

MA 501-601

ADVANCED MATHEMATICS FOR ENGINEERS AND SCIENTISTS I NORTH CAROLINA STATE UNIVERSITY - SPRING 2019

1. IMPORTANT DETAILS

- Instructor: Dr. Elisabeth Brown
- Email: embrown5@ncsu.edu

All questions regarding this course should be directed to me at the above email address. I will read all thoughtful and signed emails but will not promise to answer all of them. Try to find the information on your own first. NO email will be read or answered unless the email includes

- ★ a specific detailed subject line (for example: *MA 501 HW #4 Problem 1(c)*),
- ★ the course and section number,
- ★ your name, and
- ★ what you have already attempted to do to resolve the issue.

- Moodle page: <https://moodle-courses1819.wolfware.ncsu.edu/course/view.php?id=7246>
- Office hours (via Zoom meetings): I will be available for optional online office hours
 - Tuesdays 7:30am-8:30am (Eastern)
 - Fridays 10:00am-11:00am (Eastern)

throughout the semester. Instructions for connecting to these online Zoom meetings will be posted on the course Moodle page. Office hours are also available by appointment. There will be no office hours during testing windows.

- Textbook: Advanced Engineering Mathematics, 6th, 7th, or 8th Edition by Peter V. O'Neil
 - *Highly Recommended* but not required.
 - For each edition, a table indicating the section of the textbook most closely related to each lecture is available on the course Moodle page.
- Grades: Available on the course Moodle page.

2. COURSE DETAILS

2.1. Course Description. MA 501 is a 3-hour credit course.

Topics include a survey of mathematical methods for engineers and scientists. Ordinary differential equations, series solutions, and the method of Frobenius; Fourier series, Fourier integral, and Fourier transforms; special functions, Sturm-Liouville theory, and eigenfunction expansion; partial differential equations and separation of variables. Applications to engineering and science.

Prerequisite: MA 341 or an equivalent undergraduate course in differential equations. Credit for both this course and MA 401 will not be given. Not for credit by mathematics majors.

2.2. **Structure.** The course consists of

- **Lecture Videos:** While all videos are available via the Engineering Online portal, the videos should be viewed according to the schedule posted on the Moodle page. For your convenience, links to videos roughly one week ahead of the current date will be posted on the course Moodle page. I will only answer questions about videos that are currently posted.

All questions regarding lecture video content should be directed to Dr. Elisabeth Brown. MA 501 videos were previously recorded by one of my fellow Mathematics faculty members. Since the videos for this distance course were recorded in a studio (and not in front of a live student audience), there are occasional minor typos in the handwritten notes. I have included short errata files correcting extra/missing pen-strokes from lectures.

- **Homework:** The main purpose of homework is practicing individual methods through problem solving. Assignments are due by **11:50pm (Eastern Time)** on the following dates:

HW	Due Date	HW	Due Date	HW	Due Date
1	Thurs. January 17	5	Tues. February 26	9	Fri. April 5
2	Tues. January 29	6	Tues. March 5	10	Thurs. April 18
3	Tues. February 5	7	Fri. March 22	11	Thurs. April 25
4	Tues. February 19	8	Fri. March 29		

More information can be found in the Homework Submission Guidelines, available on the course Moodle page. Selected problems will be graded in detail. Homework solutions will not be posted unless there is a particularly troubling problem for the majority of the class.

- **Homework Forums:** Forum discussions for each homework assignment will be set up in Moodle. Here, you may post questions or answer other students' questions. You are encouraged to discuss homework with other students, but you must write up the solution in your own words based on your own understanding. Any marked similarity in form or notation between submissions with different authors will be regarded as evidence of academic dishonesty, so protect your work.

- **Tests:**

★ **Test #1** must be taken under the supervision of your proctor between **Sunday, February 10th and Tuesday, February 12th** as a **120-minute timed test**.

★ **Test #2** must be taken under the supervision of your proctor between **Sunday, March 17th and Tuesday, March 19th** as a **120-minute timed test**.

★ **Test #3** must be taken under the supervision of your proctor between **Sunday, April 14th and Tuesday, April 16th** as a **120-minute timed test**.

Note: If you are using the DELTA testing center as your proctor, please check the days and times this facility is open well in advance of each testing window.

Make-up policy for missing a test: (1) All anticipated absences must be excused at least one week in advance of the test date. These include University or work 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). (2) Emergency absences must be reported within two days of the test date and must be appropriately documented. (3) If the absence is excused, coordination will be necessary between you, your proctor, Engineering Online, and the instructor to arrange an appropriate alternative testing window. (4) Make-ups due to oversleeping, car trouble, the DELTA testing center not being open on Saturdays, or any other excuse not approved by the University will be subject to instructor availability. There will be an automatic 15 point deduction from the test.

- Final Exam: The comprehensive final exam will cover all course material.

★ **The Final Exam** must be taken under the supervision of your proctor between **Thursday, May 2nd** and **Saturday, May 4th** as a **180-minute timed test**.

2.3. Grading. This course will use the standard letter grading cutoffs: 100-97 A+, 96.9-93 A, 92.9-90 A-, and similarly for B/C/D plus/minus/etc. Grades will not be curved; it is theoretically possible for everyone in the class to get an A (or an F). Your grade depends only on *your* performance, *not* on how everyone else in the class performs. Therefore, it is in your best interests to help your classmates, while keeping the academic integrity policy in mind. Your final grade in this course will be determined by grades earned:

Component	Weight
Homeworks	30%
Tests	45%
Final Exam	25%

2.4. Corrections to the grading. If a grading error is found on a homework assignment or test, then you should explain the error **in writing** to me within one week after the assignment/test was returned. The entire assignment/test may be re-graded, and the grade is ***subject to remain the same, increase, or decrease.***

2.5. Course Topics Outline. A firm understanding of pre-requisite topics (trigonometry, sums, calculus, integration, ordinary differential equations, etc.) is expected and necessary for success in this MA 501 course. Review sessions of 8 pre-requisite topics are available as ‘tutorials’ through the Engineering Online portal.

- Unit I Review of ordinary differential equations (2 lectures)
- Unit II Series solutions of ordinary differential equations (3 lectures)
- Unit III Fourier analysis (9 lectures)
- Unit IV Special functions (2 lectures)
- Unit V Partial Differential Equations (PDEs) in rectangular coordinates (8 lectures)
- Unit VI Partial Differential Equations in other coordinate systems (6 lectures)
- Unit VII Additional PDEs topics (5 lectures)

2.6. Course Objectives. After completing this course, the student should be able to use mathematical methods to solve engineering problems. In particular, the student will be able to

- Solve a variety of second order differential equations, selecting from several techniques covered in the syllabus
- Apply mathematical methods to solve important boundary value problems: heat, wave, and Laplace's equations
- Identify specific types of equations and decide on appropriate mathematical methods to find solutions
- Use various theoretical mathematical ideas and results from this course to analyze certain physical problems

3. MISCELLANEOUS

3.1. Students with disabilities. See <http://policies.ncsu.edu/regulation/reg-02-20-01>. Students who require accommodations will need documentation through the Disability Services Office (DSO) and are encouraged to seek such accommodations early in the semester. Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the DSO: <http://dso.dasa.ncsu.edu>

3.2. Code of Student Conduct. This will be upheld, and documentation will be submitted to the Office of Student Conduct for students who violate University regulations on academic integrity. Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment." See <http://policies.ncsu.edu/policy/pol-11-35-01> for a detailed explanation of academic honesty.

3.3. Calculators and Computers. No devices are allowed during the two tests and one final exam, including, but not limited to, non-graphing calculators, graphing calculators, cell phones, tablets, and computers.

3.4. Software Access via NC State's Virtual Computing Lab (VCL). Visualization of solutions is an important aspect of this course, and some of the lectures and homework assignments will use Maple or MATLAB to visualize solutions. As an NC State student, you can access Maple and MATLAB using the Virtual Computing Lab: <https://vcl.ncsu.edu>. Simply make a reservation, and when a machine becomes available, you can remote access the machine and use the mathematical software (or whatever programs you requested). Using Maple or MATLAB is not required for this course; some students use Excel, Wolfram Alpha, or even photos of graphing calculators to visualize solutions.

3.5. Non-Discrimination Policy. NC State provides equal opportunity and affirmative action efforts, and prohibits all forms of unlawful discrimination, harassment, and retaliation that are based upon a persons race, color, religion, sex, national origin, age, disability, gender identity, genetic information, sexual orientation, or veteran status. NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05>. 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.

3.6. Electronic Course Components. Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.