex method
8	W	16-Nov	Simplex, duality, and sensitivity
9	W	23-Nov	Population based metaheuristics, evolutionary algorithms
10	W	30-Nov	Evolutionary algorithms, ant colony optimization
11	W	7-Dec	Transportation and assignment problems
12	W	14-Dec	Integer programming
13	W	21-Dec	MIDTERM 2
14	W	28-Dec	Integer programming
		TBA	Project presentations

Online announcements and e-mail notifications: You will be responsible for checking the course website on Ninova and your e-mail regularly for class work and announcements. You are also responsible for all online and in-class announcements that may or may not be included in the syllabus.

E-mail etiquette: Your full name must appear in the e-mail. Do not send the same e-mail repeatedly. Your e-mails may be in English or Turkish. Regardless of which language you use, use proper grammar, lowercase/uppercase letters, and punctuation. You e-mails should not look like chat messages.

Last day for add/drop: The add/drop period ends on Friday, September 23, 2022.
You may withdraw from the course between September 26, 2022 and September 30, 2022.
There is no way to drop or withdraw from a course after September 30, 2022!

Announcement of letter grades: The Academic Calendar lists January 22, 2023 (12 PM) as the deadline for the submission of final letter grades.