

MA 341 Applied Differential Equations I

Lecture details

Section 603 Course lectures are available to watch at <http://wolfware.ncsu.edu>
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Office Hours: MWF 10:40 am-11:40 am
or by appointment
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, 7th 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 tests that are administered by a testing proctor (information below).

Calculators of any kind are not permitted on tests or the final exam. You may choose either of the dates listed below to take the test. If you are ill on both of the test days, you will need to present a doctor's note to reschedule. If you are out of town on a test day, set up a time with a proctor in your intended location so that you can still take the test.

Test 1: February 4 or 5

Test 2: March 4 or 5

Test 3: April 8 or 9

If you take all of the tests, your lowest test grade will be replaced with your final exam grade.

Proctors:

Those students who live more than 50 miles from Raleigh, NC do not have to take their tests on NCSU campus. They may use a proctor in their town for testing. The proctor must be approved in advance through the Distance Education office. It can take up to a week to verify a proctor and set up all needed contact info, so please do this early! Visit the remote proctor website at:

https://online-distance.ncsu.edu/current_students/testing-services/testing-services-remote/

to set up this service. (If the link doesn't work, copy and paste the address into your web browser.)

Those students who live less than 50 miles from Raleigh, NC will take their tests on campus through Distance Education Testing Centers. Testing will be done by appointment only. Students should be mindful of closing hours for at the testing center and give themselves plenty of time to complete their exams. No students will be allowed to check-in for exams less than 30 minutes before closing time and all tests must be turned in before the facility closes.

For more information on location and hours of operation, please visit the On Campus Proctor website at https://online-distance.ncsu.edu/current_students/testing-services/testing-services-on-campus (If the link doesn't work, copy and paste the address into your web browser.)

Final Exam 35%

The final exam is mandatory and cumulative. You can take it either April 28 or 29 or 30. 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.

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: <https://dro.dasa.ncsu.edu>

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>

Non-Discrimination Policy

NC State prohibits discrimination, harassment, and retaliation that are based upon a person's race, color, religion, sex, national origin, age, disability, gender identity, sexual orientation, or veteran status. If you feel that you have been the subject of prohibited discrimination, harassment, or retaliation, you should contact the Office for Institutional Equity and Diversity (OIED) at 919-515-3148.

NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or <http://oied.ncsu.edu/divweb>.

MA341 Course Content and Tentative Week-by-Week Schedule

Week	Sections	Topics
Jan 6–10	1.1–1.2	Solutions & Initial Value Problems (Video 1)
	1.3	Direction Fields & Phase Line Supplement (Video 2)
Jan 13–17	2.2	Separable Equations (Video 2)
	2.3	Linear First Order Equations (Video 3)
	3.2	Mixing Problems (Video 4)
Jan 20		Martin Luther King Day - no class
Jan 21–24	3.2	Mixing Problems cont.
	3.3	Newton's Law of Heating, More Separable Applications (Video 4)
	2.4	Exact Equations (Video 5)
Jan 27–31	4.2	Homogeneous Linear Eqs. Constant Coefficients: Real Roots (Video 5)
	4.3	Homogeneous Linear Eqs. Constant Coefficients: Complex Roots (Video 6)
	4.5	Undetermined Coefficients
Feb 3–6		Test 1: February 4 or 5
	4.5	Undetermined Coefficients and Superposition (Video 7)
Feb 10–14	4.6	Variation of Parameters (Video 8)
	4.9	Free Mechanical Vibrations (Video 10)
	4.10	Forced Mechanical Vibrations (Video 10)
Feb 17–21	7.2	Definition of Laplace Transform (Video 10)
	7.2-7.3	Laplace transform: definition and properties. (Video 11)
	7.4	Inverse Laplace Transform (Video 12)
Feb 24–28	7.4	Inverse Laplace continued
	7.5	Solving IVPs with Laplace transforms (Video 13)
	7.6	Transforms of Discontinuous Functions (Video 14)
Mar 2–5		Test 2: March 4 or 5
	9.1-9.3	Systems of Differential Equations and Linear Algebra (Video 15)
Mar 9–13		Spring Break - no class
Mar 16–Mar 20	9.4	Linear Systems in Normal Form (Video 16)
	9.5	Linear Systems of Diff. Eq. with Constant Coefficients: Real Eigenvalues (Video 17)
Mar 23–27	9.6	Linear Systems of Diff. Eq. with Constant Coefficients: Complex Eigenvalues (Video 18)
Mar 30–Apr 3	9.7	Nonhomogeneous Linear Systems: Undetermined Coefficients (Video 19)
	9.7	Nonhomogeneous Linear Systems: Variation of Parameters (Video 19)
	9.5-9.7	Applications: Interconnected Tanks (Video 19)
Apr 6-10		Test 3: April 8 or 9
	5.6	Coupled Mass-Spring Systems (Video 20)
Apr 13–17	5.4	Phase Plane (Video 21)
	12.2	Linear Systems in the plane
Apr 20 –23	12.3	Almost Linear Systems (Video 22)
		Review
April 28, 29, or 30	Final Exam	

Good Luck!