SPRING 2017
Differential Equations
Math 212

Instructor	Christina Lee
Office	Modular Office Quad-side
Email	christina.lee@emory.edu
Office Hours	Tuesday at 1pm or by appointment.
Class Website	`canvas.emory.edu`
Textbook	"Elementary Differential Equations with Boundary Value Problems," 6th ed., Edwards & Penny, 2008
Class	Seney 208, MWF 12:00 - 1:05 PM

Course Description

Differential equations are used to model the world around us. Understanding the properties of solutions to differential equations is fundamental to the field of applied mathematics. The course provides an introduction to the theory, solution techniques, and applications of ordinary differential equations and boundary value problems. The topics for the course includes: solutions to first-order linear and nonlinear ordinary differential equations by analytical, qualitative, and if time permits, numerical methods; mathematical modeling with differential equations; solutions to second-order linear differential equations; power series solutions to differential equations; existence and uniqueness theorems; systems of differential equations including the connection to linear algebra, stability theory, and phase plane analysis; Fourier series and boundary value problems.

Course Goals

Every living and many nonliving things are in a constant state of change. For instance, cancer can grow within an organism, a pollutant can spread through a lake, and oil prices can rise and fall. Differential equations are used to model the rate of change of these, and other natural phenomena. Solutions of the differential equations that model these processes allow one to make predictions on future behavior. For example, we can use the solution to the appropriate differential equations to predict how a cancer will grow, to quantify the extent to which a lake is polluted, and to predict the cost of oil at a particular point in the future.

The study of differential equations used to be solely focused on finding exact solutions using analytical techniques. However, many differential equations that arise out of real-world phenomenon cannot be solved analytically, and instead require the used of qualitative and numerical solution methods. Therefore, in this course, we will focus on why we study differential equations and we will learn how to understand the behavior of these equations using analytical, qualitative, and numerical (time permitting) techniques. The learning goals of this class are to:

- Create and analyze mathematical models using ordinary differential equations.
- Classify any given differential equation, determine if a solution exists, and select the appropriate analytical technique (if there is one) for finding the solution.
- Utilize qualitative methods to gain insight into the behavior of a single differential equation and systems of differential equations.
- Be aware of how technology can be exploited to find analytical, graphical, and numerical solutions of differential equations.
- Strengthen your abilities to read, interpret, and apply mathematical truths.

Resources & Tips for Success

- **ME!** If you are encountering difficulties with the material, talk to me as soon as possible. Do not wait until the week of an exam. The earlier you communicate with me, the sooner I can help you.
- **Peers** Your classmates come from different backgrounds and have various strengths. They can help you see mathematics differently. Learn from each other. However, you should be sure that ultimately you can solve problems unaided by notes, the textbook, a calculator, or other people.
- **Time Management** In general you should expect to study at least six good hours per week in addition to time spent reviewing for exams. Exams are performances, similar to those by athletes, musicians, and dancers. You should prepare for them in similar ways – starting with practicing for them weeks in advance.
- **Persistence** Success in this course will require diligence and hard work. Don't be discouraged by an incorrect result, sometimes going down the wrong path teaches you how to recognize the correct path. You should be sure to keep up with the assignments and to attend class.
- **Students with Differing Abilities** If you have a documented disability and have anticipated barriers related to the format or requirements of this course, or presume having a disability (e.g. mental health, attention, learning, vision, hearing, physical or systemic), and are in need of accommodations for this semester, we encourage you to contact the Office of Access, Disability Services, and Resources (ADSR) to learn more about the registration process and steps for requesting accommodations.

  If you are a student that is currently registered with ADSR and have not received a copy of your accommodation notification letter within the first week of class, please notify ADSR immediately by emailing Megan Bohinc at `ADSROxford@emory.edu`. Students who have accommodations in place are encouraged to coordinate a face to face meeting with your professor, during the first week of the semester, to communicate your specific needs for the course as it relates to your approved accommodations. All discussions with ADSR and faculty concerning the nature of your disability remain confidential.

  For additional information regarding ADSR, please visit the website: `equity.emory.edu/access`.

Course Requirements & Grading

Homework

Homework will be assigned regularly throughout the semester. Assignments will be announced in class and posted on Canvas. You are responsible for knowing all due dates whether you are in class the day an assignment is given or not. You are encouraged to work on the homework with your classmates, although your final write-up must be your own. Importantly, not all homework assignments will be graded. Each class a homework assignment is due, the instructor will decided whether or not to college the homework or give a quiz based on the homework. So, you must come to class truly understanding the work in you homework assignment! If homework is collected, not all problems will be graded.

Readings

The ability to read carefully is not only important to learning mathematics, it is an essential skill for all contributing members of society. There will be a reading assignment posted by the end of the day for each class. Each reading assignment will state which section of the textbook or handout to read as well as some questions to answer. The assignment will be graded at the beginning of class for completeness.

NOTE: All written work (reports & homework) will be graded on the quality of mathematics as well as the quality of presentation. Important presentation pieces to consider are neatness, organization, grammar, and paragraph structure.

Exams
There will be one in-class exam and two out-of–class exams. Examinations will be based on material presented in-class and problems done in class, on homework, or in the textbook. Exams will consist of routine and non-routine questions. Studying examples given in class and the questions assigned for homework will NOT be enough. In order to answer the non-routine questions, you will need to understand the course material at a deep conceptual level. The instructor will announce the exact exam dates one week in advance. Tentative dates are 2/4 (in-class), 3/17, and 4/14.

Final Exam
There will be a required comprehensive final exam. Do NOT make travel arrangements until the final exam schedule is posted.

Grade Calculation
Your course grade will be computed by the formula below. Note, very good/poor class participation (attendance and active participation) can affect your final grade by up to a half of a letter grade (up or down). The instructor reserves the right to change or modify this formula as needed.

Grading Component	**Percentages**
Homework & Quizzes	15%
Readings	10%
Exam 1	11%
Exam 2 & 3	34%
Final Exam	30%

Grade Assignment

Letter Grade	**Grade (g)**
A	$g \geq 94$
A–	$90 \leq g < 94$
B+	$87 \leq g < 90$
B	$83 \leq g < 87$
B–	$80 \leq g < 83$
C+	$77 \leq g < 80$
C	$73 \leq g < 77$
C–	$70 \leq g < 73$
D+	$67 \leq g < 70$
D	$60 \leq g < 67$
F	$g < 60$

COURSE POLICIES

Website & Email
Announcements, assignments, and other material will be posted on Canvas. Students are also expected to check their Emory email address and canvas regularly to obtain course related information.

Extra Credit & Curving
There will be NO extra credit assignments nor a curve.

Calculators & other Devices
NO calculators or other devices (e.g., cell phones, iPads, smart watches etc.) will be allowed on exams or quizzes. All written solutions must be legibly written and sufficiently justified to receive full credit. Please put your devices on silent before coming to class.

Attendance, Late Policy, & Make-ups
Students are responsible for any information given out in class. If a student knows ahead of time they will not be in class, please make arrangements to find out what you missed. Homework, quizzes, and exams are based on material presented in class, so attendance is integral to learning the course material. The instructor will request to dismiss students from the course with 6 or more absences. Three tardies will count as an absence. A removal from the course due to excessive absences will result in a WF (withdraw failing) for the semester, which will be calculated into the GPA as an F. A student removed from a course for excessive absences may impact their ability to graduate on-time, keep their F-1 visa, keep housing privileges, and/or keep their financial aid.

Assignments are due at the beginning of class, and quizzes start at the beginning of class. Late assignments will not be accepted, and if you miss a quiz due to lateness, it cannot be made up. Students are expected to be present for all scheduled tests. Any conflicts should be brought to the instructor's attention as soon as possible. If a legitimate reason exists for missing a test or quiz – as determined by the instructor – then the test or quiz must be taken prior to the regularly scheduled date. If you miss an exam or quiz it is an automatic zero unless you made prior arrangements with the instructor more than 24 hours in advance. Consideration for make-up exams or quizzes will only be given to students participating in official college activities or emergency situations, in both cases appropriate written documentation of the activity or documentation from the Dean of Students of the emergency that prevents you from taking the exam.

Exceptions to the above policy for extenuating circumstances will be made on a case-by-case basis. Please do not delay in contacting me if such circumstances arise. If I do not hear from you within 24 hours of an exam, quiz, or assignment, you forfeit your chances to earn back the lost points.

Appealing a grade
If you wish to appeal a grade, you must submit the reasons in writing explaining why you feel your grade is incorrect along with the original work in dispute so that the request may be reviewed carefully. All appeals must be submitted to the instructor within ONE week of the date the items are first returned to the CLASS. After the deadline, all grades are final. Failure to pick up items before the deadline is an automatic forfeit of your rights to contest the grade.

Academic Integrity
THE HONOR CODE OF OXFORD COLLEGE APPLIES TO ALL WORK SUBMITTED FOR CREDIT IN THIS COURSE. TO RECEIVE CREDIT FOR WORK SUBMITTED YOU MUST PLACE YOUR NAME ON IT. BY PLACING YOUR NAME ON SUCH WORK, YOU PLEDGE THAT THE WORK HAS BEEN DONE IN ACCORDANCE WITH THE GIVEN INSTRUCTIONS AND THAT YOU HAVE WITNESSED NO HONOR CODE VIOLATIONS IN THE CONDUCT OF THE ASSIGNMENT.

Religious Holiday Arrangements
Instructors are encouraged, not required, to accommodate students' academic needs related to religious holidays. Please make every effort to negotiate your religious holiday needs within the first two weeks of the semester; waiting longer may compromise your instructor's ability to extend satisfactory arrangements. If you need guidance negotiating your needs related to a religious holiday, the College Chaplain, Rev. Lyn Pace, `ppace@emory.edu`, Candler Hall 202, is willing and available to help. ⋆⋆ Please be aware that Rev. Pace is not tasked with excusing students from classes or writing excuses for students to take to their professors. Emory's official list of religious holidays may be found at `www.religiouslife.emory.edu/faith_traditions/holidays/html`.

Note: Student work submitted as part of this course may be reviewed by Oxford College and Emory College faculty and staff for the purposes of improving instruction and enhancing Emory education.