

## MA 341 Applied Differential Equations I

### Lecture details

Section 050 SAS 2235 TH 10:15-11:30  
Instructor: Leslie Kurtz  
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Office Hours: In-person SAS 3240: M: 9:30-10:30, T: 9:30-10:00, H: 9:30-10:00, F: 9:30-10:30  
Over Zoom: W 1:30-2:30pm  
Moodle page: <https://wolfware.ncsu.edu>  
WeBWorK: <https://wolfware.ncsu.edu>

### 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 %  
Projects = 5 %  
Two term tests = 50 %  
Final Exam = 30 %

**Term Tests 50%**

There will be two closed book, closed notes tests. Calculators of any kind are not permitted on tests or the final exam. If you are ill on a test day, you will need to present a doctor's note to reschedule. Each student is responsible for bringing in 3 bluebooks prior to the first test. Students who test at the DRO do not need to bring in bluebooks.

**Test 1:** February 22

**Test 2:** April 11

The Teaching Assistant for the course will record attendance every day. If you have no more than 3 unexcused absences and have taken all the tests, your lowest test grade will be replaced by your final exam grade assuming it is higher.

**Final Exam 35%**

The final exam is mandatory and cumulative. It will be on April 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. I will send out reminders when you have upcoming assignments.

**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!

**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>.

**COVID ADDENDUM:**

Due to the Coronavirus pandemic, public health measures have been implemented across campus. Students should stay current with these practices and expectations through the Protect the Pack website:

<https://www.ncsu.edu/coronavirus/>

The sections below provide expectations and conduct related to COVID-19 issues.

**Health and Participation in Class:**

We are most concerned about your health and the health of your classmates and instructors. If you test positive for COVID-19, or are told by a healthcare provider that you are presumed positive for the virus, please work with your instructor on health accommodations and follow other university guidelines, including self-reporting (Coronavirus

Self Reporting): Self-reporting is not only to help provide support to you, but also to assist in contact tracing for containing the spread of the virus.

### MA341 Tentative Schedule

Week	Sections	Topics
Jan. 8–12	1.1–1.2 1.3	Solutions & Initial Value Problems Direction Fields and Phase Line Supplement
Jan. 15 Jan. 16–19	2.2 2.3	<b>Martin Luther King Day: No Class</b> Separable Equations Linear First Order Equations
Jan. 22–26	3.2,3.3 2.4	Applications Exact Equations
Jan. 29–Feb. 2	4.2 4.3 4.4	Homogeneous Linear Eqs. Constant Coefficients: Real Roots Homogeneous Linear Eqs. Constant Coefficients: Complex Roots Undetermined Coefficients
Feb. 5–9	4.5 4.6	Superposition Principle Variation of Parameters
Feb. 13 Feb. 14–16	4.9–4.10	<b>Wellness Day: No Class</b> Springs
Feb. 19–23	7.2–7.3 7.4	Laplace transform: definition and properties Inverse Laplace Transform <b>Test 1: Thursday Feb 22</b>
Feb. 26–Mar. 1	7.5 7.6	Solving IVPs with Laplace transforms Transforms of Discontinuous Functions
Mar. 4–8	9.1–9.3	Systems of Differential Equations and Linear Algebra
Mar. 11–15		<b>Spring Break: No Class</b>
Mar. 18–22	9.4 9.5	Linear Systems in Normal Form Linear Systems with Constant Coefficients: Real Eigenvalues
Mar. 25–29	9.6 9.7	Linear Systems: Complex Eigenvalues Nonhomogeneous Linear Systems
Apr. 1–5	9.7 5.6	Applications: Interconnected Tanks Coupled Mass-Spring Systems (time-permitting)
Apr. 8–12	5.4	Phase Plane <b>Test 2: Thursday April 11</b>
Apr. 15–19	12.2 12.3	Linear Systems in the plane Almost Linear Systems
Apr. 22–23 Apr. 24 April 30		Review Reading Day <b>Final Exam: 8:30–11am</b>

**Good Luck!**