

## **MATH 3360-110, 80181, Numerical Analysis I**

### **Fall 2023**

Texas A&M University-Central Texas

Course Dates: 8/28/2023-12/15/2023

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 (WebEx)

**Phone:** 512-593-8218

**Email:** [jbarry@tamuct.edu](mailto:jbarry@tamuct.edu). You may also contact me through Canvas mail.

### **Office Hours**

I will have drop-in office hours on Tuesday and Thursday 11:00 AM - 12:00 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](http://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:
  - o [iPhone/iPad](https://apps.apple.com/app/safezone/id533054756): [<https://apps.apple.com/app/safezone/id533054756>]
  - o [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 8<sup>th</sup> 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
8/28/23	1	2, 3	Intro, Measuring Errors, Sources of Error	Quiz 1(SLO 1,2,4), Python Hello World
9/4/23	1	4, 5	Binary Representation, Floating Point Representation	Quiz 2 (SLO 1,2), Python Introduction (SLO 3)
9/11/23	1	6	Propagation of Errors	Quiz 3 (SLO 1,2), Python Introduction Pt 2 (SLO 3)
9/18/23	1	7	Taylor Theorem Revisited	Quiz 4 (SLO 1, 2, 4), Taylor Theorem Python Assignment (SLO 1, 3, 4)
9/25/23	2	1, 2	Primer on Differentiation, Continuous Functions	Quiz 5 (SLO 1,4), Differentiation Python Assignment (SLO 1, 3, 4)
10/2/23	3	3, 4, 5	Bisection Method, Newton-Raphson Method, Secant Method	Quiz 6 (SLO 1, 3, 4) Root-Finding Assignment (SLO 1, 3, 4)
10/9/23	4	1	Introduction to Matrix Algebra	Quiz 7 (SLO 1), Matrix Python Assignment (SLO 1, 3)
10/16/23	TEST 1 (SLO 1-4)			
10/23/23	4	2, 3	Gaussian Elimination, Gauss-Seidel Method	Quiz 8 (SLO 1, 4), Gauss Python Assignment (SLO 1, 3, 4)

10/30/23	5	2,3	Direct Interpolation, Newton's Dif Method	Quiz 9 (SLO 1, 4), Interpolation Assignment (SLO 1,4)
11/6/23	5	5	Spline Interpolation	Quiz 10 (SLO 1, 4), Spline Interpolations (SLO 1, 2, 4)
11/13/23	7	2, 3, 4	Trapezoidal Rule, Simpson's 1/3 Rule, Romberg Integration	Quiz 11 (SLO 1, 2, 4), Integration Assignment (SLO 1, 4)
11/20/23	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)
11/27/23	8	3, 4, 5	Runge-Kutta Methods	Quiz 13 (SLO 1, 2, 4), Runge-Kutta Assignment (SLO 1, 3, 4)
12/4/23	Supp		Randomization Methods, Monte Carlo, Bootstrapping	Quiz 14 (SLO 1, 2, 3, 4), Randomization Assignment (SLO 1, 3, 4)
12/11/23	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

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.**

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/>] 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](mailto: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.*

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## 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](https://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](https://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](mailto: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](mailto: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 accommodations 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](mailto:swacc@tamuct.edu), located in Warrior Hall Room 207L or the Student Support Advocate, 254.501.5978 or [ssa@tamuct.edu](mailto: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](mailto: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.

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