

## **MATH 5360-110, CRN 11735, Computational Mathematics**

**Spring 2022 rev. 01.14.22**

Texas A&M University-Central Texas

### **COURSE DATES, MODALITY, AND LOCATION**

*Jan 18 2022 - May 13, 2022*

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

### **INSTRUCTOR AND CONTACT INFORMATION**

**Instructors:** Christopher Thron

**Office:** All contact is online

**Phone or text:** (585) 204-0314

**Email:** Please email instructors via Canvas email.

**Google Hangouts** (for online office hours): [chris.thron@gmail.com](mailto:chris.thron@gmail.com)

### **Office Hours**

Office hours are conducted via Google Hangouts ([hangouts.google.com](https://hangouts.google.com)). Go to [hangouts.google.com](https://hangouts.google.com), send an invitation to [chris.thron@gmail.com](mailto:chris.thron@gmail.com), and send an email, phone, or text informing me of your Hangouts email address. Office hour times will be set at the convenience of students, based on a Doodle poll conducted at the beginning of class.

### **Student-instructor interaction**

The instructor will hold (at least) two live online sessions per week. These sessions are optional, but students are strongly encouraged to attend if possible. Weekday sessions will probably be scheduled sometime between 7-9:30 p.m., while sessions on weekends will more likely be in the afternoon (Texas time). Online sessions will be conducted via WebEx, within the course Canvas learning management system. More details will be supplied when the course begins.

In addition, students should feel free to email, text, or send Hangouts messages any time day or night. I will answer as soon as I can, usually within 12 hours. If I receive the message instantly, I will try to respond instantly.

Students are *strongly* encouraged and expected to communicate with each other and to collaborate on assignments and projects. Mathematics is a language, and is best learned by using it to communicate with others. It is expected that students know the difference between collaboration and copying.

**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

## **COURSE INFORMATION**

**Course Overview and description** An advanced study of numerical analysis. Topics will be selected from linear systems, approximation theory, numerical differential and integral equations, integration theory.

### **Course Objective**

The course will focus on the study of algorithms (i.e. mathematical procedures) that are often used in applied computational mathematics. Important applications of these algorithms include the physical sciences, economics, and data science. The purpose of this course is for students to understand how and why these algorithms work; to be able to program the algorithms from first principles; and to be able to modify the algorithms as needed for particular applications.

### **Student Learning Outcomes**

Upon successfully completing MATH 5360, students should be able to do the following:

- a) Given a written or oral description of a mathematical algorithm, be able to implement the algorithm using a suitable computer programming language (such as Python);
- b) Use mathematical theory (mostly from calculus and algebra) to demonstrate important properties of mathematical algorithms (such as convergence);
- c) Use a programmed algorithm to calculate results that are needed in different applications, and interpret these results;
- d) Modify algorithms programmed algorithms to solve different types of problems.
- e) Be able to supplement instructor-provided material by finding additional relevant material on the Internet as necessary to accomplish (a-d) above.

### **Required Reading and Textbook(s)**

All course material will be freely available online. It is expected that no material will need to be purchased.

Introductory material in Calculus is given in a customized Khan Academy course. You may register for the course at:

<https://www.khanacademy.org/join/SHJGPB8Z>

Introductory material in Python is supplied in an online Python course. The course is located at:

<https://www.sololearn.com/learning/1073>

A primary source for much of the course material is found at the web resource, “Holistic Numerical Methods”, by Autar Kaw and associates. The address is :

<https://nm.mathforcollege.com/textbook-numerical-methods-with-applications/>

Material at this site includes textbook chapters (in pdf format), video and PowerPoint lectures, multiple choice quizzes, and exercises.

Any lectures prepared by the course instructor will be posted on a YouTube channel: a link to the YouTube channel will be provided on the Canvas course page.

In addition, the online sessions described in the ‘Student-instructor interaction’ section above will be recorded, and can be accessed within Canvas.

### **COURSE REQUIREMENTS AND GRADING**

The course will involve both guided topic exploration and projects involving coding. The student’s proficiency in guided topics will be measured by computational and programming exercises posed by the instructor. Grading rubric for these is as follows:

100% Perfect, or inessential misprints

90% Shows complete understanding of the underlying concept or procedure -- careless, minor or technical mistakes

75% General understanding of the underlying concept or procedure -- significant progress towards solution (more than 75% complete)

50% Makes some progress towards solution (problem setup and some application of relevant principles)

25% Shows some familiarity with relevant concepts.

Projected point values for the different course components are as follows:

Topic: Calculus and Python programming review (30 points)

Topic: Nonlinear equations (20 points)

Topic: Spline interpolation: (10 points)

Topic: Integration: (20 points)

Topic: Ordinary differential equations: (20 points)

Topic: Optimization: (20 points)

Topic: Fast Fourier Transform: (20 points)

*Total: 160 points*

### **Posting of Grades**

All submitted work will be graded within two weeks, and results posted on Canvas.

### **Grading Policies:**

Points are converted to letter grades as follows: A ( $x \geq 128$ ); B ( $112 \leq x < 128$ ); C ( $80 \leq x < 128$ ); F ( $x < 80$ ), where  $x$  represents earned points.

Students within one grade point of the next letter grade will have their grades bumped up if they have completed all assignments.

Late work is accepted for full credit *only* with formal documentation. Acceptable reasons for late work include: serious illness (doctor's note required); family funeral (newspaper notification required). Late work related to genuine (but undocumented) family emergencies can receive at most 70% of the assignment's value. Other late work can receive at most 50% of the assignment's value.

## **COURSE OUTLINE AND CALENDAR**

### **Complete Course Calendar**

*Topics are listed with the student learning outcomes (SLO) that they address. Each topic will have theoretical and coding exercises, as most appropriate for the material.*

Topic: Calculus (Khan academy) and Python (Sololearn) programming review (3 weeks—all SLO's)

Calculus test: Wednesday of second week of class, covers all material in unit tests in Khan Academy

Khan Academy unit tests: due Friday of second week of class

Sololearn certificate: due Friday of third week of class.

Topic: Nonlinear equations (2 weeks—all SLOs)

Topic: Spline interpolation: (1 week—all SLOs)

Topic: Integration: (2 weeks—all SLOs)

Topic: Ordinary differential equations: (2 weeks—all SLOs)

Topic: Optimization: (2 weeks—all SLOs)

Topic: Partial differential equations (2 weeks—all SLOs)

Topic: Fast Fourier Transform: (2 weeks—all SLOs)

*Total: 100 points*

### **Important University Dates**

See the TAMUCT Academic Calendar: <https://www.tamuct.edu/registrar/academic-calendar.html>]

## **TECHNOLOGY REQUIREMENTS AND SUPPORT**

### **Technology Requirements**

Home access to a computer or tablet with reliable Internet connection is required. The computer must have full audio-visual capabilities (webcam, speaker/headphone and microphone).

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. Proctorio 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](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

### **Drop Policy**

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

[<https://dynamicforms.ngwebsolutions.com/casAuthentication.ashx?InstID=eaed95b9-f2be-45f3-a37d-46928168bc10&targetUrl=https%3A%2F%2Fdynamicforms.ngwebsolutions.com%2Fsubmit%2FForm%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.

## **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 report](https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=0),

[[https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout\\_id=0](https://cm.maxient.com/reportingform.php?TAMUCentralTexas&layout_id=0)].

## **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 Office 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 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>]

## **Important information for Pregnant and/or Parenting Students**

Texas A&M University-Central Texas supports students who are pregnant 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, on a remote online basis. Visit the Academic Support Community in Canvas to view schedules and contact information. Subjects tutored on campus include Accounting, Advanced Math, Biology, Finance, Statistics, Mathematics, and Study Skills. Tutors will return at the Tutoring Center in Warrior Hall, Suite 111 in the Fall 2020. Student success coaching is available online upon request.

If you have a question regarding tutor schedules, need to schedule a tutoring session, are interested in becoming a tutor, success coaching, or have any other question, contact Academic Support Programs at (254) 501-5836, visit the Office of Student Success at 212F Warrior Hall, or by emailing [studentsuccess@tamuct.edu](mailto:studentsuccess@tamuct.edu).

Chat live with a 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 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. For the Fall 2021 semester, 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 at <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 by making an appointment via WOnline at <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.

### **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 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. 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].