Department of Mathematics & Statistics
Concordia University

MAST 662 (MATH 494B & MAST 837B)

Functional Analysis I

Fall 2015

Instructor: Dr. G. Dafni, Office: LB 927-15 (SGW), Phone: (514) 848-2424, Ext. 3216
Email: galia.dafni@concordia.ca
Webpage: http://www.mathstat.concordia.ca/faculty/gdafni/

Lectures: M-W 15:45-17:15, LB 759-6.

Office Hours: Mondays & Wednesdays, 14:00-15:15 and by appointment.

Textbook: *Elementary Functional Analysis* by Barbara D. MacCluer, Springer, 2009.

Other References: *Functional Analysis, Sobolev Spaces and Partial Differential Equations* by H. Brezis, Springer, 2011.

Foundations of Modern Analysis by Avner Friedman, Dover, 2003.

Functional Analysis: Introduction to Further Topics in Analysis by E. M. Stein & R. Shakarchi, Princeton, 2011.

Functional Analysis by W. Rudin, McGraw-Hill, 1991.

Introductory Functional Analysis and Applications by E. Kreyszig, Wiley, c1978.

*These and other references will be put on reserve in the library.

Topics: The course will consist of the following topics taken from Chapters 1-4 of the text and from the references, plus applications:

- Banach spaces, Hilbert spaces, linear functionals, dual spaces (tentative dates Sept. 9, 16, 21, 30).
- bounded linear operators, adjoints (tentative dates Oct. 7, 14).
- the Hahn-Banach, Baire category, Banach-Steinhaus, open mapping and closed graph theorems (tentative dates Oct. 19, 21, 26, 28).

- compact operators, the spectral theorem for self-adjoint compact operators, the Fredholm alternative.
- the weak/weak* topologies, topological vector spaces, distributions, Sobolev spaces, other topics & PhD student presentations.

PhD students: More advanced material will be assigned to PhD students for independent study throughout the semester. The results will be presented in a written or oral presentation and will be included in the homework & exams, and the grade will be factored into the final grade.

Pre-requisites: Previously: real analysis/metric spaces (equivalent to MATH 464); previously or concurrently: measure theory (equivalent to MATH 467/669), basic complex analysis (equivalent to MATH 366).

Assignments: Homework will be assigned approximately once every two weeks, during lecture. In the case of an absence, it is the student's responsibility to find out the homework assignment. **Late homework will not be accepted.**

Exams: Midterm: Monday, November 2, 2015; Final: to be announced.

Evaluation: **MSc:** Homework 40%, Midterm exam 20%, Final exam 40%.
PhD: Homework 30%, Presentation 10%, Midterm exam 20%, Final exam 40%.