

MA 640 - Mathematical Analysis I, section # 66393 Fall 2024

August 6, 2024

- **Instructor:** Professor Atanas Stefanov,
- **Office:** UH 4049, Phone: (205) 934-8551.
- **Class meetings:** MW 8:00- 9:50, UH 4002
- **Office Hours:** Wednesday 11:00-12:00 p.m.
- **Email:** stefanov@uab.edu
- **Prerequisite:** Undergraduate level proof based Analysis class or Math Ph.D. student standing or consent of the instructor.
- **Text:** Basic Analysis I, by Jiří Lebl, available for free download at <https://www.jirka.org/ra/realanal.pdf>
I will also post a copy of the book on CANVAS.
- **Add/Drop and Course Withdrawal**
 - Drop/Add: Deadlines for adding, dropping, or withdrawing from a course and for paying tuition are published in the Academic Calendar available online. Students may drop and add courses online after they have registered and until the drop/add deadline online using BlazerNET.
 - Withdrawal: To avoid academic penalty, a student must withdraw from a course by the withdrawal deadline shown in the academic calendar and receive a grade of W (withdrawn). Failure to attend class does not constitute a formal drop or withdrawal. The official course withdrawal must be completed online in BlazerNET.
- **Topics:**
 - Introduction - Basic set theory (induction, functions, cardinality of sets) - Section 0.3.

- sup and inf for subsets of \mathbf{R} - Section 1.2, lim sup; lim inf for real sequences, Bolzano-Weierstrass theorem, Cauchy sequences, Sections 2.1, 2.2, 2.3, 2.4
 - Continuous functions - min-max, intermediate value theorem, uniform continuity, monotone functions - Sections 3.1, 3.2, 3.3, 3.4, 3.5, 3.6.
 - Derivative - mean value theorem, Taylor's theorem for real functions on a real interval; Sections 4.1, 4.2, 4.3.
 - Riemann integration for functions on a real interval - Sections 5.1, 5.2, 5.3.
 - Series - tests for convergence - Sections 2.5, 2.6.
- **Learning outcomes:** Upon successful completion of the course, a student
 - will be well-versed in the foundational mathematical theory, specifically how the axioms and basic lemmas affect the further mathematical explorations.
 - can solve problems about sequences of reals in a rigorous way, as modern mathematical thought requires.
 - will be able to study functions and properties thereof in a mathematically sound way, specifically increasing/decreasing, convexity, differentiability etc.
 - will be able to perform an advanced mathematical analysis in problems involving Riemann integrals, in a way that is appealing for applications.
 - will be able to analyze, with advanced methods, situations arising in the theory of power series, including convergence, radius of the convergence, speed of convergence, differentiability/integrability etc.
 - Communicate abstract mathematical results to a wider audience.
 - **Class organization:** This class will employ a hybrid delivery. Specifically, for every two hours class meetings, the first half will be in the usual lecture format, while during the second half students chosen at random will take turns to present their rigorous solutions to problems from the HW, answer questions from the audience and myself. Non-presenting students are encouraged to participate with ideas and suggestions for improvements of the arguments/proofs.
 - **Exams:** There will be one midterm exam and a final exam. If you have a valid reason for missing the exam (essentially medical reasons), you should contact me BEFORE the exam to discuss alternative arrangements. There will be absolutely NO MAKEUP EXAMS! The final exam will be cumulative, i.e. it will test on the entirety of the material. The exams are scheduled as follows:

Midterm Exam	Wednesday, Oct. 2 th , in class.
Final Exam	Monday, Dec. 9, 8:00 am – 10:30 am p.m., UH 4002
 - **Grades:** Your grade for this course will be determined by the number of points that you accumulate. The points will be distributed in the following way:

Class participation	50 points	5 %
Board presentations	250 points	25 %
Midterm Exam	300 points	30 %
Final Exam	400 points	40 %

A total of 900 points will guarantee an A, 800 a B, 700 a C. I may, solely at my discretion, lower these thresholds.

- DSS Accessibility Statement** Accessible Learning: UAB is committed to providing an accessible learning experience for all students. If you are a student with a disability that qualifies under the Americans with Disabilities Act (ADA) and/or Chapter 504 of the Rehabilitation Act, and you require accommodations, please contact Disability Support Services for information on accommodations, registration and procedures. Requests for reasonable accommodations involve an interactive process and consist of a collaborative effort among the student, DSS, faculty and staff. If you are registered with Disability Support Services, please contact me to discuss accommodations that may be necessary in this course. If you have a disability but have not contacted Disability Support Services, please call (205) 934-4205 or visit the DSS website.

- Non-discrimination Statement**

The University of Alabama at Birmingham (UAB) is an Equal Employment and Equal Educational Opportunity Institution. UAB is dedicated to providing equal opportunities and equal access to all individuals regardless of race, color, religion, ethnic or national origin, sex (including pregnancy), genetic information, age, disability, religion, sexual orientation, gender identity, gender expression, and veteran's status. Title IX of the Educational Amendments of 1972 protects individuals from discrimination based on sex in any educational program or activity operated by recipients of federal financial assistance. As required by Title IX, UAB does not discriminate based on sex in its educational programs or activities, including in admission and employment. Inquiries concerning the application of Title IX may be referred to UAB's Assistant Vice President and Senior Title IX Coordinator, the U.S. Department of Education's Office for Civil Rights, or both. UAB's Assistant Vice President and Senior Title IX Coordinator is Andrea McDew, 701 20th Street South, Suite 1030, Birmingham, AL 35233, 205-5493, amcdew@uab.edu. UAB does not discriminate in admissions, educational programs, or employment on the basis of any factor stated above or prohibited under applicable law. Students, faculty, and staff are assured of participation in University programs and in the use of facilities without such discrimination.

- Divisive Concepts statement:** All University faculty, instructors and teaching staff have the academic freedom to explore, discuss, and provide instruction

on a wide range of topics in an academic setting. This class may present difficult, objectionable, or controversial topics for consideration, but will do so through an objective, scholarly lens designed to encourage critical thinking. Though students may be asked to share their personal views in the academic setting, no student will ever be required to assent or agree with any concept considered “divisive” under Alabama law, nor penalized for refusing to support or endorse such a concept. All students are strongly encouraged to think independently and analytically about all material presented in class and may express their views in a time, place, and manner, consistent with class organization and structure, and in accordance with the University’s commitment to free and open thought, inquiry, and expressions.

- **Shared Values Statement:** Collaboration, integrity, respect, and excellence are core values of our institution and affirm what it means to be a UAB community member. A key foundation of UAB is diversity. At UAB, everybody counts every day. UAB is committed to fostering a respectful, accessible and open campus environment. We value every member of our campus and the richly different perspectives, characteristics and life experiences that contribute to UAB’s unique environment. UAB values and cultivates access, engagement and opportunity in our research, learning, clinical, and work environments. Our [School] aims to create an open and welcoming environment and to support the success of all UAB community members.