

MATH 3370-110: Introduction to Linear Programming

Spring 2018 rev. 12.08.2017

Texas A&M University-Central Texas

INSTRUCTOR AND CONTACT INFORMATION

Instructor: Geoff Diestel

Office: Virtual through Skype(gdiestel) or Collaborate.

Phone: 254-319-4741 (You may call or text)

Email: Canvas Inbox.

Office Hours:

I will be available virtually most days M-F between 11am and 3pm. To guarantee time with me, make an appointment 24 hours in advance. You may also make an appointment for evenings and weekends but give me 48 hours of notice.

Mode of instruction and course access:

This course is 100% online and uses Canvas:

This course uses the A&M-Central Texas Canvas Learning Management System
[<https://tamuct.instructure.com>].

Student-instructor interaction:

You may send questions and make appointments to meet on Skype or using Collaborate. Do not wait until the last 48 hours before an assignment is due as other students from other classes may already have made an appointment with me. I will check Canvas Inbox first thing in the morning and around 4pm M-F. Just text or call me if you need more immediate assistance. If you want to set up a group online meeting using Collaborate or Skype, just make an appointment.

911 Cellular:

Emergency Warning System for Texas A&M University – Central Texas

911Cellular is an emergency notification service that gives Texas A&M University-Central Texas the ability to communicate health and safety emergency information quickly via email, text message, and social media. All students are automatically enrolled in 911 Cellular through their myCT email account.

Connect at [911Cellular](https://portal.publicsafetycloud.net/Texas-AM-Central/alert-management) [https://portal.publicsafetycloud.net/Texas-AM-Central/alert-management] to change where you receive your alerts or to opt out. By staying enrolled in 911Cellular, university officials can quickly pass on safety-related information, regardless of your location.

COURSE INFORMATION

Course Overview and description: This course provides an introduction to linear programming or operations research. This is a general area of optimization problems which utilize geometry to maximize/minimize objective functions based on constraints in the form of linear inequalities/equations. The first part of the course will focus on 2 variable problems, graphical solutions, and an introduction to modeling, i.e. translating word problems into math problems. The next part of the course will focus on problems with more variables with a focus on modeling as a solver will be used to get final answers. The third part of the course will focus on sensitivity analysis. In this part, you must learn the basic simplex algorithm to pivot matrices to solve problems step by step to determine if small changes in the given information change your decision. This is useful for long term planning of production models in business.

Course Objective:

Students will demonstrate knowledge in solving linear programming problems graphically, step-by-step with a basic simplex method, and by using a solver. Students will master the ability to translate real world problems into well organized linear programming problems to find solutions and to perform sensitivity analysis for long-term production planning.

Student Learning Outcomes:

- Producing graphical solutions of systems of linear inequalities.
- Using graphical solutions of systems of inequalities to solve 2 variable linear programming problems.
- Identify all decision variables and objective function of real world linear programming problems.
- Identify all constraints of a real world problem as a linear inequality or equation that must be satisfied by decision variables.
- Solving higher variable problems step-by-step using a basic version of the simplex method and by using a solver.
- Applying step-by-step understanding of the basic simplex method to perform sensitivity analysis to determine how sensitive optimal decision are with respect to small changes in the given information.

Required Reading and Textbook(s): *Schaum's Outlines Operations Research* Second Edition by Richard Bronson and Govindasmi Naadimuthu. This textbook is primarily used as a source of basic information, many worked out examples and similar problems for practice which have final answers in the back. Other material will be provided by instructor in the form of supplemental documents and videos.

INSTRUCTOR POLICIES.

Due dates are strict so I can give feedback to the class. This means there will be no extensions. If you miss an assignment for a legitimate reason that you can document, then your grade for that assignment will be replaced by your exam average. However, this can only be done once. Refer to Course Requirements for submission rules for Written Assignments or anything which

will be submitted like a written assignment.

TECHNOLOGY REQUIREMENTS AND SUPPORT

You are free to use any technology you have available but you still need to provide explanations of your solutions. On Exams, you will only be allowed a calculator but on the take-home final you can use anything. I will present some technologies in videos for certain problems but that does not mean you have to do it that way unless the assignment states to do so.

Technology Requirements

This course will use the A&M-Central Texas Instructure Canvas learning management system. Logon to A&M-Central Texas Canvas [<https://tamuct.instructure.com>].

Username: Your MyCT username (xx123 or everything before the "@" in your MyCT e-mail address)
Password: Your MyCT password

Additionally, you will be required to use Excel for some parts of this course. There will be videos illustrating how this is used. You will need to make sure Excel has the Data Analysis and Solver add-ins. Keep in mind that if you are using on campus computers you may have to reload these from time to time or each time you use Excel as the system restores some settings each week. Also, be aware that there are different methods for choosing and activating add-ins if you are using Windows or Mac. Use of other online tools will also be acceptable provide you can present all the required information on assignments.

Canvas Support

Use the Canvas Help link, located at the bottom of the left-hand menu, for issues with Canvas. You can select "Chat with Canvas Support," submit a support request through "Report a Problem," or call the Canvas support line: 1-844-757-0953.

For issues related to course content and requirements, contact your instructor.

Other Technology Support

For log-in problems, students should contact Help Desk Central.

24 hours a day, 7 days a week:

Email: helpdesk@tamu.edu

Phone: (254) 519-5466

[Web Chat](http://hdc.tamu.edu): [<http://hdc.tamu.edu>]

Please let the support technician know you are an A&M-Central Texas student.

COURSE REQUIREMENTS

The course is split into 3 parts. **Each part will consist of:**

1. *JOURNAL Submissions:* You must submit an updated journal most weeks so I can see what book problems you have attempted, solved, or have questions about. This is worth 25 for the entire semester with a 2 point deduction made each week if you do not submit serious attempts for the new practice problems given for that week(see calendar). By "serious attempt", I mean you have tried most of the problems suggested AND on those your questions are beyond "I just don't get it". If you just don't get a problem, you need to ask about that sooner by meeting with me online. These problems will not be graded but you will get the answers to check yourself. Restate each problem you worked on and date it.

Explain how you solved the problem or ask a question related to that problem. Clearly, mark your questions with a different font color or with a * so I can find them easily. This journal will grow throughout the semester and you can always revisit problems from past weeks that you did not get and ask more questions. Just update the marking of your new questions that I have not yet addressed and unmark those I did.

2. **WRITTEN ASSIGNMENTS:** There will be two written assignments worth 25 points each to be submitted as a single PDF document. This may be done in Word, Latex, or using some other document creating software but the final submitted file must be exported to PDF if necessary. If images are to be included, they must be in the document and not submitted separately. These will typically be due on Wednesday starting in Week 2(see calendar) but there are only 6 all semester. Assignments will be posted at least a week in advance of due date and will contain their individual rubric.
3. **EXAM REVIEWS:** There will be an exam review assignment worth 25 points to be submitted just as the written assignments. It will be due on the Wednesday prior to the exam week so I can give feedback in time for the exam.
4. **EXAMS:** There will be an exam worth 50 points which (except for Exam 3-take home) must be taken at the TAMUCT testing center or some other testing center approved in advance by the instructor. Your appointment must be made during the week prior to the exam after the instructor has sent the relevant information for the TAMUCT testing center for that exam. If you use another testing center, you must get approval and send the instructor the relevant contact information two weeks prior to the exam. See calendar!
5. **ONLINE DISCUSSIONS:** I will create a discussion for each topic in Canvas. Feel free to use this to share ideas and ask questions to everyone. Keep replies respectful and on point. These are not graded but I will respond to these regularly.

Grading Criteria Rubric and Conversion

There is a total of 400points with A-=90%, B-=80%, C-=70%, and D-=60%. Exams may be curved if it is appropriate to do so but the final grade will not be curved. If you end up missing a higher grade by less than 1%, your grade will be bumped up provided you earned at least 23 points on your journal(see 1. above).

Posting of Grades

Your Journal grade will always read 25 points until points are deducted (see 1. above). Announcements will be sent once I have addressed your journal questions, graded a written assignment, and graded an exam. At that point, you can view comments/feedback. ***IF YOU REPLY TO A GRADED COMMENT and want a response, you will need to text or send me a message in Canvas separately so I know it is waiting for further feedback from me. Canvas does not inform me if you reply to assignment feedback! It does alert me to Inbox messages and discussion posts.***

COURSE OUTLINE AND CALENDAR

Complete Course Calendar

- **Week 1 Jan 16-19:** Obtain the textbook and go through Module 1 on Graphing Linear Inequalities. Submit Journal (Due: Saturday Jan 20 at 6pm).
- **Week 2 Jan 22-26:** Go through Module 2 on Graphical Solutions of Linear Programming

Problems. Submit Written Assignment 1(Due: Wednesday Jan 24 at midnight). Then submit your updated journal (Due: Saturday Jan 27 at 6pm).

- **Week 3 Jan 29-Feb 2:** Go through Module 3 on Identifying Objective Functions and Decision Variables. Submit updated journal (Due: Saturday Feb 3 at 6pm).
- **Week 4 Feb 5-9:** Go through Module 4 on Modeling. Submit Written Assignment 2(Due: Wednesday Feb 7 at 6pm). Submit updated Journal (Due: Saturday Feb 10 at 6pm).
- **Week 5 Feb 12-16:** Schedule your Exam 1 after reading announcement. Submit Exam 1 Review Assignment(Due: Wednesday Feb 14 at 6pm). Submit updated journal (Due: Saturday Feb 17 at 6pm).
- **Week 6 Feb 19-23:** Take Exam 1 at testing center over Modules 1-4. No journal due. Start going through Module 5.
- **Week 7 Feb 26-Mar 2:** Go through Module 5 on Solving Linear Programming Problems in Excel. Submit updated journal (Due: Saturday Mar 3 at 6pm).
- **Week 8 Mar 5-9:** Continue working on Module 5. Submit Written Assignment 3(Due: Wednesday Mar 7 at 6pm). Submit updated journal (Due: Saturday Mar 10 at 6pm).
- **Mar 12-16: Spring Break**
- **Week 9 Mar 19-23:** Go through Module 6 on Modelling Higher Variable Problems. Submit Written Assignment 4(Due: Wednesday Mar 21 at 6pm). Submit updated journal (Due: Saturday Mar 24 at noon).
- **Week 10 Mar 26-30:** Schedule your Exam 2 after reading announcement. Submit Exam 2 Review Assignment (Due: Wednesday Mar 28 at 6pm). Submit updated journal (Due: Saturday Mar 31 at 6pm).
- **Week 11 Apr 2-6:** Take Exam 2 on Modules 1-5. No journal due. Continue going through Module 6.
- **Week 12 Apr 9-13:** Go through Module 7 on the Simplex Method. Submit updated journal (Due: Saturday April 14 at 6pm).
- **Week 13 Apr 16-20:** Continue working on Module 7 and go through Module 8 on Sensitivity Analysis. Submit Written Assignment 5(Due: Wednesday April 18 at 6pm) and updated journal (Due Saturday April 21 at 6pm).
- **Week 14 Apr 23-27:** Continue going through Module 8. Submit Written Assignment 6(Due: Wednesday April 25 at 6pm) and updated journal (Due: Saturday April 28 at 6pm).
- **Week 15 Apr 30-May 4:** Continue working on Chapter 8 and submit Exam Review 3(Due: Wednesday May 2 at 6pm). No journal due and final exam will be done at home.
- **Week 16 May 7-11:** Exam will be posted Tuesday morning and will be submitted like an assignment (Due Thursday May 10 at 6pm).

Important University Dates:

January 2018

January 2, (Tuesday) Winter Break Ends

January 2, (Tuesday) Priority Deadline for Admissions applications

January 5, (Friday) VA Certification Request Priority Deadline

January 11, (Thursday) Convocation

January 12, (Friday) Tuition and Fee payment deadline (16 week & 1st 8 week)

January 15, (Monday) Martin L. King Jr. Day

January 16, (Tuesday) ADD/DROP/LATE REGISTRATION BEGINS (\$25 fee assessed for late

registrants) (16 week & 1st 8 week)

January 16, (Tuesday) Classes Begins

January 18, (Thursday) ADD/DROP/LATE REGISTRATION ENDS (16 week & 1st 8 week)

January 23, (Tuesday) Last day to drop 1st 8-week classes with no record

January 31, (Wednesday) Last day to drop 16 week classes with no record

February 2018

February 2, (Friday) Priority Deadline to Submit Graduation Application

February 9, (Friday) Last day to drop a 1st 8-week class with a Q or withdraw with a W

February 15, (Thursday) Last day to apply for Clinical Teaching

February 23, (Friday) Student End of Course Survey Opens (1st 8-Week Classes)

March 2018

March 1, (Thursday) Deadline to submit application to Teacher Education Program

March 2, (Thursday) Deadline to Submit Graduation Application for Ceremony Participation

March 9, (Friday) 1st 8 week classes end

March 9, (Friday) Deadline for Admissions applications

March 11, (Sunday) Student End of Course Survey Closes (1st 8-Week Classes)

March 12, (Monday) Spring Break Begins

March 12, (Monday) 1st 8-week grades from faculty due by 3pm

March 15, (Thursday) Tuition and Fee Payment Deadline (2nd 8-week classes)

March 16, (Friday) Spring Break Ends

March 19, (Monday) 2nd 8 week begins

March 19, (Monday) Summer Advising Starts

March 19, (Monday) Class Schedule Published

March 19, (Monday) ADD/DROP/LATE REGISTRATION BEGINS (\$25 fee assessed for late registrants) (2nd 8-week classes)

March 21, (Wednesday) ADD/DROP/LATE REGISTRATION ENDS (2nd 8-week classes)

March 27, (Tuesday) Last day to drop 2nd 8-week classes with no record

March 30, (Friday) Last day to drop a 16-week course with a Q or withdraw with a W

April 2018

April 1, (Sunday) GRE/GMAT scores due to Office of Graduate Studies

April 2, (Monday) Scholarship Deadline

April 2, (Monday) Registration begins

April 5, (Thursday) Priority Deadline for International Student Admission Applications

April 13, (Friday) Last day to drop a 2nd 8-week class with a Q or withdraw with a W*

April 13, (Friday) Deadline for submission of final committee-edited theses with committee approval signatures to Office of Graduate Studies

April 27, (Friday) Student End of Course Survey Opens (16 Week and 2nd 8-Week Classes)

May 2018

May 7-11, Finals Week

May 11, (Friday) Last day to file for Degree Conferral (Registrar's Office)(\$20 Late Application Fee applies)

May 11, (Friday) Spring Term Ends

May 11, (Friday) Last day to withdraw from the university (16 week and 2nd 8 week classes)

May 11, (Friday) Last day to apply for \$1000 Tuition Rebate for Spring graduation (5pm)
May 12, (Saturday) Commencement Ceremony Bell County Expo Center 7:00 p.m.
May 13, (Sunday) Student End of Course Survey Closes (16 Week and 2nd 8-Week Classes)
May 14, (Monday) Minimester begins
May 15, (Tuesday) Last Day to clear Thesis Office
May 5, (Tuesday) Final grades due from faculty by 3pm (16 week & 2nd 8 week)
May 21, (Monday) Priority Deadline for Admissions applications
May 25, (Friday) VA Certification Request Priority Deadline
May 28, (Monday) Memorial Day

UNIVERSITY RESOURCES, PROCEDURES, AND GUIDELINES

Drop Policy.

If you discover that you need to drop this class, you must complete a [Drop Request Form](https://www.tamuct.edu/registrar/docs/Drop_Request_Form.pdf) [https://www.tamuct.edu/registrar/docs/Drop_Request_Form.pdf].

Professors cannot drop students; this is always the responsibility of the student. The Registrar's Office will provide a deadline on the Academic Calendar for which the form must be completed, signed and returned. Once you return the signed form to the Registrar's Office, you must go into Warrior Web and confirm that you are no longer enrolled. If you still show as enrolled, FOLLOW-UP with the Registrar's Office immediately. You are to attend class until the procedure is complete to avoid penalty for absence. Should you miss the drop deadline or fail to follow the procedure, you will receive an F in the course, which may affect your financial aid and/or VA educational benefits.

Academic Integrity.

Texas A&M University -Central Texas values the integrity of the academic enterprise and strives for the highest standards of academic conduct. A&M-Central Texas expects its students, faculty, and staff to support the adherence to high standards of personal and scholarly conduct to preserve the honor and integrity of the creative community. Academic integrity is defined as a commitment to honesty, trust, fairness, respect, and responsibility. Any deviation by students from this expectation may result in a failing grade for the assignment and potentially a failing grade for the course. Academic misconduct is any act that improperly affects a true and honest evaluation of a student's academic performance and includes, but is not limited to, cheating on an examination or other academic work, plagiarism and improper citation of sources, using another student's work, collusion, and the abuse of resource materials. All academic misconduct concerns will be reported to the university's Office of Student Conduct. Ignorance of the university's standards and expectations is never an excuse to act with a lack of integrity. When in doubt on collaboration, citation, or any issue, please contact your instructor before

taking a course of action.

Academic Accommodations.

At Texas A&M University-Central Texas, we value an inclusive learning environment where every student has an equal chance to succeed and has the right to a barrier free education. The Department of Access and Inclusion is responsible for ensuring that students with a disability receive equal access to the University's programs, services and activities. If you believe you have a disability requiring reasonable accommodations please contact the Department of Access and Inclusion at (254) 501-5831. Any information you provide is private and confidential and will be treated as such.

For more information please visit our [Access & Inclusion](https://www.tamuct.edu/student-affairs/access-inclusion.html) webpage [https://www.tamuct.edu/student-affairs/access-inclusion.html].

Texas A&M University-Central Texas supports students who are pregnant and/or parenting. In accordance with requirements of Title IX and guidance from US Department of Education's Office of Civil Rights, the Dean of Student Affairs' Office can assist students who are pregnant and/or parenting in seeking accommodations related to pregnancy and/or parenting. For more information, please visit <https://www.tamuct.departments/index.php>. Students may also contact the institution's Title IX Coordinator. If you would like to read more about these [requirements and guidelines online](http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf), please visit the website [http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf].

Title IX of the Education Amendments Act of 1972 prohibits discrimination on the basis of sex and gender – including pregnancy, parenting, and all related conditions. A&M-Central Texas is able to provide flexible and individualized reasonable accommodation to pregnant and parenting students. All pregnant and parenting students should contact the Division of Student Affairs at 254-501-5909 to seek out assistance. Students may also contact the University's Title IX Coordinator.

Tutoring.

Tutoring is available to all A&M-Central Texas students, both on-campus and online. On-campus subjects tutored include Accounting, Advanced Math, Biology, Finance, Statistics, Mathematics, and Study Skills. Tutors are available at the Tutoring Center in Warrior Hall, Suite 111. If you have a question regarding tutor schedules, need to schedule a tutoring session, are interested in becoming a tutor, or any other question, contact Academic Support Programs at 254-519-5796, or by emailing Dr. DeEadra Albert-Green at deeadra.albertgreen@tamuct.edu.

Chat live with a tutor 24/7 for almost any subject on your computer! Tutor.com is an online tutoring platform that enables A&M-Central Texas students to log-in and receive FREE online tutoring and writing support. This tool provides tutoring in over forty subject areas. Access Tutor.com through Canvas.

University Writing Center: Located in 416 Warrior Hall, the University Writing Center (UWC) at Texas A&M University-Central Texas is a free workspace open to all TAMUCT students from 10am-5pm Monday-Thursday with satellite hours in the University Library Monday-Thursday from 6:00-9:00pm. Students may arrange a one-on-one session with a trained and experienced writing tutor by visiting the UWC during normal operating hours (both half-hour and hour sessions are available) or by making an appointment via [WCOOnline](#) at [<https://tamuct.mywconline.com/>]. In addition, you can email Dr. Bruce Bowles Jr. at bruce.bowles@tamuct.edu to schedule an online tutoring session. Tutors are prepared to help writers of all levels and abilities at any stage of the writing process.

While tutors will not write, edit, or grade papers, they will assist students in developing more effective composing practices. By providing a practice audience for students' ideas and writing, our tutors highlight the ways in which they read and interpret students' texts, offering guidance and support throughout the various stages of the writing process. In addition, students may work independently in the UWC by checking out a laptop that runs the Microsoft Office suite and connects to WIFI, or by consulting our resources on writing, including all of the relevant style guides. Whether you need help brainstorming ideas, organizing an essay, proofreading, understanding proper citation practices, or just want a quiet place to work, the University Writing Center is here to help!

If you have any questions about the University Writing Center, please do not hesitate to contact Dr. Bruce Bowles Jr. at bruce.bowles@tamuct.edu.

University Library.

The University Library provides many services in support of research across campus and at a distance. We offer over 200 electronic databases containing approximately 250,000 eBooks and 82,000 journals, in addition to the 72,000 items in our print collection, which can be mailed to students who live more than 50 miles from campus. Research guides for each subject taught at A&M-Central Texas are available through our website to help students navigate these resources. On-campus, the library offers technology including cameras, laptops, microphones, webcams, and digital sound recorders.

Research assistance from a librarian is also available twenty-four hours a day through our online chat service, and at the reference desk when the library is open. Research sessions can be scheduled for more comprehensive assistance, and may take place on Skype or in-person at the library. Assistance may cover many topics, including how to find articles in peer-reviewed journals, how to cite resources, and how to piece together research for written assignments.

Our 27,000-square-foot facility on the A&M-Central Texas main campus includes student lounges, private study rooms, group work spaces, computer labs, family areas suitable for all ages, and many other features. Services such as interlibrary loan, TexShare, binding, and laminating are available. The library frequently offers workshops, tours, readings, and other events. For more information, please visit our [Library website](#) [<https://tamuct.libguides.com/>].

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