

EMIS 8371 - Spring 2022

Linear Programming

Tuesdays and Thursdays: 12:30 pm - 1:50 pm Caruth 0184

Instructor(s) : Dr.Harsha Gangammanavar
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Office : 331 Caruth Hall
Office hours : Tuesdays & Thursdays 2:00 – 3:30 pm,
also by appointment.

Description: *This is the first doctoral course in the field of optimization that serves as the foundation for all subsequent courses in the broad area of mathematical programming. The course is intended for first-year Ph.D. students and advanced M.S. students who intend to pursue a doctoral degree. The course provides a complete development of theoretical and computational aspects of linear programming (LP) with topics such as – linear programming formulations, simplex algorithm, optimality conditions, duality, practical computation, and applications.*

Objectives: This course has been designed with the following objectives:

- i. Help the student become a sophisticated practitioner of linear optimization, or a researcher.
- ii. Develop the ability to formulate fairly complex optimization problems in a practically solvable manner.
- iii. Describe the available solution methods.
- iv. Build understanding of the qualitative properties of the solutions.
- v. Provide insights into optimization problems through a geometric view and develop an ability to translate these insights into algebra suitable for understanding algorithms.
- vi. Emphasize principal ideas in the field such that further detail can be acquired by the student with little additional effort.

Course Material:

• **Textbook:**

1. Dimitris Bertsimas and John N. Tsitsiklis, *Introduction to Linear Optimization*, Athena Scientific, 1997, ISBN-13: 978-1-886529-19-9.

• **References:**

1. Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, *Linear Programming and Network Flows*, 4th edition, Wiley, 2010, ISBN: 978-1-118-21132-8.
2. Michael C. Ferris, Olvi L. Mangasarian and Stephen J. Wright, *Linear Programming with MATLAB*, MOS-SIAM Series on Optimization, 2007.
3. AMPL: Robert Fourer, David M. Gay, and Brian W. Kernighan, *AMPL: A Modeling Language for Mathematical Programming*, Second edition, ISBN 0-534-38809-4 (available online: [here](#)).

- **Other material:** Select lecture notes, homework exercises and their solutions, course announcements, and other course related material will be posted on SMU Canvas course page.
- Homework assignments will require the use of MATLAB, OR/MS software packages AMPL and/or CPLEX. Visit the AMPL website to download free copies of the student versions of AMPL and CPLEX for your choice of operating system. It will be beneficial to bring a laptop to class with AMPL and CPLEX installed. MATLAB is available for free for the SMU-OIT.

Course Requirement and Grading:

- **Homework:** Regular homework assignments will be assigned over the semester to help you understand the concepts developed in the class. You are encouraged to discuss the course material, including homework, with other students. However, you are completely responsible for your submission. Please follow the underlying guidelines:
 - a. You will turn in your assignment electronically on the Canvas course page.
 - b. Submissions should be made a single file (*.doc or *.pdf). When the assignment includes computer codes and you are asked to submit the code, copy them into the same submission file.
 - c. If you prefer to write down your homework, then make sure your handwriting is legible, scan and combine them together into a single PDF file. Please do not upload photographs clicked on your mobile devices.
 - d. The file should be named as follows: *lastname.hw#.pdf* or *lastname.hw#.doc*. For example, Jane Doe's Homework-5 submission will be named *doe.5.pdf*.
 - e. **Late homework will not be accepted for grading**, unless prior permission has been granted. Please make sure you complete the homework early to avoid any unforeseen situations (internet/electronic troubles etc.).

Failure to follow the above guidelines will result in **incremental penalty**.

- **Examinations:** All exams will be “in-class” and “closed book”. You are allowed to bring one 8.5” x 11” sheet of hand written notes for use during the exam. This sheet must be turned in with the exam. Students are allowed to use their calculators in the exams. All exams are comprehensive.
 - Midterm examination: Thursday, March 10, 2019, 12:30 pm — 1:50 pm.
 - Final examination: TBD.

- **Grade distribution:**

Homework	Midterm Exam	Final Exam
50%	20%	30%

Tentative course plan: The following are the tentative topics and lecture assignments:

- Geometry of LP
- Polyhedra, extreme points, degeneracy
- Simplex method
- Duality
- Complexity of LP, ellipsoid method
- Large-scale optimization

University policies:

- **Disability Accommodations:** Students needing academic accommodations for a disability must first register with Disability Accommodations & Success Strategies (DASS). Students can call 214-768-1470 or visit <http://www.smu.edu/Provost/ALEC/DASS> to begin the process. Once registered, students should then schedule an appointment with the professor as early in the semester as possible, present a DASS Accommodation Letter, and make appropriate arrangements. Please note that accommodations are not retroactive and require advance notice to implement.

- **Sexual Harassment:** All forms of sexual harassment, including sexual assault, dating violence, domestic violence and stalking, are violations of SMU's Title IX Sexual Harassment Policy and may also violate Texas law. Students who wish to file a complaint or to receive more information about the grievance process may contact Samantha Thomas, SMU's Title IX Coordinator, at accessequity@smu.edu or 214-768-3601. Please note that faculty and staff are mandatory reporters. If students notify faculty or staff of sexual harassment, they must report it to the Title IX Coordinator. For more information about sexual harassment, including resources available to assist students, please visit www.smu.edu/sexualmisconduct.
- **Pregnant and Parenting Students:** Under Title IX, students who are pregnant or parenting may request academic adjustments by contacting Elsie Johnson (elsiej@smu.edu) in the Office of the Dean of Students, or by calling 214-768-4564. Students seeking assistance must schedule an appointment with their professors as early as possible, present a letter from the Office of the Dean of Students, and make appropriate arrangements. Please note that academic adjustments are not retroactive and, when feasible, require advance notice to implement.
- **Religious Observance:** Religiously observant students wishing to be absent on holidays that require missing class should notify their professors in writing at the beginning of the semester, and should discuss with them, in advance, acceptable ways of making up any work missed because of the absence. (See "Religious Holidays" under University Policy No. 7.22).
- **Excused Absences for University Extracurricular Activities:** Students participating in an officially sanctioned, scheduled university extracurricular activity should be given the opportunity to make up class assignments or other graded assignments that were missed as a result of their participation. It is the responsibility of the student to make arrangements for make-up work with the instructor prior to any missed scheduled examinations or other missed assignments. (See 2020-2021 SMU Undergraduate Catalog under "Enrollment and Academic Records/Excused Absences.")
- **Student Academic Success Programs:** Students needing assistance with writing assignments for SMU courses may schedule an appointment with the Writing Center through Canvas. Students who would like support for subject-specific tutoring or success strategies should contact SASP, Loyd All Sports Center, Suite 202; 214-768-3648; <https://www.smu.edu/sasp>.
- **Caring Community Connections Program:** CCC is a resource for anyone in the SMU community to refer students of concern to the Office of the Dean of Students. The online referral form can be found at smu.edu/deanofstudentsccc. After a referral form is submitted, students will be contacted to discuss the concern, strategize options, and be connected to appropriate resources. Anyone who is unclear about what steps to take if they have concerns about students should either consult the CCC Reference Guide or contact the Office of the Dean of Students at 214-768-4564.
- **Campus Carry Law:** In accordance with Texas Senate Bill 11, also known as the 'campus carry' law, and following consultation with entire University community, SMU chooses to remain a weapons-free campus. Specifically, SMU prohibits possession of weapons (either openly or in a concealed manner) on campus. For more information, please see: Weapons Policy.
- **University Honor Code:** Students are reminded that the SMU Honor Code applies to this course. Academic misconduct of any kind is prohibited by the SMU Student Honor Code. Violations will be dealt with in a manner determined by the instructor in consultation with the Honor Council.
- **COVID-19 and Other Medical-Related Absences:** Students who test positive for COVID-19 and need to isolate, or who are notified of potential exposure, must follow SMU's Contact Tracing Protocol. To ensure academic continuity and avoid any course penalties, students should follow the same procedures described by their instructors as they would for any other medical-related absence in order to be provided with appropriate modifications to assignments, deadlines, and exams.