

Mathematics 421/510 (Functional Analysis), Winter/Spring 2017

Tue Thur 11-12:30, MATX 1118

Instructor: Prof. Laba

- Contact information: Math Bldg 200, 604-822-4457, ilaba@math.ubc.ca
- Office hours: Tue 12:30-1:30, Thur 10-11, and by appointment, in MATH 200.
- The best way to contact the instructor is by email. Please note that email received on evenings and weekends will be answered on the next business day. If you cannot attend regular office hours due to schedule conflict, please make an appointment in advance. Drop-ins and same-day requests for appointments cannot always be accommodated.
- Course webpage: http://www.math.ubc.ca/~ilaba/teaching/math510_S2017

Prerequisites: MATH 420/507, or equivalent background in measure theory and real analysis.

Textbook: Gerald B. Folland, *Real Analysis: Modern Techniques and Their Applications*, 2nd ed., John Wiley and Sons, 1999, ISBN 0-471-31716-0

This cross-listed 4th year undergraduate and graduate course provides an introduction to functional analysis. It will be based on Chapters 5-8 of the textbook. Most of the emphasis will be on Chapter 5, with the main topics as follows:

- Normed vector spaces, Banach spaces
- Linear operators and linear functionals
- Operator spaces: strong, weak, and weak * topologies
- Hahn-Banach theorem, open mapping theorem, closed graph theorem
- Hilbert spaces and their geometry
- Operators on Hilbert spaces

Time permitting, we will also explore the applications of abstract functional analysis to other areas of mathematics such as harmonic analysis, mathematical physics and partial differential equations:

- L^p spaces
- Radon measures and the Riesz representation theorem
- Fourier series and Fourier analysis

We may occasionally encounter topics that are only mentioned briefly, if at all, in the textbook. In such cases, additional resources will be provided. You may also want to take notes in class.

Your course mark will be based on homework (40%) and two midterm exams (30% each). The grades may be scaled at the end of the course. There will be no final exam.

Examinations: There will be two in-class 80-minute midterms, scheduled on Tuesdays, February 7 and March 7. Both midterms will be strictly closed-book: no formula sheets, calculators, or other aids will be allowed.

Homework assignments: Homework will be assigned on a regular basis, every 1-2 weeks. Each assignment will be announced and posted here at least a week in advance. The assignments are due in class on the due date. If you cannot come to class, you may drop off your homework at your instructor's office before 11 am on the due date. Late assignments will not be accepted. Solutions will be posted on the course webpage immediately after

the lecture. To allow for minor illnesses and other emergencies, the lowest homework score will be dropped.

Academic concession: Missing a midterm, or handing in a homework after the deadline, will result in a mark of 0. Exceptions may be granted in two cases: prior consent of the instructor, or a **documented** medical reason. Your course mark will then be based on your remaining coursework.

Suggested additional resources:

- John B. Conway, *A Course in Functional Analysis*, 2nd ed., Springer, 2007.
- Peter D. Lax, *Functional analysis*, Wiley-Interscience, New York, 2002.

Additional links and resources:

- [Please read the UBC policy on Student Conduct and Discipline.](#)
- [Mathematics Learning Centre](#): The Math Learning Centre (or MLC for short) is a space for undergraduate students to study math together, with support from tutors, who are graduate and undergraduate students in the math department. Please note that while students are encouraged to seek help with homework, the MLC is not a place to check answers or receive solutions, rather, their aim is to aid students in becoming better learners and to develop critical thinking in a mathematical setting. The MLC is located in Rooms 301 and 302 in the Leonard S. Klinck (LSK) Building, and is open Monday through Friday, 11:00am to 6:00pm. Check the website above for any changes to hours and announcements.
- [Past final exam database](#)
- [UBC Math Club](#), located in Math Annex 1119, sells math exam packages (old exams together with solution sets) for a nominal price before each final exam session.

[\[Mathematics Department\]](#) [\[University of British Columbia\]](#)