MATH 8110 Nonlinear Programming

Spring 2018

Instructor: Boshi Yang (boshiy@clemson.edu)

Class Times: TR 3:30pm–4:45pm   **Office:** Martin O-204
Classroom: Martin E-005   **Office Phone:** (864) 656-5198
Tentative office Hours: MW 10:00am–11:30am

Textbook: Mokhtar S. Bazaraa, Hanif D. Sherali, and C. M. Shetty, *Nonlinear Programming: Theory and Algorithms*, 3rd edition (2006), John Wiley and Sons.

Recommended book: Jorge Nocedal and Stephen J. Wright, *Numerical Optimization*, 2nd edition (2006), Springer-Verlag New York.

Prerequisites: MATH 4400/6400 (Linear programming) and MATH 4540/6540 (Advanced Calculus II). Knowledge of a programming language (e.g., FORTRAN, C, MATLAB, etc.) is expected.

Objectives: The goal of this course is to study the theoretical analysis and algorithm practice of optimization problems that have nonlinear objective function and/or constraints. The course will cover basic results on convex analysis, necessary and sufficient optimality conditions, duality theory, and algorithms for nonlinear optimization and their convergence analysis.

Materials covered: The course will cover selected sections of chapters 2-9 of the textbook. The tentative topics include:

- Convex sets and convex functions

- Unconstrained optimization theory

- Algorithms for unconstrained optimization

  - Steepest descent method
  - Newton and quasi-Newton methods
  - Conjugate gradient methods

- Constrained optimization theory

- Lagrange duality

- Algorithms for constrained optimization: penalty and barrier methods

It should be noted that the topics covered do not necessarily follow the chapter sequence of the textbook. In addition, some additional materials may be covered during the course. Class notes will be provided on Canvas.

Course evaluation: Homeworks and mid-term exams will be given throughout the semester. A comprehensive project, in which students need to perform necessary theoretical analysis and algorithm implementation, and write a formal technical report, will be due at the end of the semester. Late homework and project submissions will not be accepted.

	Homeworks	Midterm exams	Project	Final exam
Points	25	25	25	25

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:

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

Attendance: All students are required to attend the first scheduled day of classes. Students who cannot attend the first class are responsible for contacting the instructor to indicate their intent to remain in that class. If a student does not attend the first class meeting or contact the instructor by the second meeting or the last day to add, whichever comes first, the instructor has the option of dropping the student from the roll. However, students intending to drop a class should request the course be dropped and should not assume they will be dropped due to lack of attendance.

Accommodation: Student Accessibility Services coordinates the provision of reasonable accommodations for students with disabilities and students experiencing barriers due to inaccessibility. Accommodations are individualized, flexible, and confidential and are based on the nature of the disability and the academic environment, in compliance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990.

Students are encouraged to consult with the Accessibility Services staff early in the semester, preferably prior to the first day of class. Current documentation of a specific disability from a licensed professional is needed. Additional information or appointments are available from Student Accessibility Services, Suite 239 in the Academic Success Center, 656-6848. Details on policies and procedures are available at http://www.clemson.edu/academics/studentaccess/.

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Academic integrity statement: As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning'. Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately to charges of violations of academic integrity.