MAP 2302: Elementary Differential Equations

Fall 2019

Instructor: Dr. Tracy Stepien
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Office Hours:

- Mondays Period 5 (11:35am–12:35pm)
- Wednesdays Period 4 (10:40am–11:30am)
- Wednesdays Period 8 (3:00pm–3:50pm)
- By appointment

Lecture Time and Place: Mondays, Wednesdays, and Fridays
Period 3 (9:35am–10:25am)
205 Little Hall

Required Textbook: *Fundamentals of Differential Equations and Boundary Value Problems*, 7th Edition, by R. Kent Nagle, Edward B. Saff, and Arthur David Snider, Pearson, ISBN: (Print) 978-0321977106; (eBook) 978-0321977175.

Course Description and Goals: This course covers topics including first-order ordinary differential equations, theory of linear ordinary differential equations, solution of linear ordinary differential equations with constant coefficients, the Laplace transform and its application to solving linear ordinary differential equations. We will cover some material from Chapters 1–4 and 7–8.

Differential equations constitute a language through which the laws of nature are expressed. Many of the fundamental laws of applied mathematics, physics, chemistry, biology, engineering, economics, finance, and other areas can be formulated as differential equations. Hence, it is essential for students in these fields to be familiar with differential equations.

The major objective of this course is to introduce students to the basic concepts and applications of differential equations. Students would be expected to understand the basic concepts of differential equations well enough to be able to decide when, how, and why to apply them to real-world phenomena and to be able to interpret and communicate the results. This course is designed to help students progress in developing analytical thinking, critical reasoning, problem-solving, and communication skills. The goal is to obtain a useful mastery of concepts and methods basic to fully understand and appreciate the theory and practice of differential equations.

Prerequisites: A grade of C or better in Calculus 2 (MAC 2312, MAC 2512, or MAC 3473).

Course Web Site: All course materials and information will be accessible through Canvas: http://elearning.ufl.edu/. Canvas will also serve as our course gradebook. Please verify the accuracy of all assignment and exam scores in a timely fashion.

Communication: It is the student's responsibility to keep informed of any announcements, syllabus adjustments, or policy changes made during scheduled classes, by email, or through Canvas. Students are required to use their official UF e-mail address for course-related communications with their instructor.

For homework questions, we will be using Piazza (via link on the course Canvas web site) for class discussion. The system is highly catered to getting you help fast and efficiently from classmates and myself. Rather than emailing questions to the teaching staff, post your questions on Piazza.

A "Piazza Participation Grade" will be included in your overall grade (as an undroppable homework assignment). How participation is calculated will be explained in class.

Homework: Written homework assignments showing all work with proper notation will be due weekly via electronic submission through Canvas.

Late submissions will receive a point deduction of 10% per day late. Note that late days are counted in 24-hour periods. For example, if the cutoff for on-time submission is 11:59pm, submitting between 12:00am–11:59pm the next day is one day late, and so on. Every assignment has a hard deadline, usually 2 days past the original due date, and late submissions (penalty or not) are *not accepted after the hard deadline*.

The two lowest homework scores will be dropped at the end of the semester.

Exams: There will be three in-class exams tentatively scheduled for

- Friday, September 20
- Friday, October 18
- Friday, November 15

and a comprehensive final exam scheduled for

- Monday, December 9 from 3pm–5pm

in the regular classroom.

In general, there will be *no make-up exams* in the course. However, in complex and unusual circumstances which are beyond your control, a make-up exam may be given on a case-by-case basis. This will require providing a detailed account of the situation and supporting documents. The instructor must be notified as soon as possible, preferably before the exam is given with as much advanced notice as possible.

There are no exam retakes or corrections, no lowest exam will be dropped, and there will be no extra credit assignments to erase the consequences of a bad exam score.

Grades: The semester grade will be computed based on:

- Final Exam: 25%
- In-Class Exams: 50% ($16.\overline{6}$% each)
- Homework: 25%

Your final course grade will be no lower than the following:

A $= [93, 100]$	B+ $= [87, 90)$	C+ $= [76, 80)$	D $= [60, 70)$
A- $= [90, 93)$	B $= [83, 87)$	C $= [70, 76)$	E $= [0, 60)$
	B- $= [80, 83)$		

Grades are based only on academic work and are calculated using the same criteria for all students. It is unethical to bring to your instructor's attention the possible impact of your mathematics grade on your future plans, including graduation, scholarships, jobs, etc.

More information on UF grading policies (including requests for withdrawal (W) or incomplete (I*/I) grades) may be found at:

- https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

Attendance: Requirements for class attendance in this course are consistent with university policies that can be found at

- http://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Please see the above web site for more information on religious holidays, illness policy, and the 12-day rule for university-sponsored athletic or scholarly activities.

Participating in the course and attending lectures and other course events are vital to the learning process. As such, attendance is expected at all lectures. Students may be administratively dropped from the course for lack of attendance; however, students should be aware that nonattendance does not automatically result in being dropped from the course.

Classroom Behavior: To foster a positive learning environment, students and instructors have a shared responsibility. We want a safe, welcoming, and inclusive environment where all of us feel comfortable with each other and where we can challenge ourselves to succeed. To that end, our focus is on the tasks at hand and not on extraneous activities (texting, chatting, reading a newspaper, making phone calls, web surfing, taking photos, etc.).

The use of personal electronics such as laptops, tablets, cell phones, cameras, and other such mobile devices is distracting to the other students and the instructor. Their use can degrade the learning environment. Therefore, students are not permitted to use these devices during the class period.

Honesty Policy Regarding Cheating, Plagiarism, etc.: UF students are bound by *The Honor Pledge* (http://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/) which states,

> We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment."

The Student Conduct Code (http://sccr.dso.ufl.edu/process/student-conduct-code/) specifies a number of behaviors that are in violation of the honor code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please or consult with the instructor in this class.

Accessibility and Accommodations: Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-293-8565, http://www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Online Course Evaluations: Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at http://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via http://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at http://gatorevals.aa.ufl.edu/public-results/.

Health and Wellness Resources:

- *U Matter, We Care:* If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit http://umatter.ufl.edu/ to refer or report a concern and a team member will reach out to the student in distress.
- *Counseling and Wellness Center:* Visit http://counseling.ufl.edu/ or call 352-392-1575 for information on crisis services as well as non-crisis services.
- *Student Health Care Center:* Call 352-392-1161 for 24/7 information to help you find the care you need, or visit http://shcc.ufl.edu/.
- University Police Department: Visit http://police.ufl.edu/ or call 352-392-1111 (or 9-1-1 for emergencies).
- *UF Health Shands Emergency Room/Trauma Center:* For immediate medical care call 352-733-0111 or go to the emergency room at 1515 SW Archer Rd., Gainesville, http://ufhealth.org/emergency-room-trauma-center/.

Academic Resources:

- *Teaching Center:* Obtain drop-in or appointment tutoring, join a Supplemental Instruction (SI) study group, and take study skills workshops at the ground level of Broward Hall; see http://teachingcenter.ufl.edu/
- *E-learning technical support:* Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.
- *Career Connections Center:* Career assistance and counseling services at Reitz Union, Suite 1300, http://career.ufl.edu/.
- *Library Support:* Ask a librarian for help using the libraries or finding resources through various methods at http://cms.uflib.ufl.edu/ask

Important Note: Information contained in the course syllabus, other than the grade and absence policy, may be subject to change with advance notice, as deemed appropriate by the instructor.

Tentative Lecture Schedule:

Monday	Wednesday	Friday
Aug 19th	**21st** *First day of class* 1.1 Background	**23rd** 1.2 Solutions and Initial Value Problems
26th *Last day to drop/add courses* 1.3 Direction Fields	**28th** 1.3 Direction Fields	**30th** 2.1 Motion of a Falling Body
Sep 2nd **No Classes** (Labor Day)	**4th** 2.2 Separable Equations	**6th** 2.3 Linear Equations
9th 2.4 Exact Equations	**11th** 2.5 Special Integrating Factors	**13th** 2.6 Substitutions and Transformations
16th 2.6 Substitutions and Transformations	**18th** 3.1 Mathematical Modeling	**20th** **Exam #1**
23rd 3.2 Compartmental Analysis	**25th** 3.3 Heating and Cooling of Buildings	**27th** 3.4 Newtonian Mechanics
30th 3.5 Electrical Circuits	**Oct 2nd** 4.1 Mass–Spring oscillator	**4th** **No Classes** (Homecoming)
7th 4.2 Homogeneous Linear Equations: The General Solution	**9th** 4.3 Auxiliary Equations with Complex Roots	**11th** 4.4 Nonhomogeneous Equations: Method of Undetermined Coefficients
14th 4.5 Superposition Principle	**16th** 4.6 Variation of Parameters	**18th** **Exam #2**
21st 4.7 Variable–Coefficient Equations	**23rd** 4.9 Free Mechanical Vibrations	**25th** 4.10 Forced Mechanical Vibrations
28th 7.1–7.2 Definition of the Laplace Transform	**30th** 7.3 Properties of the Laplace Transform	**Nov 1st** 7.4 Inverse Laplace Transform
4th 7.5 Solving Initial Value Problems	**6th** 7.6–7.7 Transforms of Discontinuous and Periodic Functions	**8th** 7.8 Convolution
11th **No Classes** (Veterans Day)	**13th** 8.1 The Taylor Polynomial Approximation	**15th** **Exam #3**

Monday	Wednesday	Friday
18th 8.2 Power Series and Analytic Functions	**20th** 8.3 Power Series Solutions to Linear Differential Equations	**22nd** 8.3 Power Series Solutions to Linear Differential Equations
25th *Last day to withdraw from courses with W* 8.4 Equations with Analytic Coefficients	**27th** **No Classes** (Thanksgiving)	**29th** **No Classes** (Thanksgiving)
Dec 2nd 8.6 Method of Frobenius	**4th** *Last day of class* *Last day to petition to your college for late withdrawal* Review	**6th**
9th **Final Exam** 3pm–5pm	**11th**	**13th**

Students are responsible for the assigned material whether or not it is covered in class. Students are responsible for the material covered in class whether or not it is in the text.