Department of Mathematics & Statistics
Concordia University

MAST 662 (MATH 494/MAST 837), Sec. B
Functional Analysis
Fall 2020

Instructor: Dr. G. Dafni
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Lectures: Tuesdays & Thursdays, 16:15-17:30, ONLINE. Lectures will be given in live Zoom meetings, accessible through the course Moodle site, recorded for later viewing.

Office Hours: To be announced. Two or more hours per week of Zoom office hours in which students can log onto the meeting to ask questions. These meetings will be accessible via Moodle and will not be recorded. Individual Zoom meetings can be scheduled by appointment and the instructor will be available for questions by email at the address above.

Textbook: *Elementary Functional Analysis* by Barbara D. MacCluer, Springer, 2009.
Available online via Springerlink through the Concordia library website:
https://link-springer-com.lib-ezproxy.concordia.ca/book/10.1007%2F978-0-387-85529-5

Other References: *Functional Analysis, Sobolev Spaces and Partial Differential Equations* by H. Brezis, Springer, 2011.
Available online via Springerlink through the Concordia library website:
https://link-springer-com.lib-ezproxy.concordia.ca/book/10.1007%2F978-0-387-70914-7

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.

Topics: The course will consist of the following topics taken from Chapters 1-4 of the text and from the references, plus applications (as far as time permits):

- Hilbert spaces, Banach spaces, linear functional, dual spaces.
- bounded linear operators, adjoints.
- the Hahn-Banach, Baire category, Banach-Steinhaus, open mapping and closed graph theorems.
- compact operators, the spectral theorem for self-adjoint compact operators, the Fredholm alternative.
- the weak/weak* topologies, topological vector spaces, distributions, Sobolev spaces.

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

Assignments: Homework will be assigned approximately once every two weeks, on Moodle, via Assignments, and submitted on Moodle. **Late homework will not be accepted.**

Exams: There will be no examinations. Instead, students will be required to complete an independent study project on a topic of their choice as approved by the instructor, related to the course material, and submit it as a written report or in the form of an oral presentation on Zoom.

Evaluation: Homework assignments 60%, Final project/presentation 40%.
PhD students will be required to do additional work (to be determined) compared with their MA/MSc classmates.

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Communication: Communication between the students and the instructor will take place online via Zoom meetings, Moodle announcements and email messages. Students are responsible for reading and taking note of all electronic communication from the instructor and the University.

Academic Integrity and the Academic Code of Conduct

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2].*

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Disclaimer: In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in the course is subject to change.