

Differential Equations for Engineers and Physical Scientists

MAP 4305

Spring 2024

Instructor _____



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Office: 460 Little Hall



Office Hours:

■ TBD

■ By appointment

Lecture _____



Online (asynchronous)

Web Site _____



Canvas:

<https://elearning.ufl.edu/>

Course Objectives/Goals

Students will have more advanced skills with ordinary differential equations (ODEs). Students will be introduced to and develop skills to work with systems of ODEs.

Modules:

1. Review of basic relevant concepts of MAP 2302
2. Section 5.2: Differential Operators and the Elimination Method for Systems
3. Section 5.4: Introduction to the Phase Plane
Section 5.5: Applications to Biomathematics
4. Section 9.4: Linear Systems in Normal Form
5. Section 9.5: Homogeneous Linear Systems with Constant Coefficients
Section 9.6: Complex Eigenvalues
6. Section 9.7: Nonhomogeneous Linear Systems
7. Section 9.8: The Matrix Exponential Function
8. Section 12.2: Linear Systems in the Plane
9. Section 12.3: Almost Linear Systems
10. Section 12.4: Energy Methods
Section 12.5: Lyapunov's Direct Method
11. Section 12.6: Limit Cycles and Periodic Solutions
12. Section 12.7: Stability of Higher Dimensional Systems
13. Section 11.2: Eigenvalues and Eigenfunctions
14. Section 11.3: Regular Sturm–Liouville Boundary Value Problems
15. Section 11.4: Nonhomogeneous Boundary Value Problems and the Fredholm Alternative

Prerequisites: Elementary Differential Equations (MAP 2302) and Linear Algebra (MAS 3114, MAS 4105, or EGM 3344).

Student Learning Outcomes

- Students will be able to solve homogeneous and non-homogeneous first order linear systems with constant coefficients using matrix analysis or the elimination method for differential operators.
- Students will be able to analyze first order non-linear systems using phase-plane analysis, energy methods, including Lyapunov methods, and periodic solution theorems.
- Students will be able to reduce a higher order equation or system to a first order system in normal form and then analyze it using methods for first order systems.
- Students will be able to solve homogeneous and non-homogeneous boundary value problems for second order ODEs.

Textbook

Fundamentals of Differential Equations and Boundary Value Problems (7th edition) by Nagle, Saff, and Snider

An electronic version of the book comes in a package with MyLab (see below) from Pearson.

Software

MyLab: Homework, quizzes, and exams will be in Pearson's MyLab digital platform. It is available via a link on our Canvas course web site.

Honorlock: Required for proctored quizzes and exams.

Mathematica: Mathematica will be used in the lecture videos for computation and illustration to help visualize and understand course concepts. It is available on any computing device through UFApps (<https://info.apps.ufl.edu>) and in computer labs (<https://labs.at.ufl.edu/locations/>).

It is the student's responsibility to have a reliable Internet connection, adequate Internet speed, and cleared cache and cookies before starting each assignment.

Grading Scheme

25%	Homework
30%	Quizzes (15% each)
40%	Exams (20% each)
5%	Participation

MyLab's grading is final.
It is your responsibility to input your results correctly.

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






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

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/>

Academic Calendar Dates

	Mon., Jan. 8 First day of class
	Fri., Jan. 12 Last day to drop/add courses with no fee liability
	Fri., Apr. 12 Last day to withdraw from courses with W
	Wed., Apr. 24 Last day to petition to your college for late withdrawal
	Wed., Apr. 24 Last day of class

Time Commitment

Students are expected to watch all the course videos.

Students should spend about three hours on the class every week for each credit hour of the course in order to keep up with the course material.

Communication

Course Announcements: Posted on **Canvas**. It is the student's responsibility to make sure they receive notifications for this course.

Discussion Board: Homework/content questions should be posted on our class discussion board on **Canvas Discussions**.

Personal Matters: Students may e-mail the instructor via **Canvas Inbox** or e-mail using their official UF e-mail address.

Homework

Homework assignments will be due **weekly** via MyLab. Doing homework is essential to success in this course and is one of the best ways to prepare for quizzes and exams.

Students are permitted to consult with others on the assignments, but must submit their own solutions which must be a product of independent effort.

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

Quizzes

There will be three Quizzes taken online in MyLab with Honorlock proctoring:

1. **Tuesday, January 30**
2. **Tuesday, March 5**
3. **Tuesday, April 9**

Quizzes can be taken on the specified day between 9:00am and 8:00pm. Quizzes are 30 minutes long.

The **lowest** Quiz score will be dropped at the end of the semester.

Exams

There will be three Exams taken online in MyLab with Honorlock proctoring:

1. **Tuesday, February 13**
2. **Tuesday, March 26**
3. **Tuesday, April 30**

Exams can be taken on the specified day between 9:00am and 8:00pm. Exams are 50 minutes long.

The **lowest** Exam score will be dropped at the end of the semester.

Participation/Engagement

Participation/engagement is expected regularly in this class, but how you participate is (in part) up to you. There is flexibility in the ways that you can participate in class, including:

- Weekly check-in surveys
- Asking questions/giving answers on the class discussion board
- Reflections on readings

Health and Wellness Resources

- U Matter, We Care
<https://umatter.ufl.edu>
- Counseling and Wellness Center
<https://counseling.ufl.edu>
- Student Health Care Center
<https://shcc.ufl.edu>
- University Police Department
<https://police.ufl.edu>
- UF Health Shands Emergency Room/Trauma Center
<https://ufhealth.org/emergency-room-trauma-center>
- GatorWell Health Promotion Services
<https://gatorwell.ufsa.ufl.edu>
- Whole Gator App
<https://studentlife.ufl.edu/wholegator/>

Academic Resources

- CLAS Academic Resources (tutoring, study groups)
<https://academicresources.clas.ufl.edu/>
- UF Student Success (tutoring, coaching)
<https://studentsuccess.ufl.edu>
- Computing Help Desk
<https://helpdesk.ufl.edu>
- Career Connections Center
<https://career.ufl.edu>
- Library Support
<https://uflib.ufl.edu/find/ask/>
- Writing Studio
<https://writing.ufl.edu/writing-studio/>

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.

Make-Up Policy for Homework/Exams

Make-up homework/exam work is allowed only when written evidence of an official University excused absence is provided (<http://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>).

The instructor must be notified as soon as possible, preferably **before** the homework due date or quiz/exam with as much advanced notice as possible. A detailed account of the situation and supporting documents are required.

*If you do not have an official University excused absence, but are unable to complete homework on time for any reason, see the **Late Policy** below.*

Late Policy for Homework

Late submissions will receive a point deduction of 10% per day late. Note that late days are counted in 24-hour periods. The cutoff for on-time submission is 11:59pm, so submitting between 12:00am–11:59pm the next day is one day late, and so on.

Every assignment has a hard deadline 2 days past the original due date, after which late submissions are **not accepted**.

Accessibility and Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center by visiting <https://disability.ufl.edu/get-started/>.

It is important for students to share their accommodation letter with their instructor and discuss their access needs **as early as possible in the semester**.

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.

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/>.

Monday	Tuesday	Wednesday	Thursday	Friday
January 8th <i>First day of class</i>	9th	10th	11th Module #1	12th <i>Last day to drop/add courses</i>
15th Martin Luther King Jr. Day	16th	17th	18th Module #2	19th
22nd	23rd	24th	25th Module #3	26th
29th	30th Quiz #1 (M1-3)	31st	February 1st Module #4	2nd
5th	6th	7th	8th Module #5	9th
12th	13th Exam #1 (M1-5)	14th	15th Module #6	16th
19th	20th	21st	22nd Module #7	23rd
26th	27th	28th	29th Module #8	March 1st
4th	5th Quiz #2 (M6-8)	6th	7th Module #9	8th
11th Spring Break	12th Spring Break	13th Spring Break	14th Spring Break	15th Spring Break
18th	19th	20th	21st Module #10	22nd
25th	26th Exam #2 (M6-10)	27th	28th Module #11	29th
April 1st	2nd	3rd	4th Module #12	5th
8th	9th Quiz #3 (M11-12)	10th	11th Module #13	12th <i>Last day to withdraw from courses with W</i>
15th	16th	17th	18th Module #14	19th
22nd	23rd	24th <i>Last day of class</i> <i>Last day to petition to your college for late withdrawal</i> Module #15	25th	26th
29th	30th Exam #3 (M11-15)	May 1st	2nd	3rd