MA 341 Applied Differential Equations I

Lecture details

Instructor:	Dr. Alina Duca	TA:	
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Office Hours:	Mondays 1:30–3:00pm Thursdays 11:45–12:45pm or by appointment	Office Hours:	
Lecture:	Tu Th 10:15–11:30, HA 100		
Moodle page:	http://moodle.wolfware.ncsu.edu/		

Course text

Fundamentals of Differential Equations and Boundary Value Problems, by Nagle, Saff, and Snider, 6th Edition, Addison-Wesley, ISBN:9780321747747.

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) Reduction of order
  (d) Methods of undetermined coefficients and variation of parameters
  (e) 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:

On-line homework = 15 %
Three term tests = 50 % (Lowest grade counts half of as much as the other two.)
Final Exam = 35 %

Note: I do not curve grades in this course. It is theoretically possible for everyone in the class to get an A (or an

F). Your performance depends only on how you do, not on how everyone else in the class does. It is therefore in your best interests to help your classmates, while keeping the academic integrity policy in mind.

Term Tests 50%
There will be three closed book, closed notes in-class term tests. The lowest test grade will count half as much as each of the other two. *No re-tests* will be given. If you miss a test because of an undocumented or unexcused absence, a zero will be entered for that test grade. Students who are unable to take the test at those times (with a documented excusenot just that you don't want to) will schedule an alternate time to take the exam.

Final Exam 35%
The final exam is mandatory, cumulative and will be held in the usual classroom.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 (15%) will be completed on-line using an Internet-based homework service called WeBWorK. The lowest 2-3 homework grades will be dropped. Use these drops wisely. You can find the link to the login page on the Moodle page of this course. 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. If you believe an error has been made in grading on a problem set, bring it to the TA who did the grading during her office hours. If you believe that you should have gotten more points than you got for any reason other than a simple addition error, write a statement making your case and take it to the grader. If you are not satisfied with the TAs decision, bring the statement to your course instructor, who will make the final decision. I will give partial credit to partial correct solution that was neatly presented. You have *1 week after the test is returned* to request re-grading. 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.

Optional Homework
Suggested problems from the book will be posted on the course web page (Moodle). It will not be collected nor graded. We can go over some homework problems in class or after class, as time permits. I encourage you to collaborate on the homework with fellow students, provided that it is done in a way that maximizes the benefit of the homework to all people involved. You will get maximum benefit from a homework problem if you work hard on it alone before combining your ideas with someone else's.

Attendance is expected every day as it is critical for the understanding of the material and not attending class serves as its own penalty because this material takes much longer to learn independently. You are responsible for keeping up with missed work so that you do not fall behind. Office hours will not be utilized to re-teach material presented in class.

Instructor's commitment
You can expect your instructor and TA to be courteous, punctual, well organized, and prepared for lecture and other class activities; to answer questions clearly and in a non-negative fashion; to be available during office hours or to notify you beforehand if they are unable to keep them; to provide a suitable guest lecturer when they are traveling; and to grade uniformly and consistently according to the posted guidelines.

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 Undergraduate Tutorial Center at NC State University.

VW Date – *Monday, October 15, 2012*
Last day to withdraw or drop a course without a grade at ALL levels. Last day to change from credit to audit at ALL levels. Last day to change to credit only. Last day to submit Request for Course Repeat Without Penalty forms. MyPack Portal closes for Undergraduate and Graduate drops at 11:59 p.m.

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 for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.1)"

Student Evaluations
Online class evaluations will be available for students to complete during the last three weeks of classes. You will receive an email message directing you to a website where you can login using your Unity ID and complete the evaluation. All evaluations are confidential; instructors will not know how any one student responded to any question, and students will not know the ratings for any instructors.

Academic Integrity Statement and Academic Dishonesty
Both faculty and students at North Carolina State University have a responsibility to maintain academic integrity. An informational brochure about academic integrity is available from the university and students are encouraged to obtain a copy.

> "Academic dishonesty is the giving, taking, or presenting of information or material by a student that unethically or fraudulently aids oneself or another on any work which is to be considered in the determination of a grade or the completion of academic requirements or the enhancement of that student's record or academic career." (NCSU Code of Student Conduct)

Scholarly activity is marked by honesty, fairness and rigor. A scholar does not take credit for the work of others, does not take unfair advantage of others, and does not perform acts that frustrate the scholarly efforts of others. The violation of any of these principles is academic dishonesty. Penalties for a violation: For the first violation, you will receive a zero for your work and be put on academic integrity probation for the remainder of your stay at NCSU. The second violation may result in your suspension from NCSU. Both situations will involve the Office of Student Conduct.

Other Remarks

- You are more than welcome to visit me during my official office hours, but I am available at many other times (just before class is usually not a good time, however). Please make an appointment if necessary.
- A good way to contact me is by e-mail: anduca@ncsu.edu. Please make sure that you include your name and the course number (MA 341) in your email as I teach other classes and determining which course you are referring to could be time consuming and may delay my reply.
- Your email address registered with the NCSU online directory will be used for announcements associated with this class. It is your responsibility to maintain a valid email address and check/empty your Inbox regularly.
- The test grades will be recorded in the gradebook in Moodle. The grades for the WeBWorK assignments will be transferred to Moodle at the end of the semester. Please notify me immediately if you notice any discrepancies in your grades. Keep all your quizzes and tests for future reference.
- Please check the course webpage regularly, as it will be continuously updated with announcements, any changes in the schedule, homework problems, solutions, review sheets, and other additional course materials.
- Please mark the test dates on your calendar and do not set your dental/doctor/interiew... appointments on top of the test dates.
- Be respectful to your peers and to me. All cell phones should be turned off during class and no eating, drinking, or any tobacco products are allowed in the classroom. Please leave your laptop in your bag during class time. Students who do not follow these guidelines may be asked to leave class.

Good Luck!

MA341 Course Content and Week-by-Week Tentative Schedule

Week	Sections	Topics
Aug.16–17	1.1–1.2	Solutions & Initial Value Problems
Aug.20–24	1.1–1.2 1.3 2.2, 3.2	Solutions & Initial Value Problems (cont.) Direction Fields Separable Equations (review from MA241) and Applications
Aug.27–31	3.2 2.3, 3.2-3.4 2.4	Separable Equations and Applications (cont.) Linear First Order Equations. Applications. Exact Equations (optional).
Sep.3		**Labor Day** - no class
Sep.4–7	4.1–4.2 4.2 4.3	Introduction, Second Order Linear Equations Homogeneous Linear Eqs. with Constant Coefficients: Real Roots (review from MA241) Homogeneous Linear Eqs. with Constant Coefficients: Complex Roots (review from MA241)
Sep.10–14	4.9 4.4	Free Mechanical Vibrations Undetermined Coefficients.
Sep.17–21	4.5	Superposition Principle. **Test 1**
Sep.24–28	4.6 4.10	Variation of Parameters Forced Mechanical Vibrations
Oct.1–3	9.1-9.3	Matrices and vectors.
Oct.5–5		Fall break
Oct.8 – 12	9.1-9.3 9.4	Systems of differential equations. Linear systems of diff.eqs. with constant coefficients
Oct.15-19	9.5	Linear systems of diff.eqs. with constant coefficients: Real Eigenvalues Applications (interconnected tanks)
Oct. 22–26	9.6	Linear systems of diff.eqs. with constant coefficients: Complex Eigenvalues **Test 2**
Oct. 29 – – Nov.2	9.7 5.6	Non-homogeneous systems Coupled Mass-Spring Systems
Nov. 5–9	5.4 7.1-7.3	Phase Plane Laplace transform: definition and properties
Nov. 12–16	7.3 7.4 7.5	Properties of Laplace transform Inverse Laplace transform Solving IVP with Laplace transform
Nov.19–20	7.6	Transforms of discontinuous functions **Test 3**
Nov. 21–23		Thanksgiving Break
Nov. 26–30	7.6 12.2 - 12.3	Transforms of discontinuous/periodic functions Linear Systems in the plane (optional) Review
Dec.3–4		Reading Days
Dec.5–13		Final Exams