Functional Analysis — Math 421/510

[Winter 2027]

- ***Instructor:*** Malabika Pramanik
- ***Office:*** Mathematics Building, Room 214
- ***Phone:*** (604) 822-2855
- ***Email:*** malabika@math.ubc.ca

- ***Office hours:*** To be announced.

Text. *Real Analysis: Modern Techniques and Their Applications*, by Gerald B. Folland (2nd ed., Wiley-Interscience, 1999). This is the same textbook used in the earlier course in this sequence, Math 420/507.

References. Supplementary material may be found in

- *A First Course in Functional Analysis*, by John B. Conway;
- *Functional Analysis*, by Peter D. Lax;
- *Functional Analysis, Sobolev Spaces and Partial Differential Equations*, by Haïm Brezis.

Prerequisite. Basic knowledge in measure theory and complex analysis will be required (Math 420/507 at UBC or equivalent).

Course outline. This cross-listed first-year graduate / fourth-year undergraduate course gives an introduction to functional analysis. Together with the measure and integration theory covered in Math 420/507, it provides the foundation for much of mathematical analysis, and is useful in many areas of pure and applied mathematics, including harmonic analysis, differential equations, probability theory, information theory, differential geometry, and mathematical physics. The UBC course description is as follows.

- Banach spaces
- Linear operators
- Point-set topology; strong, weak, and weak* topologies
- Bounded and compact operators
- Hahn–Banach, open mapping, and closed graph theorems
- Hilbert spaces
- L^p spaces
- Symmetric and self-adjoint operators
- Spectral theory for bounded operators

The core topics of this course are contained in Chapters 5 and 6 of the textbook, with parts of Chapters 4 and 7. Time permitting, we will also consider other special topics, such as distributions.

Lectures. MWF, 11-12:30 in ESB4133 and on Zoom

Grading policy. Homework problem sets, due every other week, will be posted regularly on the course website. In addition, there will be a take-home final exam, and weekly short quizes. Your total score will be a weighted average of your homework, quiz, and final scores, with the following breakdown.

Homework	25%
Quizzes	25%
Final exam	50%