

MATH 9880 Selected Topics in Operations Research: Conic Programming

Spring 2020

Instructor: Boshi Yang (boshiy@clemsun.edu)

Class Times: TTh 3:30 - 4:45

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Office Hours: TTh 8:30 - 10:00

Prerequisites: MATH 8100 (Mathematical Programming) or MATH 4400 (Linear Programming) or equivalent. MATH 8110 (Nonlinear Programming) is recommended but not required.

Textbook: A. Ben-Tal and A. Nemirovski, *Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications*, SIAM, 2001. (Lecture notes available online at https://www2.isye.gatech.edu/~nemirovs/Lect_ModConvOpt.pdf)

Objectives: Conic optimization has become an important component in the optimization society in recent decades. This course covers fundamental concepts in conic optimization, including conic duality, second-order cone programming, semidefinite programming, copositive programming, and their applications. Upon successful completion of the course, students are expected to be able to formulate conic programming problems, understand conic duality theory, and solve moderate-scale conic programs using available software. Students should also be comfortable to apply conic programming techniques to nonconvex optimization problems such as quadratically constrained quadratic programs and mixed integer programs.

Materials covered: The course will cover most of the theoretical work in the first 4 chapters of the textbook. A selection of research articles will be provided to supplement the textbook. A tentative list of topics is as follows.

- Convex cones and geometry
- Conic programming duality
- Second-order cone representability
- Semidefinite representability
- Copositive programming and relaxation
- Solvers for conic programming
- Conic relaxations for combinatorial problems
- Conic relaxations for quadratically constrained quadratic programs

Course evaluation: Homework will be assigned throughout the semester. Students will be required to give presentations to the class on selected topics. A computational project involving using solvers for conic programs will be due at the end of the semester.

	Homework	Presentations	Final Project
Points	30	40	30

Class cancellation: The class will be dismissed in the case when the instructor or the invited lecturer is not present within 15 minutes of the scheduled start time.

Final grade:

	Over 85	70-84	60-69	Below 60
Grade	A	B	C	F

Accommodation: It is university policy to provide, on a flexible and individualized basis, reasonable accommodations to students who have disabilities. Students with disabilities requesting accommodations should make an appointment with Accessibility Services (656-6848), to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Accessibility Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester..

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