MA 502-601
Advanced Mathematics for Engineers and Scientists II
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 502 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=7247`
- Office hours: By appointment - I will be available for optional online or on-campus office hours throughout the semester. There will be no office hours during testing windows. Instructions for connecting to Zoom online office hours will be posted on the course Moodle page.
- Textbook: Advanced Engineering Mathematics, 6^{th}, 7^{th}, or 8^{th} 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 502 is a 3-hour credit course.

Topics include vector calculus, vector analysis, line and surface integrals, and integral theorems; complex function theory, complex integrals and residues; linear algebra, determinants, and matrices. The emphasis will be solution techniques of classical problems in these topic areas as a bridge to further work. Applications to engineering and science.

Prerequisite: MA 341 or an equivalent undergraduate course in differential equations. Any student receiving credit for this course may receive credit for, at most, one of the following: MA 405, MA 512, MA 513. 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.

  Since the videos for this distance course were recorded in a studio (and not in front of a live student audience), there may be occasional minor typos in the handwritten notes. Please let me know if you find any errors in the videos or notes, and I will include short errata files correcting extra/missing pen-strokes from the lecture videos or notes.

- 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	Tues. April 9
2	Thurs. January 24	6	Fri. March 8	10	Thurs. April 18
3	Tues. February 5	7	Tues. March 19	11	Thurs. April 25
4	Tues. February 19	8	Thurs. March 28		

  More information can be found in the Homework Submission Guidelines, found on the course Moodle page. Selected problems will be graded in detail.

- 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 10$^{\text{th}}$ and Tuesday, February 12$^{\text{th}}$ as a 120-minute timed test**.
  - ⋆ **Test #2** must be taken under the supervision of your proctor between **Sunday, March 3$^{\text{rd}}$ and Tuesday, March 5$^{\text{th}}$ as a 120-minute timed test**.
  - ⋆ **Test #3** must be taken under the supervision of your proctor between **Sunday, April 14$^{\text{th}}$ and Tuesday, April 16$^{\text{th}}$ 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 weekends, 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 Final Exam** must be taken under the supervision of your proctor between **Sunday, May 5$^{\text{th}}$ and Tuesday, May 7$^{\text{th}}$ 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	20%
Tests	60%
Final Exam	20%

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.** This course is organized in 2 independent sections, the first covering topics in vector calculus and analysis, and the second covering topics related to complex functions. Applications to engineering and science are explored throughout the course.

- Unit I Review of vectors and matrices
- Unit II Vector differential calculus
- Unit III Vector integral calculus
- Unit IV Complex numbers and functions
- Unit V Complex integration
- Unit VI Series representations of complex functions & singularities
- Unit VII Residues

A firm understanding of pre-requisite topics (trigonometry, sums, calculus, integration, ordinary differential equations, etc.) is expected and necessary for success in this MA 502 course. Review sessions of 8 pre-requisite topics are available as 'tutorials' through the Engineering Online portal.

2.6. **Course Objectives.** After completing this course, the student should be able to use mathematical methods to solve problems that arise in engineering and the sciences.

- The student is expected to achieve proficiency in and understanding of vector differential and integral calculus, complex function theory, and linear algebra in preparation for applications in engineering and science.
- In vector calculus, the student will learn vector fields, divergence, curl, Green's Theorem, Divergence Theorem, Stokes' Theorem, and how to apply these topics.
- In complex function theory, the student will learn complex numbers and their representations, analytic functions, complex integrals, Cauchy's Theorem, Taylor Series, Laurent Series, residues, and complex integration techniques as needed for special functions, transforms, and further studies.

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 three tests and one final exam, including, but not limited to, non-graphing calculators, graphing calculators, cell phones, tablets, and computers.

3.4. **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.

3.5. **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.