

Math 6170 – Differential Equations – Fall 2023

Place: General Academic Building 461 (GAB 461)

Time: Tuesday & Thursday 9:30AM - 10:50AM

Instructor Contact

Name: Giordano Tierra Chica

Office Location: General Academic Building 471A

Office Hours: Tuesday & Thursday 11:00AM - 12:45AM

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Communication Expectations: The communication in this course will be through Canvas and email (only from UNT accounts).

Course Description

We will discuss material related to the following topics as time permits:

Method of Finite Differences, Finite Element method for linear elliptic PDEs, Numerical Analysis of linear and nonlinear parabolic PDEs, Numerical Analysis for incompressible fluids and Finite Volume method for conservation laws.

Course Structure

This is a face to face course.

Course Objectives

The aim of the course is to develop a practical understanding of numerical methods for Partial Differential Equations (PDEs) by analyzing the methods and developing codes for different applications. PDEs appear and have applications in an enormous number of problems, including propagation of sound or heat, the motion of fluids, the description of electric and magnetic fields, as well as the behavior of biological systems like bacterial dynamics or tumor growth to name a few.

Materials

We are not going to follow a specific reference, but the content of the course will be related with the following sources (and the references therein):

[Allaire'07] Allaire, G.; Numerical Analysis and Optimization: An introduction to mathematical modelling and numerical simulation. Oxford University Press (2007). ISBN 9780199205226

[Brenner-Scott'08] Brenner, S.C.; Scott, L.R.; The Mathematical Theory of Finite Element Methods. Texts in Applied Mathematics, Springer-Verlag New York (2008). ISBN 978-0-387-75933-3

[Ciarlet'10] Ciarlet, L.C.; The Finite Element Method for Elliptic Problems. Classics in Applied Mathematics, SIAM (2002). ISBN 978-0-89871-514-9

[Gatica'14] Gatica, G.N.; A Simple Introduction to the Mixed Finite Element Method. Theory and Applications. Springer Briefs in Mathematics (2014). ISBN 978-3-319-03694-6

[LeVeque'07] LeVeque, R.J.; Finite Difference Methods for Ordinary and Partial Differential Equations. Steady State and Time Dependent Problems. Society for Industrial and Applied Mathematics (SIAM), Philadelphia, (2007). ISBN 978-0-898716-29-0

[LeVeque'02] LeVeque, R.J.; Finite Volume Methods for Hyperbolic Problems. Cambridge University Press, (2002). ISBN 0-521-81087-6

[Quarteroni'14] Quarteroni, A.; Numerical Models for Differential Problems. Springer-Verlag Mailand (2014). ISBN 978-88-470-1070-3

Course Technology & Skills

Minimum Technology Requirements

You will need some electronic device that allows you to check Canvas, to read emails, to use Matlab and to submit homework in digital form.

Computer Skills & Digital Literacy

Using Canvas and scanning documents (this can be done using a smartphone).

Course Requirements

Assignment	Points Possible	Percentage of Final Grade
Homework/Quizzes	<i>100 points</i>	<i>100%</i>

Grading

A = [100,90], B = (90,80], C = (80,70], D = (70,60], F = (60, 0].

Course Policies

Attendance

Attendance is required. Students will need the lecture notes in order to prepare for the homework. Important information and announcements are oftentimes made during class time, and students are responsible for that information. Students who miss class have the responsibility to check the lectures notes and learn about any class announcements, and unless the absences are justified, they will affect the student grade.

Homework

Homework will be submitted electronically via Canvas. "Naked numbers are not acceptable." Solutions must include a short write-up describing the problem, your solution technique, and procedural details. All things must be clearly labeled with your name and the problem number or statement. Hand written work must include the steps for solution presented in a neat orderly fashion and in a fairly large size.

Late Work

Late work is unacceptable. No make-ups.

Welcome to UNT!

As members of the UNT community, we have all made a commitment to be part of an institution that respects and values the identities of the students and employees with whom we interact. UNT does not tolerate identity-based discrimination, harassment, and retaliation. UNT's full Non-Discrimination Policy can be found in the UNT Policies section of the syllabus.

Rules of Engagement

Rules of engagement refer to the way students are expected to interact with each other and with their instructors. See these [Engagement Guidelines](https://clear.unt.edu/online-communication-tips) (https://clear.unt.edu/online-communication-tips) for more information.

Online Course System

The University is committed to providing a reliable online course system to all users. However, part of working in the online environment involves dealing with the inconveniences and frustration that can arise when technology breaks down or does not perform as expected. Here at UNT we have a Student Help Desk that you can contact for help with Canvas or other technology issues.

UIT Help Desk: [UIT Student Help Desk site](https://www.unt.edu/helpdesk) (https://www.unt.edu/helpdesk)

Email: helpdesk@unt.edu

Phone: 940-565-2324

In Person: Sage Hall, Room 130

Walk-In Availability: 8am-9pm

Telephone Availability:

- Sunday: noon-midnight
- Monday-Thursday: 8am-midnight
- Friday: 8am-8pm
- Saturday: 9am-5pm

Laptop Checkout: 8am-7pm

For additional support, visit [Canvas Technical Help](https://community.canvaslms.com/docs/DOC-10554-4212710328) (https://community.canvaslms.com/docs/DOC-10554-4212710328)

UNT Policies

Academic Integrity Policy

According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University.

ADA Policy

UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the [ODA website](https://disability.unt.edu/) (https://disability.unt.edu/).

Prohibition of Discrimination, Harassment, and Retaliation (Policy 16.004)

The University of North Texas (UNT) prohibits discrimination and harassment because of race, color, national origin, religion, sex, sexual orientation, gender identity, gender expression, age, disability, genetic information, veteran status, or any other characteristic protected under applicable federal or state law in its application and admission processes; educational programs and activities; employment policies, procedures, and processes; and university facilities. The University takes active measures to prevent such conduct and investigates and takes remedial action when appropriate.

Emergency Notification & Procedures

UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Canvas for contingency plans for covering course materials.

Retention of Student Records

Student records pertaining to this course are maintained in a secure location by the instructor of record. All records such as exams, answer sheets (with keys), and written papers submitted during the duration of the course are kept for at least one calendar year after course completion. Course work completed via the Canvas online system, including grading information and comments, is also stored in a safe electronic environment for one year. Students have the right to view their individual record; however, information about student's records will not be divulged to other individuals without proper written consent. Students are encouraged to review the Public Information Policy and the Family Educational Rights and Privacy Act (FERPA) laws and the University's policy. See UNT Policy 10.10, Records Management and Retention for additional information.

Acceptable Student Behavior

Student behavior that interferes with an instructor's ability to conduct a class or other students' opportunity to learn is unacceptable and disruptive and will not be tolerated in any instructional forum at UNT. Students engaging in unacceptable behavior will be directed to leave the classroom and the instructor may refer the student to the Dean of Students to consider whether the student's conduct violated the Code of Student Conduct. The University's expectations for student conduct apply to all instructional forums, including University and electronic classroom, labs, discussion groups, field trips, etc. Visit UNT's [Code of Student Conduct](https://deanofstudents.unt.edu/conduct) (<https://deanofstudents.unt.edu/conduct>) to learn more.

Access to Information - Eagle Connect

Students' access point for business and academic services at UNT is located at: my.unt.edu. All official communication from the University will be delivered to a student's Eagle Connect account. For more information, please visit the website that explains Eagle Connect and how to forward e-mail [Eagle Connect](https://it.unt.edu/eagleconnect) (<https://it.unt.edu/eagleconnect>).

Student Evaluation Administration Dates

Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The survey will be made available during weeks 13, 14 and 15 of the long semesters to provide students with an opportunity to evaluate how this course is taught. Students will receive an email from "UNT SPOT Course Evaluations via IASystem Notification" (no-reply@iasystem.org) with the survey link. Students should look for the

email in their UNT email inbox. Simply click on the link and complete the survey. Once students complete the survey they will receive a confirmation email that the survey has been submitted. For additional information, please visit the [SPOT website](http://spot.unt.edu/) (<http://spot.unt.edu/>) or email spot@unt.edu.

Survivor Advocacy

UNT is committed to providing a safe learning environment free of all forms of sexual misconduct. Federal laws and UNT policies prohibit discrimination on the basis of sex as well as sexual misconduct. If you or someone you know is experiencing sexual harassment, relationship violence, stalking and/or sexual assault, there are campus resources available to provide support and assistance. The Survivor Advocates can be reached at SurvivorAdvocate@unt.edu or by calling the Dean of Students Office at 940-5652648.

Academic Support & Student Services

Student Support Services

Mental Health

UNT provides mental health resources to students to help ensure there are numerous outlets to turn to that wholeheartedly care for and are there for students in need, regardless of the nature of an issue or its severity. Listed below are several resources on campus that can support your academic success and mental well-being:

- [Student Health and Wellness Center](https://studentaffairs.unt.edu/student-health-and-wellness-center) (<https://studentaffairs.unt.edu/student-health-and-wellness-center>)
- [Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services) (<https://studentaffairs.unt.edu/counseling-and-testing-services>)
- [UNT Care Team](https://studentaffairs.unt.edu/care) (<https://studentaffairs.unt.edu/care>)
- [UNT Psychiatric Services](https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry) (<https://studentaffairs.unt.edu/student-health-and-wellness-center/services/psychiatry>)
- [Individual Counseling](https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling) (<https://studentaffairs.unt.edu/counseling-and-testing-services/services/individual-counseling>)

Additional Student Support Services

- Registrar (<https://registrar.unt.edu/registration>)
- [Financial Aid](https://financialaid.unt.edu/) (<https://financialaid.unt.edu/>)
- [Student Legal Services](https://studentaffairs.unt.edu/student-legal-services) (<https://studentaffairs.unt.edu/student-legal-services>)
- [Career Center](https://studentaffairs.unt.edu/career-center) (<https://studentaffairs.unt.edu/career-center>)
- [Multicultural Center](https://idea.unt.edu/multicultural-center) (<https://idea.unt.edu/multicultural-center>)
- [Counseling and Testing Services](https://studentaffairs.unt.edu/counseling-and-testing-services) (<https://studentaffairs.unt.edu/counseling-and-testing-services>)
- [Pride Alliance](https://idea.unt.edu/pridealliance) (<https://idea.unt.edu/pridealliance>)
- [UNT Food Pantry](https://studentaffairs.unt.edu/food-pantry) (<https://studentaffairs.unt.edu/food-pantry>)

Academic Support Services

- [Academic Resource Center](https://clear.unt.edu/canvas/student-resources) (<https://clear.unt.edu/canvas/student-resources>)
- [Academic Success Center](https://success.unt.edu/asc) (<https://success.unt.edu/asc>)
- [UNT Libraries](https://library.unt.edu/) (<https://library.unt.edu/>)
- [Writing Center](https://writingcenter.unt.edu/) (<https://writingcenter.unt.edu/>)
- [Math Lab](https://learningcenter.unt.edu/math-lab) (<https://learningcenter.unt.edu/math-lab>)