

## MA 341 – Section 002 Summer 1 – 2020

Instructor: Brandon Hollingsworth

Office: Cox 406

Online Office Hours: TBD

### Important Links:

Lectures:	<a href="https://oit.online.ncsu.edu/online/Catalog/catalogs/ma-341-003-maultsby">https://oit.online.ncsu.edu/online/Catalog/catalogs/ma-341-003-maultsby</a>
Homework:	<a href="https://webwork.math.ncsu.edu/webwork2/">https://webwork.math.ncsu.edu/webwork2/</a>
Moodle:	<a href="http://wolfware.ncsu.edu/">http://wolfware.ncsu.edu/</a>

### Course Texts:

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.

### Course Structure:

Due to the ongoing Covid-19 outbreak, this class will be entirely online. Lectures will consist of online videos to be watched on demand. Videos can be found at:

<https://oit.online.ncsu.edu/online/Catalog/catalogs/ma-341-003-maultsby>.

Homework will be available through WeBWork.

### Learning Objectives:

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

1. 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.
2. Distinguish between
  - a. linear and non-linear differential equations
  - b. ordinary and partial differential equations
  - c. homogeneous and non-homogeneous differential equations
3. 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
4. Determine particular solutions to differential equations with given initial conditions. •
5. 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.
6. Apply matrix techniques to solve systems of linear ordinary differential equations with constant coefficients.

7. 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.

### Course Policies:

Mistakes are a necessary component of learning. I encourage you to try, make mistakes, and revise your answers. Each individual is expected to be actively engaged in classroom discussion. “Actively engaged” means sharing input with the entire class and listening when others speak.

Diversity in this classroom is a source of strength and should be respected and appreciated. We must all recognize the value that each individual brings to the class. Any speech or actions that do not serve this sense of community in our classroom will not be tolerated.

### Zoom Policies:

Any behavior that can be deemed distracting to others should be minimized. By default, video will be off, and you will be muted upon entering class meetings. Please make sure you are dressed appropriately before turning zoom video on. If there is a large amount of background noise, please keep yourself muted until you need to talk in order to keep from distracting your classmates.

### Course Grade:

The grading will be assigned on a 10-point scale:

A: 90 – 100, B: 80 – 89, C: 70 – 79, D: 60 – 69, F:  $\leq 60$

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 Midterm Tests = 50 %

Final Exam = 35 %

**Homework** - 15% - 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. No late assignments will be accepted.

**Three Midterm Tests** - 50% - will be open notes and open book. Tests will be administered through the Moodle page. Tests will become available at a preset time and students will be required to email scans or photos of their work to the instructor by the due time. Exams returned after that time will be subject to a penalty of 5 points, with an additional 10 points for every 15 minutes late. Exams returned more than an hour late will not be graded. **If you take all the midterm tests, your lowest midterm test grade will be replaced by your final exam grade. This will only occur if it is to your benefit.** Test dates are as follows:

**Test 1:** May 22<sup>nd</sup>

**Test 2:** June 5<sup>th</sup>

**Test 3:** June 12<sup>th</sup>

**Final Exam** – 35% - is mandatory and cumulative. It will either be **July 17<sup>th</sup> or 18<sup>th</sup>**. I will send out a poll on June 15<sup>th</sup> to determine the time. 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. It will follow the same guidelines as Midterm exams.

**Corrections to Grading**

If you believe an error has been made in grading on a test notify me within 3 days of receiving your test back. I will give partial credit where appropriate. I will not consider corrections after those 3 days. Corrections will not be considered if the original test has been altered in any way.

**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.

**Getting Help**

**Use your instructor:** I am here to help. My office hours are dedicated specifically for this class, please use them. If you are unable to make it to the regularly scheduled office hours or need more one-on-one help, please email the instructor or a recitation leader to see if they are able to set up another time to meet with you. Also, feel free to email the instructor or recitation leaders any questions you may have, we will return your emails as soon as we are able.

**Use your classmates:** Working and studying together is highly encouraged. Although, this should be done in a physically-distanced manor, due to the ongoing outbreak. Many of your fellow students may have had, or be having, similar problems and you may find it more beneficial to work together to find a solution than to simply search online for a solution.

**Use online resources:** There are several websites that have great tutorials and instructional videos that may cover the topics of the course. These videos will not work as a substitute for lectures but are a great supplement if you ever find yourself at a loss. This list is by no means exhaustive:

<http://tutorial.math.lamar.edu/>

<https://www.khanacademy.org/>

<http://patrickjmt.com/>

**Add/Drop Regulation**

Undergraduate students are expected to complete all courses for which they are enrolled as of census date (the official enrollment date defined as the 10th day of fall and spring terms and the 3rd day of summer terms). Undergraduate course drops after census date will now be considered to be course withdrawals and will result in W grades on the transcript. Undergraduates will be limited to a maximum of 16 hours of course withdrawals after census date and before the drop date October 18, 2019 for their entire undergraduate career at NC

State. These course withdrawals will count as attempted hours for course repeat, financial aid satisfactory academic progress, and tuition surcharge calculations.

## **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. We may also have mid-semester evaluations to determine if instruction should change in any way to meet students’ needs.

## **Non-Discrimination Policy**

NC State University provides equality of opportunity in education and employment for all students and employees. Accordingly, NC State affirms its commitment to maintain a work environment for all employees and an academic environment for all students that is free from all forms of discrimination. Discrimination based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation is a violation of state and federal law and/or NC State University policy and will not be tolerated. Harassment of any person (either in the form of quid pro quo or creation of a hostile environment) based on race, color, religion, creed, sex, national origin, age, disability, veteran status, or sexual orientation also is a violation of state and federal law and/or NC State University policy and will not be tolerated. Retaliation against any person who complains about discrimination is also prohibited. 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://www.ncsu.edu/equal-op/>. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

## **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. Your signature on any test or assignment indicates “I have neither given nor received unauthorized aid on this test or assignment.”

*“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. 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.

### Pacing Guide

Week	Sections	Topics
May 13 <sup>th</sup> – May 15 <sup>th</sup>	1.1-1.2 1.3 1.3 2.2 2.3	Solutions & Initial Value Problems (Video 1) Direction Fields (Video 2) Phase Line Supplement (Video 2) Separable Equations (Video 3) Linear First Order Equations (Video 3)
May 18 <sup>th</sup> – May 22 <sup>nd</sup>	3.2 3.3 2.4 4.1-4.2 4.2-4.3 4.4 4.5	Applications (Video 4) Newton's Law of Cooling (Video 5) Exact Equations (Video 5) Introduction, Second Order Linear Equations (Video 5) Homogeneous Linear Eqs. Constant Coefficients (Video 6) Undetermined Coefficients (Video 7) Superposition Principle (Video 8)
May 22 <sup>nd</sup>	Midterm Exam 1	
May 26 <sup>th</sup> – May 29 <sup>th</sup>	4.5 4.9-4.10 7.2 7.2-7.3 7.4 7.5	Variation of Parameters (Video 9) Free and Forced Mechanical Vibrations (Video 10) Definition of the Laplace transform (Video 10) Laplace transform: definition and properties (Video 11) Inverse Laplace Transform (Video 12) Solving IVPs with Laplace transforms (Video 13)
June 1 <sup>st</sup> – June 5 <sup>th</sup>	7.6 9.1-9.3 9.4 9.5 9.6	Transforms of Discontinuous Functions (Video 14) Systems of Differential Equations and Linear Algebra (Video 15) Linear Systems in Normal Form (Video 16) Linear Systems of DEs w/ Constant Coeff.: Real Eigenvalues (Video 17) Linear Systems of DEs w/ Constant Coeff.: Complex Eigenvalues (Video 18)
June 5 <sup>th</sup>	Midterm Exam 2	
June 8 <sup>th</sup> – June 12 <sup>th</sup>	9.7 9.7 5.6 5.4 12.2	Nonhomogeneous Linear Systems (Video 19) Applications: Interconnected Tanks (Video 19) Coupled Mass-Spring Systems (Video 20) Phase Plane (Video 21) Linear Systems in the plane (Video 21)
June 12 <sup>th</sup>	Midterm Exam 3	
June 15 <sup>th</sup> – June 16 <sup>th</sup>	12.3	Almost Linear Systems (Video 22) Additional Review Video (Video 23)
June 17 <sup>th</sup> /18 <sup>th</sup>	Final Exam	

**Good Luck!**