

MA 341 Applied Differential Equations I

Lecture details

Section 601	LINK to Video lectures		
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Office Hours:	MTWH 11:40 am-12:40 pm or by appointment	Office Hours:	TA office hours
Moodle page:	http://moodle.wolfware.ncsu.edu/		
WeBWorK:	https://webwork.math.ncsu.edu/webwork2/		

Course text

Fundamentals of Differential Equations and Boundary Value Problems, by Nagle, Saff, and Snider, 6th Edition, Addison-Wesley.

Catalog Description

Prerequisite: MA 242 or (MA 132 and MA 231)

Differential equations and systems of differential equations. Methods for solving ordinary differential equations including Laplace transforms, phase plane analysis, and numerical methods. Matrix techniques for systems of linear ordinary differential equations. Credit is not allowed for both MA 301 and MA 341.

Learning Objectives

Upon successful completion of this course, students will be able to:

- Determine if a given function is a solution to a particular differential equation; apply the theorems for existence and uniqueness of solutions to differential equations appropriately;
- Distinguish between
 - (a) linear and non-linear differential equations;
 - (b) ordinary and partial differential equations;
 - (c) homogeneous and non-homogeneous differential equations;
- Solve ordinary differential equations and systems of differential equations using:
 - (a) Direct integration
 - (b) Separation of variables
 - (c) Methods of undetermined coefficients and variation of parameters
 - (d) Laplace transform methods
- Determine particular solutions to differential equations with given initial conditions.
- Analyze real-world problems such as motion of a falling body, compartmental analysis, free and forced vibrations, etc.; use analytic technique to develop a mathematical model, solve the mathematical model and interpret the mathematical results back into the context of the original problem.
- Apply matrix techniques to solve systems of linear ordinary differential equations with constant coefficients.
- Find the general solution for a first order, linear, constant coefficient, homogeneous system of differential equations; sketch and interpret phase plane diagrams for systems of differential equations.

Grading Policy

The grading will be assigned on a 10-point scale: **A: 90 – 100, B: 80 – 89, C: 70 – 79, D: 60 – 69, F: ≤ 60**

The cutoffs for the +/- grades are determined at the end of the semester. Your final grade in this course will be determined by marks earned on the final exam, three term tests, online homework assignments, and in-class quizzes. The weighting of these components are as follows:

Homework = 15 %
 Three term tests = 50 %
 Final Exam = 35 %

Term Tests 50%

There will be three closed book, closed notes in-class term tests. Students taking their tests in the classroom are

required to turn in 4 blue examination booklets by September 21 (This does not apply to DSO students or students taking their tests remotely via Distance Education).. Those who fail to do so will lose 5 points on Test 1. After Test 1, students who haven't brought blue books will continue to lose 5 points on each test/exam until blue books are brought in. Blue books can be purchased in the bookstore. Do not write anything on them.

Final Exam 35%

The final exam is mandatory, cumulative and will be held in the usual classroom. Check the Final Exam Calendar on <http://registrar.ncsu.edu/calendars/academic/> for the exact date/time of the final exam. The only way to take the final exam at another time is to request a change through the Department of Registration and Records, 1000 Harris Hall.

Homework Assignments will be completed on-line using an Internet-based homework service called WeBWorK. The link to the login page is:

<http://webwork.math.ncsu.edu/webwork2/>

also found on the Moodle page. For your username enter the NCSU unity id and your NCSU email password. If you are unable to get into WeBWorK for any reason, email me. You can find more information about submitting your assignments in WeBWorK on the course webpage.

Corrections to the grading

The responsibility for grading tests resides with the Teaching Assistant for this section. After the tests are returned, you have 3 days to look them over and compare them to the solutions online. If you believe an error has been made in grading on a test, you need to notify me within those 3 days. Grade changes will not occur outside of this timeframe. Do not alter the original work!

Test Make-Up Policy

All *anticipated absences* must be excused in advance of the test date. These include university duties or trips (certified by an appropriate faculty or staff member), required court attendance (certified by the Clerk of Court), or religious observances (certified by the Department of Parent and Family Services 515-2441). *Emergency absences* must be reported as soon as possible once returning to class and must be appropriately documented (illness by an attending physician or family emergencies by Parent and Family Services). If you are sick on a test day and decide not to come to class, go to the health center or other medical facility. Students who miss a test and have a university-approved excuse must submit appropriate documentation. No other make-ups will be given.

Attendance will be recorded daily. You are expected to arrive on time to class. Any student who is not an active class participant the full class period (e.g., doing other work in class, socializing, texting, coming late, leaving early). will be recorded as absent. If you miss no more than 3 days AND attend every test, your lowest test grade will be replaced with your final exam grade (assuming it is higher). Please note: If you get a zero on a test because of cheating, your test will NOT be replaced. If you miss class or are late, you are still responsible for all material covered and assignments due.

The Math Multimedia Center is a tutorial center for undergraduate students that need help in their mathematics courses (100- through 300-level), and is staffed by math graduate students familiar with the material taught in these courses.

Location: SAS Hall 2103/2105

Hours: Monday - Friday 8:00 am - 5:00 pm

You can also get help with your courses (not only math) at the NCSU Undergraduate Tutorial Center.

Students with disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services: <http://www.ncsu.edu/dso/>
Please let me know how I can better accommodate you.

Academic Integrity Statement and Academic Dishonesty

I assume that anything turned in with your name on it is your own work. Each time you submit a test, homework, quiz, or WebWork assignment, you affirm the honor pledge, "I have neither received unauthorized aid nor given aid on this assignment." The minimum penalty for cheating is a grade of zero on the assignment; violators will be reported to the Academic Integrity Board, which can impose additional sanctions. The code of student conduct can be found at: <https://policies.ncsu.edu/policy/pol-11-35-01>

MA341 Course Content and Tentative Week-by-Week Schedule

Week	Sections	Topics
Aug.16–18	1.1–1.2	Solutions & Initial Value Problems
Aug.21–25	1.3 2.2, 3.2	Direction Fields and Phase Line Supplement Separable Equations and Applications
Aug.28 – Sep. 1	2.3, 3.2, 3.3 2.4	Linear First Order Equations. Applications. Exact Equations (time permitting).
Sep.4 Sep.5-8	4.1–4.2 4.2	Labor Day - no class Introduction, Second Order Linear Equations Homogeneous Linear Eqs. Constant Coefficients: Real Roots (review MA241)
Sep.11–15	4.3 4.4	Homogeneous Linear Eqs. Constant Coefficients: Complex Roots (review MA241) Undetermined Coefficients
Sep.18–22	4.5 4.6	Superposition Principle. Variation of Parameters. Test 1
Sep.25–29	4.9 4.10	Free Mechanical Vibrations Forced Mechanical Vibrations
Oct.2–4	7.2-7.3	Laplace transform: definition and properties.
Oct.5–6		Fall break
Oct.9–13	7.3 7.4	Properties of Laplace transform Inverse Laplace Transform
Oct.16–20	7.5 7.6	Solving IVPs with Laplace transforms Transforms of Discontinuous Functions
Oct.23–27	7.6 9.1-9.3	Extra Day with Laplace transforms if necessary Systems of Differential Equations and Linear Algebra, Review Test 2
Oct.30–Nov. 3	9.1-9.3 9.4 9.5	Continued Linear Systems in Normal Form Linear Systems of Diff. Eq. with Constant Coefficients: Real Eigenvalues
Nov.6–10	9.6 9.7	Linear Systems of Diff. Eq. with Constant Coefficients: Complex Eigenvalues Nonhomogeneous Linear Systems
Nov.13–17	9.7 5.6	Applications: Interconnected Tanks Coupled Mass-Spring Systems (time permitting). 5.4 Phase Plane
Nov.20–21		Test 3
Nov.22–24		Thanksgiving Break
Nov. 27 – Dec.1	5.4 12.2 - 12.3	Phase Plane Continued Linear Systems in the plane (time permitting) Review
Dec.6		Reading Day
Dec.4–13		Final Exams

Good Luck!