

MATH 3360-110, 80076, Numerical Analysis

Fall 2022

Texas A&M University-Central Texas

COURSE DATES, MODALITY, AND LOCATION

Course Dates: 8/25/2022-12/11/2022

This is a 100% online course, and we will use the A&M-Central Texas Canvas Learning Management System [<https://tamuct.instructure.com/>] to access textbook, assignments, and other course material.

INSTRUCTOR AND CONTACT INFORMATION

Instructor: Jordan Barry

Office: Online/Virtual

Phone: 512-593-8218

Email: jbarry@tamuct.edu. You may also contact me through Canvas mail.

Office Hours

I will have drop-in office hours on Tuesdays 1:00 PM - 2:00 PM, and I will be available at other times by appointment. Please email me to set up a time.

Student-instructor interaction

I will check my email regularly throughout the day, and I will typically return emails within 24 hours of you sending them. If it has been longer than 2 days, and you have not heard back from me, please send me a follow-up email or contact me directly by phone.

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

An introduction to numerical analysis. Topics will be selected from error analysis, solving algebraic equations, interpolation, regression, numerical differentiation and integration, methods for solving systems of equations, approximation theory, and initial value problems of ordinary differential equations.

Prerequisite: Calculus 2 and 3 hours Computer Science.

Course Objective or Goal

Student Learning Outcomes

Learning outcomes and objectives for each section can be found in the course guide available on Canvas and below in the calendar.

By the end of the course, students should be able to:

1. Demonstrate an understanding of the derivation of and motivation for numerical algorithms.
2. Choose an appropriate technique for a given problem and apply the technique successfully.
3. Implement numerical algorithms using software
4. Interpret the results of numerical algorithms and discuss the accuracy of the results.

Competency Goals Statements (certification or standards)

Students will also gain more facility in the following competency areas:

Competency 6:

F. Solves equations and inequalities involving polynomial, rational, radical, absolute value and piecewise functions using a variety of methods (e.g., tables, algebraic methods, graphs, use of a graphing calculator) and evaluates the reasonableness of solutions.

G. Models situations using polynomial, rational, radical, absolute value and piecewise functions and solves problems using a variety of methods, including technology.

Competency 10:

A. Understands the concept of limit and the relationship between limits and continuity.

B. Relates the concept of average rate of change to the slope of a secant line and relates the concepts of instantaneous rate of change to the slope of the tangent line.

C. Uses the first and second derivatives to analyze the graph of a function.

E. Models and solves a variety of problems using differential and integral calculus.

F. Analyzes how technology can be used to solve problems and illustrate concepts involving differential and integral calculus.

Competency 17

- E. Describes and analyzes bivariate data using various techniques.
- F. Understands how to transform nonlinear data into linear form to apply linear regression techniques to develop exponential, logarithmic and power regression models.

Competency 19

- A. Recognizes and uses multiple representations of a mathematical concept.
- B. Understands how mathematics is used to model and solve problems in other disciplines.

Required Reading and Textbook(s)

For this course you will work through introductory material in numerical analysis and apply concepts, techniques, and theory to solving realistic problems.

Course web site: <http://mathforcollege.com/nm>

Textbook: (not required): <http://www.lulu.com/shop/autar-kaw-and-egwu-kalu/numerical-methods-with-applications-customized-for-mechanical-engineering-of-university-of-south-florida-usf/paperback/product-15098444.html>

All course material is online or available in pdf, so the textbook is not necessary

Students will also need access to a computer running Windows, macOS or Linux to utilize the Anaconda Python suite. More information about this is available on Canvas.

COURSE REQUIREMENTS

Quizzes: We will have 14 quizzes throughout the semester. Each quiz will count between 25 and 30 points. At the end of the semester, the two lowest quizzes will be dropped.

Python Assignments: We will have 14 coding assignments in Python. These will typically be short assignments that will allow you to apply theory to problems in a realistic context. The first 3 assignments will be introductory assignments to familiarize you with the programming language. The lowest Python assignment grade will be dropped at the end of the semester.

Tests: There will be 2 tests given during the semester. One test will focus on the first 7 weeks of the course and will be taken on the 8th week. The second test will focus on the remaining weeks of the course and it will be taken the last week of class. Each exam will be worth 100 points.

At the end of the semester, your final overall grade will be determined as a weighted average according to the scheme below.

Grading

Assignment Type	Percent of Total
Quizzes	30%
Coding Assignments	30%
Exams	40%

Grades will be based on the following scale:

A: 90%-100% B: 80%-89% C: 70%-79% D: 60%-69% F: <59%

Grading Criteria Rubric and Conversion

Each quiz will be graded automatically, and you will see the results once you submit. You may have 2 attempts per quiz, and the highest of your grades will be recorded.

Each Python assignment will be graded according to the following rubric:

Completion of Assignment: 10 pts

Correct Code: 30 pts

Implementation of Numeric Method: 20 pts

Correct Output: 20 pts

Formatting: 20 pts

Total: 100 pts

Posting of Grades

Grades will be posted in Canvas. Quiz grades are available immediately after completion, and python assignments will be graded within one week of submission deadline.

Grading Policies

Late work may be submitted with a maximum possible grade of 75% up to one week after the deadline. Work will not be accepted more than one week late.

COURSE OUTLINE AND CALENDAR

Complete Course Calendar

Week	chapter	section	topic	material due
8/22/22	1	2, 3	Intro, Measuring Errors, Sources of Error	Quiz 1(SLO 1,2,4), Python Hello World
8/29/22	1	4, 5	Binary Representation, Floating Point Representation	Quiz 2 (SLO 1,2), Python Introduction (SLO 3)
9/5/22	1	6	Propagation of Errors	Quiz 3 (SLO 1,2), Python Introduction Pt 2 (SLO 3)
9/12/22	1	7	Taylor Theorem Revisited	Quiz 4 (SLO 1, 2, 4), Taylor Theorem Python Assignment (SLO 1, 3, 4)
9/19/22	2	1, 2	Primer on Differentiation, Continuous Functions	Quiz 5 (SLO 1,4), Differentiation Python Assignment (SLO 1, 3, 4)
9/26/22	3	3, 4, 5	Bisection Method, Newton-Raphson Method, Secant Method	Quiz 6 (SLO 1, 3, 4) Root-Finding Assignment (SLO 1, 3, 4)
10/3/22	4	1	Introduction to Matrix Algebra	Quiz 7 (SLO 1), Matrix Python Assignment (SLO 1, 3)
10/10/22	TEST 1 (SLO 1-4)			
10/17/22	4	2, 3	Gaussian Elimination, Gauss-Seidel Method	Quiz 8 (SLO 1, 4), Gauss Python Assignment (SLO 1, 3, 4)

10/24/22	5	2,3	Direct Interpolation, Newton's Dif Method	Quiz 9 (SLO 1, 4), Interpolation Assignment (SLO 1,4)
10/31/22	5	5	Spline Interpolation	Quiz 10 (SLO 1, 4), Spline Interpolations (SLO 1, 2, 4)
11/7/22	7	2, 3, 4	Trapezoidal Rule, Simpson's 1/3 Rule, Romberg Integration	Quiz 11 (SLO 1, 2, 4), Integration Assignment (SLO 1, 4)
11/14/22	8	1, 2	Primer on ODE, Euler's Method, Improved Euler Method	Quiz 12 (SLO 1, 4), Euler's Method Assignment (SLO 1, 3,4)
11/21/22	8	3, 4, 5	Runge-Kutta Methods	Quiz 13 (SLO 1, 2, 4), Runge-Kutta Assignment (SLO 1, 3, 4)
11/28/22	Supp		Randomization Methods, Monte Carlo, Bootstrapping	Quiz 14 (SLO 1, 2, 3, 4), Randomization Assignment (SLO 1, 3, 4)
12/5/22	TEST 2 (SLO 1-4)			

Important University Dates

To access important dates for the university you may visit the following website:

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

TECHNOLOGY REQUIREMENTS AND SUPPORT

Technology Requirements

You will need access to a computer that is capable of downloading and using Jupyter Notebooks and the Anaconda Python suite. Students are also encouraged to utilize calculators for some simple numeric computations on quizzes and exams.

This course will use the A&M-Central Texas Instructure Canvas learning management system.

We strongly recommend the latest versions of Chrome or Firefox browsers. Canvas no longer supports any version of Internet Explorer.

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

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

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.

Online Proctored Testing

A&M-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 also requires the Chrome web browser with their custom plug in.

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

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 Warrior Center for Student Success, Equity 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 Office of Access and Inclusion, WH-212; or call (254) 501-5836. Any information you provide is private and confidential and will be treated as such.

For more information, please visit our [Access & Inclusion](https://tamuct.instructure.com/courses/717) Canvas page (log-in required) [<https://tamuct.instructure.com/courses/717>]

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 Office of Student Conduct. 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/reportingform.php?TAMUCentralTexas&layout_id=0), [https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=0].

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/samlso&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 Registrar's Office will provide a deadline on the Academic Calendar for which the form must be completed. Once you submit the completed 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.

Important information for Pregnant and/or Parenting Students

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 Dean of Student Affairs' Office can assist students who are pregnant and/or parenting in seeking accommodations related to pregnancy and/or parenting. Students should seek out assistance as early in the pregnancy as possible. 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]. Students may also contact the institution's Title IX Coordinator. 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 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 Associate Dean in 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 virtually and in-person. Student success coaching is available online upon request.

If you have a question, are interested in becoming a tutor, or in need of success coaching contact the Warrior Center for Student Success, Equity and Inclusion at (254) 501-5836, visit the Warrior Center at 212 Warrior Hall, or by emailing WarriorCenter@tamuct.edu.

To schedule tutoring sessions and view tutor availability, please visit [Tutor Matching Services](https://tutormatchingservice.com/TAMUCT) [https://tutormatchingservice.com/TAMUCT] or visit the Tutoring Center in 111 Warrior Hall.

Chat live with a remote tutor 24/7 for almost any subject from on your computer! Tutor.com is an online tutoring platform that enables A&M-Central Texas students to log in and receive online tutoring support at no additional cost. This tool provides tutoring in over 40 subject

areas except writing support. Access Tutor.com through Canvas.

University Library & Archives

The University Library & Archives provides many services in support of research across campus and at a distance. We offer over 200 electronic databases containing approximately 400,000 eBooks and 82,000 journals, in addition to the 96,000 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 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/?g=6956) [https://tamuct.libcal.com/appointments/?g=6956]. 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](http://tamuct.libguides.com/index) [http://tamuct.libguides.com/index]

University Writing Center

University Writing Center: Located in Warrior Hall 416, 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 hours of operation are from 10:00 a.m.-5:00 p.m. Monday thru Thursday in Warrior Hall 416 (with online tutoring available every hour as well) with satellite hours available online only Monday thru Thursday from 6:00-9:00 p.m. and Saturday 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 [WOnline](https://tamuct.mywconline.com/) [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.

OPTIONAL 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/reportingform.php?TAMUCentralTexas&layout_id=2].

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.

OTHER POLICIES

Copyright Notice

Students should assume that all course material is copyrighted by the respective author(s). Reproduction of course material is prohibited without consent by the author and/or course instructor. Violation of copyright is against the law and Texas A&M University-Central Texas' Code of Academic Honesty. All alleged violations will be reported to the Office of Student Conduct.