## MATH 2552 DIFFERENTIAL EQUATIONS

GEORGIA TECH LORRAINE

# COURSE SYLLABUS

**Updated on March 21, 2023**

***(The syllabus may be updated during the semester, depending on the flow of the course.)***

*Welcome to Differential Equations!*

*All of our students play an important role in our educational mission.*

*Differential Equations are a fundamental topic of Engineering Sciences.*

## 1. Course Description

**Course Title**: Differential Equations

**Course Meeting Times**: Mondays & Wednesdays, time and location TBC

**Recitation Meeting times:** Tuesdays & Thursdays, time and location TBC

**2. Instructor and TA Contact Information**

**Instructor**: Dr. Salah MEHDI

**Office**: TBC

**Office Hours**: TBC and by appointment

**E-mail**: salah.mehdi@univ-lorraine.fr (preferred address)

**Teaching Assistant**: TBC

**Office**: PhD students room

**Office Hours**: by appointment.

**E-mail**: TBC

## 3. Textbook

Differential Equations: An Introduction to Modern Methods & Applications, 3rd edition, by Brannan & Boyce. Wiley. ISBN 9781118531778. The GT Bookstore has online, hard cover, and soft cover editions available.

## 4. Assessments & Information

**Assessments:** Tests (quizzes and midterm) will be returned in class.

**Information:** Announcements and course-related documents will be sent by email.

## 5. Prerequisites

A great deal of tools from calculus, including trigonometry, complex numbers, functions, differentiation, integration and partial fraction decomposition, will be used extensively. Topics from linear algebra are also supposed to be well understood, these include: row reduction, linear combinations, and linear independence. The codes for prerequisites are (from GT course official website): MATH 1502 OR MATH 1512 OR MATH 1555 OR MATH 1504 ((MATH 1552 OR MATH 15X2 OR MATH 1X52) AND (MATH 1522 OR MATH 1553 OR MATH 1554 OR MATH 1564 OR MATH 1X53)).

## 6. Grades

Final grades will be calculated using whichever of the following weights yields the highest grade.

| Assessment | Weight 1 | Weight 2 |
|---|---|---|
| Participation | 2% | 2% |
| Quizzes | 18% | 18% |
| Midterms | 45% | 35% |
| Final Exam | 35% | 45% |

Letter grades will be determined based on the usual intervals. **A**: 90% and higher, **B**: [80%, 90%), **C**: [70%, 80%), **D**: [60%, 70%), **F**: [0%, 60%). For example, a final grade of 89.99% is converted into a B, a final grade of 79.99% is converted into a C, and so on. Any changes to these intervals would only be made after the final exam.

There will be five quizzes, one midterm exam and a final exam. The best four quizzes will be kept out of the five. Homework will be assigned as suggest problems, but will not be collected nor graded. Some of these problems will be discussed in class. A **midterm grade** will be assigned. A satisfactory grade will be assigned by to all students with a midterm average of 70% or higher.

## 7. Learning Outcomes and Topics

**Learning outcomes** (or learning **objectives**) are statements that articulate what students are expected to do in a course. The learning outcomes for this course include the following.

- **Classify** differential equations (by order, linearity, homogeneity, exact, separable, etc) and apply their classification to determine which methods can be used to solve them.
- **Solve** differential equations using techniques introduced throughout this course, and **interpret** the solution to characterize a system.
- **Model** real-life situations using differential equations.
- **Analyze** mathematical statements and solutions of differential equations (for example, by using a direction field or a phase portrait).
- **Write** logical progressions of precise mathematical statements to justify and communicate your reasoning.

**Topics** covered include methods for obtaining numerical and analytic solutions of elementary differential equations. Applications are also discussed with an emphasis on modeling. Topic outline:

- Introduction and Euler's method
- First Order Differential equations
- Systems of two first order equations
- Second order linear equations
- Laplace Transform Methods
- Systems of first order equations
- Nonlinear Differential Equations and Stability
- Numerical approximation of solutions

The list of which sections are covered in lecture is in the syllabus. Students are not expected to be familiar with the material in the sections that are not covered.

# 8. Expectations

## 8.1 Students

Students are expected to attend lectures and recitations and behave at all times in a respectful manner to their instructor, teaching assistants, and fellow students. Students are expected to study the subject matter outside of class time, review this syllabus, review their graded work in a timely manner for potential marking errors and to review where mistakes were made (if any), and ask for help when needed. Students are responsible for obtaining any announcements or materials sent by email or communicated orally in class.

## 8.2 Teaching Assistants (TAs)

TAs are responsible for facilitating learning activities during recitations, holding office hours, marking, and responding to questions from students via email and during office hours and recitations.

## 8.3 Instructor

As your instructor, my role is to facilitate interactive lectures, coordinate with teaching assistants to grade student work and facilitate learning activities, provide students with assessments that both develop and measure their understanding and knowledge of the subject matter, provide feedback on their performance, provide solutions to midterms, and be available for assistance when requested.

# 9. Preparing for Tests

Practice materials and additional office hours will be offered prior to each test. Depending on your goals, you may need to complete additional work beyond homework, worksheets, and practice materials to adequately prepare for them.

# 10. Homework, Participation, Tests Policies

## 10.1 Homework

Homework are assigned exercises (not necessarily from the textbook) and will not be collected. You are expected to understand all homework problems for all quizzes, midterms and the exam. In order to increase the effectiveness of lectures, you should attempt problems before lectures.

## 10.2 Participation

The purpose of participation activities is to encourage participation and active learning, foster community among students, offer feedback to the instructor on student understanding and course activities, and help students become more aware of their level of understanding of course material. Participation activities will be held during lecture and recitation sessions. Participation activities will not be held in the first and last weeks of the course, and will only be graded for completion (not for accuracy). Participation activities could include activities such as individual problem solving, practice quizzes, group work activities, and surveys.

## 10.3 Midterm Schedule and Topics

We will have 50 or 55-minute tests. Tentative dates are on the last page of the syllabus.

## 10.4 Midterm and Final Exam Procedures

### 10.4.1 Tests Procedures

- Books, notes, cell phones, and calculators are not allowed during tests.

- Students may have something to write with and an eraser when taking tests.
- Unless students are asked to use a particular method or theorem, they are allowed to use any approach to solve any problem they are given on any test.
- Unless indicated otherwise, students must adequately justify their reasoning for full marks.
- Marks can be taken off in a test for not using the correct notation.
- The tests are comprehensive.
- Students who are unable to take any test for any reason are responsible for notifying their instructor prior to the exam and as soon as possible.
- Tests will be returned to students in class.

**10.4.2 Additional Final Exam Procedures**

Students take their final exam in the room where they have lectures (as per institute policy). The duration, date, and time of the final exam for local students is listed on the registrar website: http://www.registrar.gatech.edu/registration/exams.php Note that the schedule of the final exam is non negotiable.

**10.4.3 Re-grade Requests for Tests**

1) If any of your work has been graded in error, you should contact your **instructor** as soon as possible.
2) Teaching assistants are not permitted to handle re-grade requests.
3) Should you wish to have your work re-graded, do not change or add to the work on your paper.
4) A re-grade request can only be submitted if you did something correct that was marked as incorrect.
5) Re-grade requests **must be requested within two weeks** after the work has been returned to you.
6) You must check your answers with the solutions before submitting such a request.
7) To submit a re-grade request, you must send your instructor an email from your GT email account that contains your first and last name, the midterm you are referring to, the question(s) you are referring to, and a description of what was graded incorrectly.

## 11. Illnesses, Emergencies, Absences

Students who will miss a midterm or final exam due to a university-sponsored event or athletics should provide their instructor with the official documentation in advance. Any student who misses a test, with reasonable explanation, can write a make-up. Students must notify their instructor as soon as they can to make necessary arrangements.

## 12. Re-Scheduled/Missed Exams

NO MAKE-UP EXAMS! In general, no make-up exams will be given and any missed exam results in a "0" score.

- If you have a valid reason to request a make-up exam, please contact Dr. Mehdi or your TA as early as possible. Only extraordinary cases will be considered.
- In the case of illness and emergency, please contact the Office of Dean of Students immediately. The Dean's office will verify the case, determine the severity of the problem, and then interact with the instructor if necessary.
- Requests for student organization excused absences must be made no later than two weeks prior to the date of the event. No late requests will be honored. Please have your advisor send me a written notice or an e-mail.

- Students who are absent because of participation in a particular religious observance will be permitted to make up the work missed during their absence with no late penalty, provided the student informs Dr. Mehdi of the upcoming absence, in writing, within the first two weeks of class, and provided the student makes up the missed material within the timeframe established by the course instructor.
- If you have off campus interviews for jobs or graduate/professional schools on the test dates, please contact me as early as possible with a supporting document.

# 13. Class Policies

## 13.1 Attendance

In the event of an absence, you are responsible for all missed materials, assignments, and any additional announcements or schedule changes given in class. Class disruptions of ANY kind will NOT be tolerated and may result in your removal from the classroom. Please show courtesy to your fellow classmates and instructor by adhering to the following class rules.

- Come to class on time and stay for the entire class period.
- Refrain from conversing with your fellow students while the instructor is lecturing.
- Put away any reading materials unrelated to the course.
- Please, refrain from using laptops and do not bring food to eat during lectures, they are a distraction to others.

## 13.2 Academic Dishonesty

All students are expected to comply with the Georgia Tech Honor Code (see http://www.policylibrary.gatech.edu/student-affairs/code-conduct). Any evidence of cheating or other violations of the Georgia Tech Honor Code will be submitted directly to the Dean of Students. Cheating includes, but is not limited to the following.

Using a calculator, cell phone, books, or any form of notes on exams.

Copying directly from **any** source during an exam, including friends, classmates, or a solutions manual.

Allowing another person to copy your work. Taking a test using someone else's name, or having someone else take a test in your name.

Asking for a re-grade of a paper that has been altered from its original form.

Using someone else’s name to gain participation points for them, or to take tests for them, or asking someone else to use your identity for any graded or participation submission.

## 13.3 Students with Disabilities and/or in need of Special Accommodations

Georgia Tech complies with the regulations of the Americans with Disabilities Act of 1990 and offers accommodations to students with disabilities. If you are in need of classroom or testing accommodations, please make an appointment with the ADAPTS office to discuss the appropriate procedures. More information is available on their website, http://www.adapts.gatech.edu

## 14. Campus-Wide Dates

Please check with Registrar for possible updates

08 - 22 - 2023 First day of class

10 - 27, 11 - 05 - 2023 Fall Break

12 - 05 - 2023 Final Instructional Class days

12 - 05, 06, 07 & 12 - 2023 Reading periods

12 07 - 14 - 2023 Final Exams period

For further information on campus-wide dates see http://www.registrar.gatech.edu/calendar

The date and time of the final exam is scheduled by the registrar.

For **final exam schedules**, see http://www.registrar.gatech.edu/students/exams.php.

## 15. TENTATIVE SCHEDULE

Please use this as an approximate class schedule. Section coverage may change depending on the flow of the course.

| Week and Dates | Section Coverage in Lecture | Tests | Registrar |
|---|---|---|---|
| Week 1<br>Aug 21 - 25 | 1.1, 1.2, 1.3 | | |
| Week 2<br>Aug 28 - 31 | 2.1, 2.2, 2.3 | Quiz 1 | |
| Week 3<br>Sep 4 - 7 | 2.4, 2.5, 2.6 | | |
| Week 4<br>Sep 11 - 14 | 2.7, 3.1, 3.2 | Quiz 2 | |
| Week 5<br>Sep 18 - Sep 21 | 3.3, 6.1, 6.2 | | |
| Week 6<br>Sep 25 - 28 | 6.3, 3.4, 6.4 | Quiz 3 | |
| Week 7<br>Oct 2 - 5 | 3.5, 3.6, 4.1 | | |
| Week 8<br>Oct 9 - 12 | 4.2, 4.3, 4.5 | Quiz 4 | |
| Week 9<br>Oct 16 - 19 | 4.7, 4.4, 4.6 | | |
| Week 10<br>Oct 23 - 26 | 5.1, 5.2, 5.3 | Midterm | |
| Oct 30 - Nov 5 | NO CLASS | NO CLASS | FALL BREAK |
| Week 11<br>Nov 6 - 9 | 5.4, 5.5, 5.6 | | |
| Week 12<br>Nov 13 - 16 | 5.7, 5.8, 7.1 | Quiz 5 | |
| Week 13<br>Nov 20 - 23 | 7.2, 7.3, 7.4 | | |
| Week 14<br>Nov 27 - 30 | 8.1, 8.2, 8.3 | | |
| Week 15<br>Dec 4 - 5 | Review for Final Test | | Last day of class, Dec 5 |