

**SYLLABUS Spring 2019**  
**The University of Iowa**  
**The College of Liberal Arts and Sciences**  
**Department of Mathematics**  
**MATH 4210.0AAA Foundations of Analysis**

**Lectures: 2:30P-3:20P MWF 210 MLH and Discussion: 2:00-2:50P Th 214 MLH**

Some of the policies relating to this course (such as the drop deadline) are governed by its administrative home, the College of Liberal Arts and Sciences, 120 Schaeffer Hall.

**Instructor: Oguz Durumeric**

Office location: B20F MLH

Office hours: Mon, Wed, 10:30 am - 12:00 noon, and **Thu 11:30-12:30** and by appointment

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**TA:** Shuyang Fu (meetings with the TA are 2:00-2:50P Th 214 MLH)

**DEO Contact Information:** Professor Maggy Tomova, 14 MLH, [maggy-tomova@uiowa.edu](mailto:maggy-tomova@uiowa.edu)

**Prerequisites:** MATH 3770 or graduate standing

**Catalog Description of Course:** Introduction to fundamental ideas of analysis; emphasis on understanding and constructing definitions, theorems, and proofs; real and complex numbers, set theory in metric spaces, compactness and connectedness, sequences, Cauchy sequences, series, and continuity; elements of differential and integral calculus; sequences and series of functions; modes of convergence; equicontinuity; **serves as a bridge between MATH:3770 an introductory proofs course, and MATH:5200 a first year graduate course in analysis.**

**Objectives and Goals of the Course:**

- Strong emphasis on formal reasoning, understanding and constructing definitions, theorems, and proofs. To raise the level of proof writing and abstraction so that the students should be able to do well in graduate courses in mathematics.
- Real and Complex Numbers: Development of the real numbers from the rational numbers. Extended real numbers. Complex Numbers. Euclidean Spaces.
- Set Theory: Countable/Uncountable Sets. Metric Spaces. Open and closed sets in metric spaces. Compactness with finite subcovers. Bolzano-Weierstrass theorem. Cantor Set. Connectedness.
- Sequences: Convergence, subsequences, and Cauchy sequences in  $\mathbf{R}$  and in general metric spaces. Limsup and liminf. Completeness. Series, partial sums, convergence and absolute convergence. Power series and radius of convergence.
- Continuity: Continuity, relationship of continuity and compactness, relationship of continuity and connectedness.
- Calculus: Derivatives. Mean value theorem. Taylor's theorem. Riemann-Stieltjes integral. Fundamental Theorem. Functions of bounded variation.

- Sequences and Series of Functions: Modes of convergence: Pointwise, Uniform,  $L_p$ . Relationship of modes of convergence and continuity, integration and differentiation. Stone-Weierstrass Theorem. Equicontinuity and Arzela-Ascoli theorem.
- If time permits, Functions of several variables, Implicit and Inverse function Theorems

**Texts:** Principles of Mathematical Analysis, by Walter Rudin ISBN 978-0-0415-42356 McGraw Hill. Available in the University Bookstore and Iowa Book and Supply, Amazon and many other possibilities for online purchases

**Tentative Syllabus and timetable:**

Chapters                                    1, 2, 3, 4, 5, 6, 7, (9) of Principles of Mathematical Analysis, Rudin  
 Time to spend on each                1, 3, 3, 2, 2, 1, 3 weeks approximately

**Grades: Plus/minus** grading will be used.

- 40% 2 Midterms, on **February 22 and April 5** both Fridays, in class exams
- 25% Final Exam during the final’s week, in class exam
- 15% Homework (about 10, drop the lowest two)
- 15% 5 quizzes on Thursdays (tentatively on **1/31, 2/14, 3/7, 3/28, 4/18**), every 2 weeks
- 5% Attendance and class participation

**ALL EXAMS ARE COMPREHENSIVE**, unless specified otherwise

**A Word about the Date and Time of the Final Exam:** The date and time of every final examination is announced by the Registrar generally by the fifth week of the classes. **No exams of any kind are allowed during the last week of classes.** All students should plan on being at the UI through the final examination period. Once the Registrar has announced the date, time, and location of each final exam, the complete schedule will be published on the Registrar’s web site and will be shared with instructors and students. It is the student's responsibility to know the date, time, and place of the final exam.

**Criterion-Referenced Grading:** Described by CLAS as “With criterion-reference grading, students receive grades based on the quality of their work in relation to the criteria defined by the instructor and by the rubrics or models specifying the qualities of each grade. Students’ achievements are measured by this mastery of concepts and skills.” Our starting scale is as follows. If a need arises, this scale can be revised only to improve your letter grades, (that is, the cut scores will never go up).

**A, A- > 90      B+, B, B- > 80                      C+, C, C- > 65                      D+, D, D- > 50**

**Course Structure and Expectations:** You are expected to attend almost all (>90%) of the lectures and participate in class. More than 10% absences will reduce your grade. You are responsible for everything covered in the lectures, textbook and the prerequisites. Lectures will cover material beyond the textbook when a need arises.

Homework will be assigned by Fridays (almost every week) and it is due the following Friday. No late homework without a good excuse, and no make-ups for homework. If a HW is late for 1-6 days, the score will be reduced by 10%. Any HW that is late for 7 or more days will

not be accepted, unless that is due to an illness that can be documented. We will drop the lowest two homework grades. If you have a conflict with exams, or a medical problem, discuss your situation with your lecturer as soon as possible.

**Rules on Collaboration:** In this class, students are allowed to talk with others about homework. However, do not share your written work with others or ask others to see their completed assignments since both are considered academic misconduct. In other words, you can discuss a problem with other students, but you write your solution alone. If you worked/discussed a problem with others, you must state their names on your homework before the beginning of that problem, even if you wrote the solution yourself. HWs showing duplication will be considered the result of academic dishonesty. If you need help, please stop by during my office hours. Students are responsible for understanding this policy; if you have questions, ask for clarification.

**Resources:** You are strongly encouraged to go to your lecturer's and TA's office hours or make an appointment if you have a conflict with the office hours.

**Other Expectations of Student Performance:** Please put away your cell phones during the lectures and turn the volume off. If you need to make an urgent call or text, please go outside the classroom to do it. Usage of laptops and phones during the class time are not permitted except if it is related to this course.

**Notes to the Students:** All students in the College have specific rights and responsibilities. You have the right to adjudication of any complaints you have about classroom activities or instructor actions. Information on these procedures and your responsibilities is available in the Schedule of Courses and on-line in the College's Student Academic Handbook, see the next page. In summary, first see the person you wish to complain about, and then see his/her immediate supervisor. The chain is: graduate or undergraduate assistants, then Prof. Durumeric, then the DEO of the Department of Mathematics, Prof. Tomova, and then an appropriate Dean. The Department of Mathematics has offices in 14 MLH (MacLean Hall). To make an appointment to talk to the DEO of the department call 335-0714 or contact the departmental secretary in 14 MLH.

We would like to hear from anyone who has a disability which may require some modification of seating, testing, or other class requirements so that appropriate arrangements may be made. Please contact your lecturer during his office hours, in the beginning of the semester and far in advance of the exams. You should notify the Office of Student Disability services and obtain the forms. The necessary modifications will be made available to you.

We are planning to use ICON for posting grades and other course material. Also, some announcements may be e-mailed through ICON to your UI e-mail. Check ICON and your UI e-mail regularly, and make sure that UI has your correct e-mail address.

This course plan may be modified during the semester. All changes will be announced in class in advance. It is solely the student's responsibility to be informed of such announced changes.

## Teaching Policies & Resources — Syllabus Insert from College of Liberal Arts and Sciences

### Administrative Home

The College of Liberal Arts and Sciences (CLAS) is the administrative home of this course and governs its add/drop deadlines, the second-grade-only option, and other policies. These policies vary by college (<https://clas.uiowa.edu/students/handbook>).

### Electronic Communication

Students are responsible for official correspondences sent to their UI email address (uiowa.edu) and must use this address for all communication within UI ([Operations Manual, III.15.2](#)).

### Accommodations for Disabilities

UI is committed to an educational experience that is accessible to all students. A student may request academic accommodations for a disability (such as mental health, attention, learning, vision, and physical or health-related condition) by registering with Student Disability Services (SDS). The student should then discuss accommodations with the course instructor (<https://sds.studentlife.uiowa.edu/>).

### Nondiscrimination in the Classroom

UI is committed to making the classroom a respectful and inclusive space for all people irrespective of their gender, sexual, racial, religious or other identities. Toward this goal, students are invited to optionally share their preferred names and pronouns with their instructors and classmates. The University of Iowa prohibits discrimination and harassment against individuals on the basis of race, class, gender, sexual orientation, national origin, and other identity categories set forth in the University's Human Rights policy. For more information, contact the Office of Equal Opportunity and Diversity ([diversity.uiowa.edu](https://diversity.uiowa.edu)).

### Academic Integrity

All undergraduates enrolled in courses offered by CLAS have, in essence, agreed to the College's [Code of Academic Honesty](#). Misconduct is reported to the College, resulting in suspension or other sanctions, with sanctions communicated with the student through the UI email address (<https://clas.uiowa.edu/students/handbook/academic-fraud-honor-code>).

### CLAS Final Examination Policies

The final exam schedule for each semester is announced around the fifth week of classes; students are responsible for knowing the date, time, and place of a final exam. Students should not make travel plans until knowing this final exam information. No exams of any kind are allowed the week before finals (<https://clas.uiowa.edu/faculty/teaching-policies-resources-examination-policies>).

### Making a Complaint

Students with a complaint should first visit with the instructor or course supervisor and then with the departmental executive officer (DEO), also known as the Chair. Students may then bring the concern to CLAS (<https://clas.uiowa.edu/students/handbook/student-rights-responsibilities>).

### Understanding Sexual Harassment

Sexual harassment subverts the mission of the University and threatens the well-being of students, faculty, and staff. All members of the UI community must uphold the UI mission and contribute to a safe environment that enhances learning. Incidents of sexual harassment must be reported immediately. For assistance, definitions, and the full University policy, see <https://osmrc.uiowa.edu/>.