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SYLLABUS FOR MATH 383.004, FALL 2024

Course Meeting Time & Place: Phillips Hall 332, MWF 2:30-3:20 PM
Instructor: Saiful Tamim
Office: Phillips 344
Email: stamim@unc.edu
Office Hours: Monday & Tuesday 3:30-5:00 PM
TA: Leyi Zhang (leyi_zhang@unc.edu)
TA office hours: Thursday 9:00 AM -10:00 PM at PH 388

1. Course Information

Course overview: Differential equations are equations that involve a relationship between functions and their derivatives. Ordinary differential equations constitute a special class that provides indispensable tools for describing physical processes and dynamical systems, and thus are vital in the study of the applied sciences.

Learning objectives: The big picture goals of our class will be twofold:

1. Learn about the common types of ODEs and the analytic techniques for studying them.

2. Learn to develop mathematical models and analyze physical systems that have a known dynamic evolution. e.g., growing populations, oscillating systems.

Learning methods: Lecture notes are the primary learning resource in this class, while the assigned textbook is meant to be complementary. You are strongly encouraged to ask questions throughout this course in class, during office hours, and with each other. The more you are engaged in the material, the more beneficial this class will be. Throughout the term, you should be reading along in the textbook, reviewing your notes, and working problems beyond what is assigned in the homework to get a better grasp of the material and to be better prepared for both lectures and exams.

Prerequisites: You must have earned a passing grade in MATH233 (or an equivalent) to register for this class. Review the following topics with particular emphasis:

(1) Rules of differentiation and logarithm,
(2) Basic integration techniques,
(3) Fundamentals of trigonometry.

Text: *Differential Equations: Computing and Modeling*, sixth edition, by Edward, Penney and Calvis.

Textbook options: 1. MyLabMath that comes with an e-book version (this is less expensive), 2. Hardback Textbook + MyLabMath.

Technologies: We will be using the following programs and websites for this class:

(1) **Canvas:** All lecture notes, as well as solutions and other class material will be posted on Canvas which can be accessed by going to: https://canvas.unc.edu/.
(2) **MyLab Math:** The access code may be purchased using a credit card or in the UNC Textbook store. You can also bundle with a physical copy of the textbook. You must purhcase an access code and enroll online to view and submit homework assignments. The Course ID is **tamim59082**. More specific instructions for registration can be found on Canvas under Files.
(3) **Gradescope:** For submitting written homework and worksheets. Gradescope can be accessed through Canvas or https://www.gradescope.com/.

Class expectations: Attending class is essential (but not sufficient) to succeed in this class. You are only allowed **three** unexcused absences throughout the semester.

[1] Updated September 16, 2024

2. Assignments and Grading

Homework: Online homeworks will be assigned and submitted through MyLab Math and written homework assignments through Gradescope. These will be assigned periodically throughout the semester. The lowest grade will be removed from the mylab homeworks. Deadlines for all homework will be followed strictly and all late submissions are subject to a 25% penalty. Students are solely responsible for keeping track of all deadlines and finishing the work on time.

In Class Worksheets: I aim to give students the opportunity to work with the content presented in class before ever leaving class, so they can ask the questions that normally arise when they first open their homework. These worksheets are also how I will take attendance the majority of the time. Worksheets will be posted prior to class and to be submitted at the end of class on Gradescope. Worksheets will be graded out of 10 points based on your effort, rather than accuracy. For example, if you show clear work with the correct method you will receive full credit. But if you simply write down the correct answer to a problem with no work shown you will receive a failing grade.

Exams: There will be two in class exams, lasting the entire class period.

Exam 1: Friday, September 27
Exam 2: Monday, October 28

Any change to the exam dates will be stated in class. There will be no make-up exams, except for religious and university-sponsored exceptions. All make up exams will require official approval to be given.

Comprehensive Final Exam: The final exam is given in compliance with UNC's final exam regulations and calender. This will be on **8 AM, Friday, Dec 6**. In order to take a make-up exam outside this date, you must have an official examination excuse, signed by a Dean or authorized agent of the Dean. If you need to reschedule the final exam, it will be your responsibility to obtain the necessary documents and contact me to set up the exam at least two weeks prior to the official exam date.

Grade Calculation:

MyLab Homeworks	15%
Written Homeworks	8%
In Class Worksheets	7%
Exam 1	20%
Exam 2	20%
Final Exam	30%

Course Grade:

93-100	A	77-79	C+
90-92	A-	73-76	C
87-89	B+	70-72	C-
83-87	B	67-69	D+
80-82	B-	60-66	D
		0-59	F

Grading policy: Final Grading schemes are subject to change without prior notice at the sole discretion of the instructor. Posted final grades will be final and no regrading requests are accepted.

Note: The lower midterm grade will be replaced by the final exam grade before calculating final grades.

Generative AI: Please follow the updated university policies regarding AI usage in this course: https://provost.unc.edu/student-generative-ai-usage-guidance/

3. Syllabus and Lecture Schedule

- **Chapter 1 (Week 1-4)**
  - Introduction to DE and Modeling
  - Different types of DE
  - Separable equations
  - Linear 1^{st} order equation
  - Exact equations
  - Substitution method
  - Existence and uniqueness theorem
- **Chapter 2 (Week 5)**
  - Equilibrium and stability of DE
  - Logistic equation
- **Chapter 3 (Week 6-9)**
  - General solution of 2^{nd} order linear ODEs
  - Homogenous equations
  - Linear equations of higher orders
  - Application of homogenous equations (mechanical vibration)
  - Linear non-homogenous equations
  - Boundary value problem and eigenvalues
- **Crash course of linear algebra (Week 10-11)**
  - Matrices and system of equations
  - Eigenvalues and eigenvectors
- **Chapter 5 (Week 11-14)**
  - Linear system of ODEs
  - Eigenvalue method of solving linear homogenous systems
  - Applications of system of ODEs
- **Chapter 6 (Week 15)**
  - Stability of 2-D systems

Exam Topics

(1) Exam 1: Chapters 1-2.
(2) Exam 2: Chapter 3.
(3) Final: All lectures.

There will be review classes held before each exam.

University of North Carolina at Chapel Hill
Statements for Undergraduate Classes
Fall 2024

Attendance Policy

University Policy: As stated in the University's Class Attendance Policy, no right or privilege exists that permits a student to be absent from any class meetings, except for these University Approved Absences:

1. Authorized University activities: University Approved Absence Office (UAAO) website provides information and FAQs for students and FAQs for faculty related to University Approved Absences
2. Disability/religious observance/pregnancy, as required by law and approved by the Equal Opportunity and Compliance Office (EOC)
3. Significant health condition and/or personal/family emergency as approved by the Office of the Dean of Students, Gender Violence Service Coordinators, and/or the Equal Opportunity and Compliance Office (EOC).

Code of Conduct

All students are expected to adhere to University policy and follow the guidelines of the UNC Code of Conduct. Additional information can be found at studentconduct.unc.edu.

Artificial Intelligence (AI) Use Policy – *CAS units only*

Instructors should specify the details of AI Use Policies for the particular course, either by indicating that:

Use of generative AI tools of any kind is not permitted in this course. Any use of these tools will be considered an instance of academic dishonesty and will be referred to the Honor System.

- or -

The following uses of generative AI tools are permitted in this course: *Categories of possible permitted use include, but are not limited to: topic selection, brainstorming and idea generation, research, source validation, outlining and planning, drafting, media creation, peer review, revising, and polishing.*

Syllabus Changes

Information for Students (to be included on the syllabus):

The instructor reserves the right to make changes to the syllabus including project due dates and test dates. These changes will be announced as early as possible.

Equal Opportunity and Compliance - Accommodations

Equal Opportunity and Compliance Accommodations Team (Accommodations - UNC Equal Opportunity and Compliance) receives requests for accommodations for disability, pregnancy and related conditions, and sincerely held religious beliefs and practices through the University's Policy on Accommodations. EOC Accommodations team determines eligibility and reasonable accommodations consistent with state and federal laws.

Counseling and Psychological Services (CAPS)

UNC-Chapel Hill is strongly committed to addressing the mental health needs of a diverse student body. The Heels Care Network website is a place to access the many mental health resources at Carolina. CAPS is the primary mental health provider for students, offering timely access to consultation and connection to clinically appropriate services. Go to the

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CAPS website or visit their facilities on the third floor of the Campus Health building for an initial evaluation to learn more. Students can also call CAPS 24/7 at 919-966-3658 for immediate assistance.

Title IX and Related Resources

Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Reports can be made online to the EOC or by contacting the University's Title IX Coordinator, Elizabeth Hall, or the Report and Response Coordinators in the Equal Opportunity and Compliance Office. Please note that I am designated as a Responsible Employee, which means I must report to the EOC any information I receive about the forms of misconduct listed in this paragraph. If you'd like to speak with a confidential resource, those include Counseling and Psychological Services and the Gender Violence Services Coordinators. Additional resources are available at safe.unc.edu.