

MTH 5361 TENTATIVE SYLLABUS

→ APPLIED MATHEMATICS II →

Syllabus, Spring 2024

↔ **Section 01: TTh 12:30 PM–1:45 PM, SR 333**

Instructor: Professor Qin “Tim” Sheng
Office Hours: TTh 2:00-3:30 pm (confirmed)
Office Location: Sid Richardson 302.F
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TEXTS:

- *A First Course in the Numerical Analysis of Differential Equations* by A. Iserles, Cambridge University Press, 2nd Edition. **ISBN-10:** 0521734908; **ISBN-13:** 978-0521734905.
- *My Lecture Notes and Slides.*

COURSE DESCRIPTION: Applied mathematics presents different faces to the world. For mathematicians it is a bona fide mathematical theory with an applicable flavor. For scientists and engineers it is a practical, applicable tool, part of the standard repertoire of modeling and computational techniques. For computer scientists it is a theory on the interplay of computer architecture and algorithms for real-number calculations. The tension between these standpoints is the driving force of this class, which presents a rigorous account of the fundamentals of applied and numerical analysis of both ordinary and partial differential equations. Our exposition maintains a balance between theoretical, algorithmic and practical aspects. This exciting course will include new ideas on emerging subject areas: exponential splitting, adaptations in finite difference methods and financial computations. Traditional topics covered in MTH 5361 include numerical ODEs and numerical PDEs; and a variety of strategies for solving large, sparse algebraic systems. Matlab is the hands-on computer software package encouraged to use throughout this advanced course in applied and computational mathematics.

OUTLINE OF THE TOPICS (textbook):

1. Euler’s and single step methods (1.1-4)
2. Multi-step methods (2.1-3)
3. Runge-Kutta methods, stiffness and stabilities (3.1-4, 4.1-4)
4. Error estimates and optimized controls in data science (6.1-3)
5. An introduction to finite difference methods (8.1-3)
6. An introduction to finite element and spectral methods (9.1-3)
7. Direct and indirect methods for solving systems (11.1, 12.1-2)
8. Effective numerical methods for solving PDEs (16.1-4)
9. Splitting strategies (16.6)
10. Latest topics in the territory (my notes)
11. Latest topics in applications and image processing (my notes)

HOMEWORK: As we go along section by section for the covered materials in the textbook, students are required to complete suggested exercises in time. You are required to keep a notebook solely for this homework. If you have questions please see me either during my office hours or by making an appointment. Homework will not be collected or graded directly.

PROJECT ASSIGNMENTS, QUIZZES AND GRADING POLICIES: Two theoretical and computational assignments will be given. Ten quizzes will be given on Wednesdays and there will be one final exam or project.

See following tentative quiz, assignment and exam schedule:

<i>Preview</i>	01/16	Quiz 4	02/13	Quiz 8	03/19	Quiz 10	04/16
Quiz 1	01/23	Quiz 5	02/20	Proj I due	03/26	Proj II due	04/23
Quiz 2	01/30	Quiz 6	02/27	Quiz 9	04/02	Final Ex.	05/08
Quiz 3	02/06	Quiz 7	03/12	<i>Eclipse</i>	04/09		

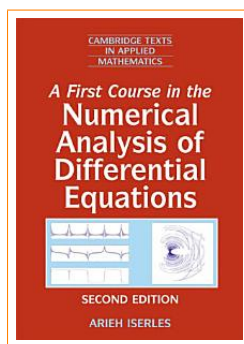
↔ **FINAL EXAM INFORMATION:** Wednesday, May 8, 2024, 02:00–04:00 pm

↔ Website: <https://registrar.web.baylor.edu/exams-grading/spring-2024-final-exam-schedule>

The Method of Evaluation is:

- 10 quizzes, which contribute 30% toward your final (no makeup quizzes without justified reasons);
- 2 project assignments, each one counts 20% toward your final (no makeup tests without justified reasons);
- 1 final comprehensive exam or project, 30%

↔ **Grading Scale:** A 91-100%, A- 89-90, B+ 87-88%, B 81-86%, B- 79-80, C+ 77-78%, C 71-76%, C- 69-70, D+ 67-68, D 61-66%, D- 59-60, F below 59%



main textbook to use

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Academic Integrity: Plagiarism or any form of cheating involves a breach of student-teacher trust. This means that any work submitted under your name is expected to be your own, neither

composed by anyone else as a whole or in part, nor handed over to another person for complete or partial revision. Be sure to document all ideas that are not your own. In addition, you must not provide course materials to other students, whether individually or generally (such as online) that would enable them to gain an unfair academic advantage. Instances of plagiarism or any other act of academic dishonesty will be reported to the Honor Council and may result in failure of the course. Not understanding plagiarism is not an excuse. I expect you, as a Baylor student, to be intimately familiar with the Honor Code at: <http://www.baylor.edu/honorcode/>

Class Attendance: Excerpt from Class Attendance policy, pages 31-32 of the 21-22 Undergraduate Catalog: “Specific policies for attendance are established by the academic units within the university. Faculty members may establish more stringent requirements regarding attendance, punctuality, and participation. Any attendance requirements and penalties for excessive absences will be set forth in the syllabus for each course. The student bears the responsibility for the effect that absences may have upon class participation, announced and unannounced examinations, written assignments, reports, papers, and other means of evaluating performance in a course.”

Academic Success: I believe every student who has been admitted to Baylor can be successful and I want to partner with you to help you thrive academically. Be sure to take advantage of the many resources available for academic success, including coming to see me during my office hours. Students who regularly utilize the great resources in the Paul L. Foster Success Center (<http://www.baylor.edu/successcenter/>) are among my most successful students. If your academic performance in this class is substandard, I will submit an Academic Progress Report to the Success Center so that the team of coordinated care professionals can ensure that you get the help you need.

First Generation College Students: Baylor University defines a first-generation college student as a student whose parents did not complete a four-year college degree. The First in Line program is a support office for first-generation college students to utilize if they have any questions or concerns. Please check out First in Line, visit us in the Basement of Sid Richardson West Wing or email firstinline@baylor.edu. *If you are a first gen college student, you may wish to add: I was also the first in my family to graduate with a four-year bachelor’s degree and can answer questions about experiences as a first-generation college student.*

Military Connected Students: Veterans, active duty military personnel, and dependents are encouraged to connect with the VETS program, a space dedicated to supporting our military-connected students. Please communicate, in advance if possible, any special circumstances (e.g., upcoming deployment, drill requirements, disability accommodations).

Office Hours: One of the best ways to take full advantage of learning in my course is by coming to my office hours. I look forward to guiding you in your academic pursuits. Take advantage of the hours listed in syllabus or email me for an appointment. Appointments are also possible. Those who visit me in office may wear proper face covering or mask.

Health Resources for Students: Baylor University is strongly committed to addressing the mental health and wellness needs of students by providing access to on-campus healthcare resources.

Crises and Emergencies:

BUCC Crisis Line: (254) 710-2467 (Business Hours/Non-Business Hours/Weekends)

Baylor Police Department: (254)710-222

MHMR Crisis Center: (254)867-6550

MHMR 24-Hour Emergency/Crisis Number: (254)752-3451

When home during academic breaks, when the counseling center is closed, please call your local resources. Some national numbers for support during a crisis:

National Hope Network Hotline: 1-800-SUICIDE (1-800-784-2433)

National Suicide Prevention Lifeline: 988

General Guidance for Struggling Students: Baylor University CARE Team Services:

Located on the second floor of the Student Life Center, suite 207.

The Department of CARE Team Services is a team of case managers who work with students who are struggling with mental health issues, financial struggles, and anything else affecting a student's ability to be successful in the classroom. Contact Information: (254) 710-2100; CareTeam@baylor.edu.

Students' Basic Needs (Food & Housing): Food insecurity is defined as "a lack of consistent access to enough food for you to live an active, healthy life." At Baylor, we want all students to have access to food resources that will support their holistic well-being and success. If you or someone you know experiences food insecurity at any time, you can find information on campus and community food resources by visiting The Store. You can also contact Store staff at 254-710-4931. For additional basic needs assistance, please reach out to CASE or the Care Team.

Physical Health and Wellness, Psychiatric Evaluations, Pharmacy: Baylor Health Services Department: Baylor Health Services includes Primary Care, Psychiatry, Physical Therapy and Pharmacy and is staffed with fully certified and licensed physicians and nurse practitioners, as well as nurses and administrative staff. Appointments may be made by calling our main number or by logging into the health portal located on our website. Contact Information: (254) 710-1010; Health_Services@baylor.edu.

Baylor University Counseling Center: The Counseling Center seeks to foster wholeness for every student through caring relationships, cultural humility and integrated mental health services. Located on the second floor of the Student Life Center. For an appointment, go to our website to schedule an Initial Assessment or call (254) 710-2467.

Substance and Behavioral Addiction: Beauchamp Addiction & Recovery Center (BARC):

The Beauchamp Addiction Recovery Center aims to support students in recovery from substance and behavioral addictions through an all-encompassing level of support approach that includes one-on-one mentorship, support groups, and social events open to all Baylor students. Located in the East Village Residential Community (bottom floor of Teal Residential College). Contact Information: (254)-710-7092; BARC@baylor.edu

Spiritual Life: Baylor University Office of Spiritual Life: The Office of Spiritual Life offers programs, persons, and resources to nurture theological depth, spiritual wholeness, and missional living. Located on the corner of 5th and Speight Street in the BoBo Spiritual Life Center. Contact Information: (254) 710-3517; Spiritual_Life@baylor.edu

University's Civil Rights Policy and Sexual and Interpersonal Misconduct Policy: Baylor University does not tolerate unlawful harassment or discrimination on the basis of sex, gender, race, color, disability, national origin, ancestry, age (over 40), citizenship, genetic information or the refusal to submit to a genetic test, past, current, or prospective service in the uniformed services, or any other characteristic protected under applicable federal, Texas, or local law (collectively referred to as Protected Characteristics). Any issue or incident that violates the University's Civil Rights Policy or other policies must be reported through the **Report It** website at <http://www.baylor.edu/reportit> or in conjunction with Baylor's Equity Office.

Title IX Office – Title IX Coordinator: The Office of Equity and Title IX understands the sensitive nature of these situations and can provide information about available on- and off-campus resources, such as counseling and psychological services, medical treatment, academic support, university housing, and other forms of assistance that may be available. Staff members at the office can also explain your rights and procedural options. You will not be required to share your experience. **If you or someone you know feels unsafe or may be in imminent danger, please call the Baylor Police Department (254-710-2222) or Waco Police Department (9-1-1) immediately.**

RESOURCES FOR STUDENT WELLBEING AND SUCCESS:

1. Baylor Telehealth by Academic Live Care All Baylor students have access to medical and counseling services via telehealth in addition to the on-campus services listed below. Medical services include virtual urgent care, psychiatry, and nutrition counseling. Counseling services include 24/7/365 in-the-moment support and ongoing mental health counseling. Access to care is now available in the evenings, during weekends, and when the University is closed. All services are free and unlimited to Baylor students. Please visit <https://baylor.academiclivecare.com/> for more information.
2. Students Needing Accommodations Any student who needs academic accommodations related to a documented disability should inform me immediately at the beginning of the semester. You are required to obtain appropriate documentation and information regarding your accommodations from the Office of Access and Learning Accommodation (OALA). Stop by the first floor of Sid Richardson, East Wing in the Paul L. Foster Success Center or call (254) 710-3605 or email OALA@baylor.edu.

The Office of Equity and Title IX understands the sensitive nature of these situations and can provide information about available on- and off-campus resources, such as counseling and psychological services, medical treatment, academic support, university housing, advocacy services, and other forms of assistance that may be available. Staff members at the office can also explain your rights and procedural options. You will not be required to share your experience. **If you or someone you know feels unsafe or may be in imminent danger, please call the Baylor Police Department (254-710-2222) or Waco Police Department (9-1-1) immediately.**

Except for Confidential Resources, all University Employees are designated Responsible Employees and thereby mandatory reporters of potential sexual and interpersonal misconduct violations. Confidential Resources who do not have to report include those working in the Counseling Center, Health Center and the University Chaplain, Dr. Burt Burleson.

Students Needing Accommodations: Any student who needs academic accommodations related to a documented disability should inform me immediately at the beginning of the semester. You are required to obtain appropriate documentation and information regarding your accommodations from the Office of Access and Learning Accommodation (OALA). Stop by the first floor of Sid Richardson, East Wing in the Paul L. Foster Success Center, 1st floor on the East Wing of Sid Richardson, or call (254) 710-3605 or email OALA@baylor.edu.

University Writing Center: I encourage you to visit the University Writing Center (UWC) this semester and get feedback on your writing for this course. Located in Moody Library 2nd floor West, the UWC offers free assistance to you at any stage of the writing process (brainstorming, researching, outlining, drafting, revising, editing). In their feedback, the consultants focus on higher order concerns, such as content, thesis, evidence, and organization, before grammar or style. The UWC tutors will not proofread, edit, or write your paper for you, but they will equip

you with a toolbox of strategies to improve your writing, research, and editing skills. Please take the assignment prompt, your paper/text, and other materials you might need with you to your appointment. Please include my name as the professor, and a report will automatically be sent to me after your session. You can set up an appointment online at www.baylor.edu/uwc, call the UWC at (254)710-4849, or stop by in person.

Canvas: Visit and review the *Online Student Quickstart* that is on your Canvas Dashboard page in order to familiarize yourself with the technology needed.