MATH 8100 - Mathematical Programming – Spring 2019

T & Th, 12:30 p.m. – 1:45 p.m. Martin E-004

Instructor:	Dr. Margaret Wiecek	**Office:**	Martin Hall O-208
E-mail:	wmalgor@clemson.edu	**Ph:**	656-5245
Office hours:	T & Th 11:15 p.m. – 12:00 pm or by appointment		

Class cancellation: A class is canceled 15 minutes after the instructor fails to arrive.
Attendance: Regular attendance is strongly recommended.

Textbook: I. Griva, S. G. Nash, and A. Sofer, *Linear and Nonlinear Optimization*, 2nd edition, SIAM, Philadelphia, 2009.
Software: AMPL; LINDO, SAS, MATLAB, or others.

Electronic equipment: Students are not allowed to use any electronic equipment in class for calling, texting, listening, emailing, etc.

Topical outline *

Review
- Linear algebra: solvability of systems of linear equations, rank, linear independence, basis
- Concepts in geometry of linear systems
- Review of multivariable calculus

Introduction
- Mathematical Optimization and Mathematical Programming

Nonlinear Programming (NLP)
- Formulation and basic concepts
- Convex sets and functions
- Unconstrained problems: optimality conditions, methods
- Constrained problems: optimality conditions, methods

Linear Programming (LP)
- Introduction to LP problems: examples of applications, basic concepts;
- Geometry of polyhedral sets; computations: simplex algorithm, Phase I, degeneracy and cycling;
- Duality: weak and strong duality, complementary slackness, economic interpretation, dual simplex algorithm
- Sensitivity; performance of simplex algorithm;

Network Flow Programming (NFP)
- Models and formulations; basic concepts
- Network simplex algorithm

* We will attempt to adhere to the syllabus. However, the actual pace may be adjusted at the instructor's discretion.

Student learning objectives: Upon successful completion of this course, a student will be able to
- develop NLP, LP, NFP models for a class of decision-making problems,
- solve smaller-size NLP, LP, NFP problems analytically,
- solve LP problems using software,
- analyze LP models to get additional insight into the theory of linear programming and applications of LP to real-life decision-making problems,
- continue graduate-level education taking advanced courses in operations research.

Grading:

Homework **25%**

Students are encouraged to discuss the assignments with one another but are expected to individually write the document they submit.
All assignments will be collected.
All or some assignments will be graded and discussed in class.
Scores will be lowered for late submission or illegible writing.

Midterm exam March 5 or 12, 2019 **30%**

The exam will be given in class with closed notes and books. No make-up exam.

Project **15%**

Application of LP to solving problems in mathematical sciences.
Details will be given after Exam 1.
Due **April 18, 2019**. Scores will be lowered for late submission.

Final exam Monday, April 29, 2019, 3:00 – 5:30 pm **30%**

Grading scale: A (86-100), B (71-85), C (56-70), F ($\leq$55) The scale will be strictly followed.

Disability access: 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 Disability Services (656-6848), to discuss specific needs within the first month of classes. Students should present a Faculty Accommodation Letter from Student Disability Services when they meet with instructors. Accommodations are not retroactive and new Faculty Accommodation Letters must be presented each semester.

Title IX statement: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. The policy is located at
http://www.clemson.edu/campus-life/campus-services/access/non-discrimination-policy.html.
Jerry Knighton serves as Clemson's Title IX coordinator and he may be reached at knightl@clemson.edu or 656-3181.

Academic Dishonesty Policy will be strictly enforced (see Student Handbook). *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."*
For more information refer to the graduate academic integrity policy at
http://gradspace.editme.com/AcademicGrievancePolicyandProcedures#intergritypolicy