

**MA 745 - FUNCTIONAL ANALYSIS,
SECTION # 67636
FALL 2025**

- **Instructor:** Professor Atanas Stefanov,
- **Office:** UH 4049, Phone: (205) 934-8551.
- **Class meetings:** MW 2:30 - 3:45, UH 4002
- **Office Hours:** Wednesday 11:00-12:00 p.m.
- **Email:** stefanov@uab.edu
- **Prerequisite:** MA 646 or permission of the instructor. Some familiarity with general topology will be helpful, but not necessary.
- **Goals:** To expose students to the techniques of the modern theory of functional analysis with applications arising in analysis, partial differential equations and applied mathematics.
- **Text:** Functional Analysis (Graduate Studies in Mathematics), by T. Bühler and D. Salamon, ISBN-10: 147044190X, ISBN-13: 978-1470441906, Freely available online at: [Bühler-Salamon book](#)
- **Topics:**
 - Foundations (Chapter I): Metric spaces, Banach spaces, Dual spaces, Hilbert spaces, Baire category theorem.
 - Principles of Functional Analysis (Chapter II) - the big three: Uniform boundedness principle, Hahn-Banach theorem, Open mapping/closed graph theorem, reflexive Banach spaces
 - The weak and weak* topologies (Chapter III) - Banach-Alaoglu's theorem, Krein-Milman's theorem.
 - Fredholm theory (Chapter IV) - dual operators, compact operators, Fredholm operators - index, Fredholm alternative.
- **Homework:** There will be four homework assignments per semester, consisting of about 6-10 problems each, covering specific portions of the material. No final exams will be offered.

Note that group work is preferred - groups of two-three students will submit one copy of their work and everybody will be assigned the same grade. Each student must be a lead on at least 2 problems!