

MATH-5380-110 INTRODUCTION TO OPTIMIZATION METHODS

Fall 2023

Texas A&M University-Central Texas

COURSE DATES, MODALITY, AND LOCATION

Aug 28, 2023 - Dec 15, 2023

The instructional method is online and uses the A &M-Central Texas Canvas Learning Management System [<https://tamuct.instructure.com/>].

INSTRUCTOR AND CONTACT INFORMATION

Instructor: Babatunde Sawyerr

Office: All contact is online

Office Phone: (254) 519 8751

Email: Please email the instructor via Canvas email.

Webex (for online meetings): Inside Course Canvas

You may contact me at any time by email. I can respond immediately, and if necessary, we can meet online to answer your question right away.

Office Hours

The instructor is generally available online from 9 A.M. – 1 P.M. on weekdays and Saturdays. *Students are encouraged to make appointments to discuss issues with homework (both before and after grading). Each student is entitled to an average of ½ hour of face-to-face time with the instructor (besides questions you may have with the homework).*

Student-instructor interaction

Aside from the above, the instructor will schedule two regular online sessions per week for lectures, discussion and problem-solving. Sessions will be accessed within Canvas and will be recorded.

Emergency Warning System for Texas A&M University-Central Texas SAFEZONE. SafeZone provides a public safety application that gives you the ability to call for help with the push of a button. It also provides Texas A&M University-Central Texas the ability to communicate emergency information quickly via push notifications, email, and text messages. All students automatically receive email and text messages via their myCT accounts.

Downloading SafeZone allows access to push notifications and enables you to connect directly for help through the app.

You can download SafeZone from the app store and use your myCT credentials to log in. If you would like more information, you can visit the [SafeZone](http://www.safezoneapp.com) website [www.safezoneapp.com].

To register SafeZone on your phone, please follow these 3 easy steps:

1. Download the SafeZone App from your phone store using the link below:

- [iPhone/iPad](https://apps.apple.com/app/safezone/id533054756): [https://apps.apple.com/app/safezone/id533054756]
 - [Android Phone / Tablet](https://play.google.com/store/apps/details?id=com.criticalarc.safezoneapp)
[https://play.google.com/store/apps/details?id=com.criticalarc.safezoneapp]
2. Launch the app and enter your myCT email address (e.g., {name}@tamuct.edu)
 3. Complete your profile and accept the terms of service.

For updates on COVID information, please monitor the University [website](https://www.tamuct.edu/covid19/)
[https://www.tamuct.edu/covid19/]

COURSE INFORMATION

Course Overview and description

This course will introduce optimization methods and their applications to students. Topics will include formulation of optimization problems, solutions by graphical methods, nonlinear programming problems: analytical one-dimensional unconstrained optimization, analytical multidimensional unconstrained optimization, analytical multidimensional constrained optimization with equality and inequality constraints, numerical methods for one-dimensional nonlinear programming, numerical methods for unconstrained optimization of multivariable nonlinear programming problems and modern methods of optimization: Introduction to metaheuristics, evolutionary algorithms, genetic algorithms, etc.

Student Learning Outcomes (SLO)

After completing this course, students will be able to:

1. define and use the optimization basic concepts.
2. understand and apply analytical unconstrained optimization theory and algorithms to problems.
3. understand and apply analytical constrained optimization theory and algorithms to problems.
4. understand and numerical unconstrained optimization theory and algorithms to problems.
5. use metaheuristic methods to solve real life problems.

Required Reading and Textbook(s)

1. Raju, N.V.S. (2014). Optimization Methods for Engineers. PHI Learning.
2. Zbigniew Michalewicz. 1994. Genetic algorithms + data structures = evolution programs (2nd, extended ed.). Springer-Verlag, Berlin, Heidelberg.

Supplementary material

3. Rao, S. S. (2019). Engineering Optimization: Theory and Practice. United Kingdom: Wiley.
4. E. Eiben and James E. Smith. 2015. Introduction to Evolutionary Computing (2nd. ed.). Springer Publishing Company, Incorporated.

COURSE REQUIREMENTS

- Homework (50%) will be assigned on a bi-weekly basis. Solutions will be provided. Students are expected to self-check. Selected homework questions will be graded.
- Exam 1: 20%
- Exam 2/project (30%). This may be a combination of take-home test and project, as determined by the instructor.

Grading Criteria Rubric and Conversion

Homework	50% (50 points)	90- 100%= A
Exam 1	20% (20 points)	80- 89%= B
Exam 2/Project	30% (30 points)	70- 79%= C
		60- 69%= D
TOTAL	100% (100 points)	Below 60 % F

Partial credit for homework and test questions will be awarded according to the following guidelines:

- 100% Perfect.
- 90% Minor careless or technical mistakes.
- 80% Minor procedural error.
- 70% Major conceptual or procedural errors.
- 40% Make beginning steps towards a solution.
- 20% Some relevant information supplied.

Posting of Grades

I will attempt to post grades on Canvas within one week of submissions. If I am late and you want to know your grade, please email me and I will respond as soon as possible. If you want feedback on your homework, I'm always happy to schedule an appointment and look through it together.

Grading Policies

Late work is only accepted with written documentation of exceptional circumstances. Examples of exceptional circumstances include family emergencies, hospitalization, funeral, etc. Late work also receives a maximum B grade, regardless of circumstances.

If your overall grade (on a scale from 0 to 100) is within 1 point of the next highest grade level, I will increase your grade if you have done all the quizzes. Otherwise, you will be graded strictly according to the numbers. That means that if your average is 89.99 and you didn't do all the quizzes, then you still get a B.

COURSE OUTLINE AND CALENDAR

Complete Course Calendar

First day of the week (Monday)

28 Aug Chapter One and Two (Intro. to Optimization and Formulation of Optimization Problems) SLO 1.

04 Sep Chapter Three (Solutions by Graphical Methods) SLO 1.

11 Sep Chapter Four (Classical Optimization Methods & Basic Concepts) SLO 1
18 Sep Chapter Five (Analytical One-dimensional unconstrained optimization) SLO 2
25 Sep Chapter Six (Analytical Multidimensional unconstrained Optimization) SLO 2
02 Oct Chapter Seven (Direct substitution, Constrained variation, and Lagrange Multiplier methods) SLO 3
09 Oct Chapter Eight (Kuhn-Tucker Conditions for Solving Multivariable Inequality) SLO 3
16 Oct Exam 1 (covers Chapters 1-8)
23 Oct Chapter 9 (Selected Numerical Methods for One-dimensional Nonlinear Programming) SLO 4
30 Oct Chapter 9 (Selected Numerical Methods for One-dimensional Nonlinear Programming) SLO 4
06 Nov Chapter 10 (Direct search methods: univariate & Hooke-Jeeves Pattern search methods) SLO 4
13 Nov Chapter 10 (Cauchy's steepest descent & Newton's methods) SLO 4
20 Nov Modern methods (Introduction to metaheuristics, Evolutionary Algorithms) SLO 5
27 Nov Modern methods (Genetic Algorithms) SLO 5
04 Dec 2nd Test/Project TBD
11 Dec 2nd Test/Project TBD

Important University Dates

<https://www.tamuct.edu/registrar/academic-calendar.html>]

TECHNOLOGY REQUIREMENTS AND SUPPORT

You will need a computer that can be used for video conferencing.

Any software used during the course will be open-source and free.

Technology Requirements

This course will use the A&M-Central Texas Instructure Canvas learning management system. We strongly recommend the latest versions of Chrome, Firefox, Edge, or Safari browsers. Canvas will run on Windows, Mac, Linus, iOS, android, or any other device with a modern web browser. **Canvas no longer supports any version of Internet Explorer.**

Log on to A&M-Central Texas Canvas [<https://tamuct.instructure.com/>] or access Canvas through the TAMUCT Online link in myCT [<https://tamuct.onecampus.com/>] by clicking on the "TAMUCT Online Canvas" tile. You will then log in through our Microsoft portal.

Username: Your MyCT email address. Password: Your MyCT password

Canvas Support

Use the Canvas Help tab, located at the bottom of the left-hand menu, for issues with Canvas. You can search the support articles or use the Email, Call, or Chat buttons at the bottom of the support pop-up to contact the Canvas Help Desk.

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

Online Proctored Testing

Texas A&M University-Central Texas uses Proctorio for online identity verification and proctored testing. This service is provided at no direct cost to students. If the course requires identity verification or proctored testing, the technology requirements are: Any computer meeting the minimum computing requirements, plus web camera, speaker, and microphone (or headset). Proctorio requires use of the Chrome web browser with their custom plug in installed.

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.

UNIVERSITY RESOURCES, PROCEDURES, AND GUIDELINES

Warrior Center for Student Success

The Warrior Center for Student Success is a comprehensive academic support department at A&M-Central Texas, dedicated to fostering an environment of excellence and empowerment among its student body. The center offers a wide range of programs and services to ensure every student reaches their full potential, and is a haven for students seeking guidance, resources, and a strong support network to excel in their educational journey.

ADA Access and Accommodations: Texas A&M University-Central Texas ensures that students with disabilities have equal access to educational opportunities by providing appropriate accommodations and support services. If you believe you have a physical, learning or socio-emotional disability requiring reasonable accommodations, please visit [Access and Inclusion](https://www.tamuct.edu/student-affairs/access-inclusion.html) [<https://www.tamuct.edu/student-affairs/access-inclusion.html>] for more details or contact the Office of Access and Inclusion, WH-212; (254) 501-5836. Any information you provide is private and confidential.

Success Coaching and Peer Mentoring: Our experienced Success Coaches work one-on-one with students to develop personalized action plans, set academic goals, and build effective study strategies, time management skills, and resilience. Our Peer Mentors provide a valuable support system, offering guidance, encouragement, and a relatable perspective to help students navigate their academic and personal challenges. For more details call 254-501-5836 or 254-501-5928 or visit [Academic Support](https://www.tamuct.edu/student-affairs/academic-support.html) [<https://www.tamuct.edu/student-affairs/academic-support.html>]. Click the link to schedule a session (virtual or in-person) with a success coach bit.ly/3q7uB50 or visit WH, 111.

Testing Services: We offer a secure and comfortable environment for students and members of the community to take courses and distance learning exams, as well as placement tests and professional certification exams. Our Testing Service also offers resources and support referrals for testing related challenges (test anxiety, learning disabilities, etc.) and supports all approved ADA accommodations. Call (254) 519-5830 or visit the [Testing Center](https://www.tamuct.edu/testing-center/) [<https://www.tamuct.edu/testing-center/>].

Tutoring and Supplemental Instruction Services: Our team of qualified Tutors and Supplemental Instructors assist students in various non-writing subjects, promoting academic comprehension and enhancing learning outcomes. Click the link to schedule a tutoring session with a TAMUCT tutor (virtual or in-person) or view tutor availability bit.ly/43Q6wNz. You may also chat live with a remote tutor 24/7 for a variety of subjects through our partnership with Tutor.com, an online tutoring platform that is free to all TAMUCT students. To learn more please visit [Tutoring Services](https://www.tamuct.edu/student-affairs/academic-support.html#tutoring) [https://www.tamuct.edu/student-affairs/academic-support.html#tutoring] or call (254) 501-5836 or visit the Tutoring Hub in Warrior Hall, 111.

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. Any deviation by students from this expectation may result in a failing grade for the assignment and potentially a failing grade for the course. All academic misconduct concerns will be referred to the Student Conduct Office. When in doubt on collaboration, citation, or any issue, please contact your instructor before taking a course of action.

For more information regarding the [student conduct process](https://www.tamuct.edu/student-affairs/student-conduct.html), [https://www.tamuct.edu/student-affairs/student-conduct.html].

If you know of potential honor violations by other students, you may [submit a referral](https://cm.maxient.com/reporting.php?TAMUCentralTexas), [https://cm.maxient.com/reporting.php?TAMUCentralTexas].

Drop Policy

If you discover that you need to drop this class, you must complete the [Drop Request](#) Dynamic Form through Warrior Web.

[https://federation.ngwebsolutions.com/sp/startSSO.ping?PartnerIdpId=https://eis-prod.ec.tamuct.edu:443/samlssso&SpSessionAuthnAdapterId=tamuctDF&TargetResource=https%3a%2f%2fdynamicforms.ngwebsolutions.com%2fSubmit%2fStart%2f53b8369e-0502-4f36-be43-f02a4202f612].

Faculty cannot drop students; this is always the responsibility of the student. The Records and Admissions Office will provide a deadline on the Academic Calendar for which the form must be completed. Once you submit the completed form to the Records and Admissions 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 Records and Admissions 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.

Pregnant and/or Parenting Students Rights and Accommodations

Texas A&M University-Central Texas supports students who are pregnant, experiencing pregnancy-related conditions, and/or parenting. In accordance with requirements of [Title IX and related guidance from US Department of Education's Office of Civil Rights](#), the Associate Dean

in the Division of Student Affairs, (254) 501-5909, can assist students who are pregnant, experiencing pregnancy-related conditions, and/or parenting by provide flexible and individualized reasonable accommodations. Students should seek out assistance as early in the pregnancy as possible through the [Pregnancy & Parenting webpage](https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html) [https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html]. For more information, please visit [Student Affairs](https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html) [https://www.tamuct.edu/student-affairs/pregnant-and-parenting-students.html]. If you would like to read more about these [requirements and guidelines](http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf) online, please visit the website [http://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.pdf].

[Title IX of the Education Amendments Act of 1972](https://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.html) specifically prohibits discrimination against a student based on pregnancy, childbirth, false pregnancy, termination of pregnancy, or recovery from any of these conditions [https://www2.ed.gov/about/offices/list/ocr/docs/pregnancy.html].

Students experiencing any form of discrimination due to any of these conditions are encouraged to reach out to the Title IX Coordinator, 254.519.5716, titleix@tamuct.edu, Founders Hall 317B, or the Associate Dean of Student Affairs, 254.501.5909, Warrior Hall 105.

Title IX Rights and Reporting Responsibilities

Texas A&M University-Central Texas is committed to creating a safe and open learning environment for all students. If you or another student has experienced any form of gender discrimination or sexual misconduct, including sexual harassment, sexual assault, dating/domestic violence, and/or sex-based stalking, help and support are available. Our university strongly encourages all members of our campus community to report incidents and seek support for gender discrimination and sexual misconduct through the Title IX Office. You may contact the Title IX Office at 254.519.5716, titleix@tamuct.edu, Founders Hall 317B, or learn more by visiting the [Title IX webpage](https://www.tamuct.edu/compliance/titleix.html) [https://www.tamuct.edu/compliance/titleix.html].

Please be aware that that under [Title IX](https://policies.tamus.edu/08-01-01.pdf), [Texas Senate Bill 212](https://policies.tamus.edu/08-01-01.pdf), and [System Regulation 08.01.01](https://policies.tamus.edu/08-01-01.pdf), [https://policies.tamus.edu/08-01-01.pdf] all university employees are mandated reporters and are required to disclose information about suspected or alleged violations as listed above and defined in System Regulation 08.01.01. If the Title IX Office receives information about an incident, they will reach out to offer information about resources, rights, and procedural options as a member of the campus community. Although I have an obligation to report, you will, in most cases, control how your case will be handled. When working with the Title IX Office you will have access to resources and accommodation but also have the opportunity to express if you wish to move forward with an investigation. Our goal is to make sure you are aware of the options available to you as a student. Community members are not required to respond to this outreach.

If you or another student wishes to speak to a confidential employee who does not have this reporting responsibility, you can contact the [Student Wellness & Counseling Center](https://www.tamuct.edu/student-affairs/student-counseling.html), [https://www.tamuct.edu/student-affairs/student-counseling.html], 254.501.5955, or swacc@tamuct.edu, located in Warrior Hall Room 207L or the Student Support Advocate, 254.501.5978 or ssa@tamuct.edu, located in founder Hall Room 317D.

University Library & Archives

The University Library & Archives provides many services in support of research across campus and at a distance. We offer over 350 electronic databases containing approximately 1,203,947

eBooks and 134,750 journals, in addition to the 96,879 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 24 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 virtually through WebEx, Microsoft Teams or in-person at the library. [Schedule an appointment here](#)

[<https://tamuct.libcal.com/appointments>]. 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 workspaces, 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/index>]

University Writing Center

Located in Warrior Hall 416 and online, the University Writing Center (UWC) at Texas A&M University–Central Texas (A&M–Central Texas) is a free service open to all A&M–Central Texas students. The face-to-face hours of operation are from 10:00 a.m.-5:00 p.m. Monday and Thursday in Warrior Hall 416. Online tutoring is available Monday thru Thursday from 10:00 a.m.-5:00 p.m. and from 6:00-9:00 p.m. and on Saturdays from 12:00-3:00 p.m.

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 UWC is here to help!

Students may arrange a one-to-one session with a trained and experienced writing tutor by making an appointment via [WConline](#) [<https://tamuct.mywconline.com/>]. In addition, you can email Dr. Bruce Bowles Jr. at bruce.bowles@tamuct.edu if you have any questions about the UWC, need any assistance with scheduling, or would like to schedule a recurring appointment with your favorite tutor.

OTHER POLICY STATEMENTS

A Note about Sexual Violence at A&M-Central Texas

Sexual violence is a serious safety, social justice, and public health issue. The university offers support for anyone struggling with these issues. University faculty are mandated reporters, so if someone discloses that they were sexually assaulted (or a victim of Domestic/Dating Violence or Stalking) while a student at TAMUCT, faculty members are required to inform the Title IX Office. If you want to discuss any of these issues confidentially, you can do so through Student Wellness and Counseling (254-501-5955) located on the second floor of Warrior Hall (207L).

Sexual violence can occur on our campus because predators often feel emboldened, and victims often feel silenced or shamed. It is incumbent on ALL of us to find ways to actively create environments that tell predators we don't agree with their behaviors and tell survivors we will support them. Your actions matter. Don't be a bystander; be an agent of change. For additional information on campus policy and resources visit the [Title IX webpage](https://www.tamuct.edu/compliance/titleix.html) [<https://www.tamuct.edu/compliance/titleix.html>].

Behavioral Intervention

Texas A&M University-Central Texas cares about the safety, health, and well-being of its students, faculty, staff, and community. If you are aware of individuals for whom you have a concern, please make a referral to the Behavioral Intervention Team. Referring your concern shows you care. You can complete the [referral](#) online

[<https://cm.maxient.com/reporting.php?TAMUCentralTexas>].

Anonymous referrals are accepted. Please see the [Behavioral Intervention Team](#) website for more information [<https://www.tamuct.edu/bit>]. If a person's behavior poses an imminent threat to you or another, contact 911 or A&M-Central Texas University Police at 254-501-5805.
