

MA 425 Mathematical Analysis I Spring 2019

- Instructor:** Dr. Alina Duca, 2108 SAS Hall, anduca@ncsu.edu, (919) 515-1875
- Lecture:** Section 1: Mondays, Wednesdays, Fridays 10:40 - 11:30 pm, SAS 1220
Thursdays 10:40 - 11:30 pm, 2620 Cox Hall
- Section 3: Mondays, Wednesdays, Fridays 12:50 - 1:40 pm, SAS 2102
Thursdays 10:40 - 11:30 pm, 2310 Poe Hall
- Moodle page:** <https://wolfware.ncsu.edu/>
- Office Hours:** Mondays 11:45 - 12:45
Thursdays 3:00 - 4:00, or by appointment

Communications. Moodle will be used for most communications in this course. In particular, math questions should be asked in class, in office hours, or on the Moodle forum. In general, I will not answer math questions sent by email. You are encouraged to discuss concepts and homework (with discretion) in the Moodle forum.

Course Text. *Introduction to Real Analysis*, by R. Bartle, D. Sherbert, 4th Edition

Optional Texts. In addition to the assigned book, you may find the following books helpful:

- *How to Think about Analysis*, by Lara Alcock
- *Understanding Analysis*, by Stephen Abbott (e-book available at ncsu libraries)
- *Principles of Mathematical Analysis*, by Walter Rudin (hard copy available at ncsu libraries)

Course Prerequisite. MA 225 (MA 407 desirable).

Course Organization and Scope. MA 425 is the first semester of a two semester sequence designed to develop the theory of differential and integral calculus. MA 425 focuses on real-valued functions of one real variable, while MA 426 focuses on multi-variable functions. Unlike a calculus course, MA 425 focuses on rigorous definitions and proofs. In addition, students continue the process begun in MA 225 and MA 407 of learning to think mathematically and to write proofs and problem explanations in a clear, concise and logical fashion. The following topics will be covered in MA425: real number system, functions and limits, topology on the real line, continuity, differential and integral calculus for functions of one variable. Infinite series, uniform convergence. Credit is not allowed for both MA 425 and MA 511.

Learning Goals. At the end of the course, the student should be able to do the following things:

- Develop an understanding of the theory underpinning the calculus.
- Reproduce clear and precise definitions, theorems, and proofs of beginning analysis.
- Identify properties of objects of the types studied in beginning analysis.
- Critique mathematical writing of beginning analysis.
- Apply the definitions and theorems of beginning analysis to prove facts about examples and to prove new theorems.
- Write proofs that are (a) correct, (b) clear, (c) well-organized, and (d) without extraneous material.
- Explore examples and make conjectures about properties of examples and general facts.
- Explain intuitively, in writing and speaking, the concepts of beginning analysis and their significance, at a level appropriate to other students in the class.

Schedule. We will cover the following sections although parts of some of the sections may be omitted.

# 50-min. lectures	Chapter & Section	Topics
1	1.1 Sets, Functions.	
5	2.1 - 2.5	Real numbers.
9	3.1 - 3.5 (3.7 optional)	Sequences.
3	4.1 - 4.3	Limits.
7	5.1 - 5.4, 5.6	Continuous Functions.
6	6.1 - 6.3 (6.4 optional)	Differentiation.
6	7.1 - 7.3	The Riemann Integral.
2	8.1 - 8.2	Sequences of Functions.

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:** below 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, homework assignments, and quizzes. The weighting of these components are as follows:

Homework Quizzes = 15 %

Quizzes = 5 %

Three term tests = 50 %

Final Exam = 30 %

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 scheduled for the following dates: *February 8, March 22, and April 17*. The lowest test grade counts as 10% of the final grade, while the other two are each 20%. *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.

Final Exam (30%). The final exam is mandatory, cumulative and will be held in our usual classroom on *Friday, May 3, 8:00 - 11:00 am* for Section 1 and *Monday, May 6, 1:00 - 4:00 am* for Section 3. The only way to take the final exam at another time is to request a change through the Department of Registration and Records, 100 Harris Hall.

In-class quizzes. Each Thursday starting with the week of January 14 you will have to write a short quiz on definitions and/or statement of important results (no proofs, although I do expect you to understand the proofs we do in class). A missed quiz will receive a zero score. No make-up quizzes will be given but your lowest two-three quiz/homework grades will be dropped.

Homework is an important part of the course. Most of your learning will take place while doing it. Students will submit homework assignments individually. You will get maximum benefit from a homework problem if you work hard on it alone before combining your ideas with someone else's. The assignment schedule will be posted on the course Moodle page. Turn-in homework assignments are due at the beginning of class on the day due. No late homework will be accepted. A missed homework will receive a zero score.

Homework format. It is preferable that you type your assignment in LaTeX, but it is not required. Use one side of each page; each problem should be on a new page; you may have solutions to two problems on the same page, but only if they are clearly marked and do not extend on the next page. Staple the pages, and put your name and the problem set number and date on the outside.

Presentation Style. Approximately 5% of the test and homework grades will consist of “*style points*”. I expect almost everyone to receive all points. If I have a hard time deciding what is or is not scratch work, if I have to reread a solution several times to find a train of thought, or if a solution is illegible, ambiguous, or incoherent, it will affect your “*style points*”, therefore you should give some thought to how you present your work. As a consequence, your solutions on the exam will have a beginning, middle, and end; the solutions will flow (more or less) with direction and purpose and this will help me give more honest and focused feedback.

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.

Corrections to the grading. If you believe an error has been made in grading on a problem set or test, write a statement making your case and bring it to me during my office hours. I will give partial credit to partial correct solution that was neatly presented. You have 1 week after the assignment/test is returned to request re-grading. Do not alter the original work!

Attendance. Attendance is expected every day. There is no formal penalty for missing class. However, attendance 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.

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 March 4, 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)”

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. Academic dishonesty includes the giving, taking, or presenting of information or material by a student with the intent of unethically or fraudulently

aiding oneself or another person on any work which is to be considered in the determination of a grade or the completion of academic requirements.

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. The Student Affairs web site has more information.

Student Evaluations

Online class evaluations will be available for students to complete during the last two 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.

Additional Remarks

- Students are expected to be attentive in lectures and are encouraged to participate actively.
- **TURN OFF ALL CELL PHONES AND BEEPERS DURING CLASS!** Leave all distractions (laptops, newspapers, ipods, work for other courses, etc) at home or in your book bag!
- You are more than welcome to visit me during my official office hours (no appointments necessary), but I am available at many other times (just before class is usually not a good time, however). 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 425) in your email.
- 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 term grades will be recorded in the Moodle gradebook at <https://wolfware.ncsu.edu/> . Please notify me immediately if you notice any discrepancies in your grades.
- Please check the course Moodle page 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/interview... appointments on top of the test dates. Keep all your tests/homeworks for future reference.

GOOD LUCK!