MA 694 - Analysis JPE prep
Summer 2025

May 29, 2025

- **Instructor:** Professor Atanas Stefanov
- **Office:** UH 4049, Phone: (205) 934-8551.
- **Class meetings:** MTWR: 12:50 - 14:20, UH 4002
- **Office Hours:** Thursday, 11:00-12:00, UH 4049
- **Email:** stefanov@uab.edu
- **Prerequisite**: MA 641, Minimum Grade of C.
- **Text:** Basic Analysis I, II; by Jiří Lebl, I have uploaded this on CANVAS. They are also available for **free download** at
  `https://www.jirka.org/ra/realanal.pdf`
  `https://www.jirka.org/ra/realanal2.pdf`
- **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student must withdraw from a course by the withdrawal deadline shown in the academic calendar and receive a grade of W (withdrawn).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:** The course will concentrate on developing solving skills for problems on the JPE Analysis Exams. Specifically,

  we will go through a list of about 150 problems, which will be provided.
- **Class Organization**

  - Monday and Tuesday: some theory review in the first half, homework problem presentation on the whiteboard by students;
  - Wednesday: I will propose problems, followed by some time to think about it, then presentation on the whiteboard by the students,
  - Thursday: 2 hour practice qual (3-4 problems). HW problems will be assigned on Thursday for the following week.

- **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.
  - will be able to analyze, at an advanced level, problems arising in the theory of series - specifically pointwise vs. uniform convergence.
  - will be able to solve problems involving integrals and derivatives of limit functions in a rigorous way (i.e. with proofs)
  - will be able to study advanced topics in improper integrals and differentiation with respect to parameters, a prime and indispensable tool in further mathematical explorations
  - will be able to extract important information about a global behavior of function spaces, by utilizing the methods of metric spaces.
  - will be able to recognize and analyze functions in terms of its Fourier series, in a rigorous way. As this is the theoretical foundation of signal analysis, students will have a broader understanding of the underlying issues arising in these application (de-blurring, curse of dimensionality etc.)
  - Communicate abstract mathematical results to a wider audience.

- **Exams and Grades:** I will grade the whiteboard presentations (40 % of the grade), the rest of the grade (60 %) will be based on the grade of the practice quals (6-7 of them). No final exam is planned.

- **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.

- **Title IX Statement** The University of Alabama at Birmingham is committed to providing an environment that is free from sexual misconduct, which includes gender-based assault, harassment, exploitation, dating and domestic violence, stalking, as well as discrimination based on sex, sexual orientation, gender identity, and gender expression. If you have experienced any of the aforementioned conduct we encourage you to report the incident. UAB provides several avenues for reporting. For more information about Title IX, policy, reporting, protections, resources and supports, please visit the UAB Title IX webpage for UAB's Title IX Sex Discrimination, Sexual Harassment, and Sexual Violence Policy; UAB's Equal Opportunity and Discriminatory Harassment Policy; and the Duty to Report and Non-Retaliation Policy.