Department of Mathematics & Statistics
Concordia University

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MAST 661/837 (MATH 494), Sec. C
Topics in Analysis
Topic*: ″*Topological Vector Spaces & Distributions*″
Fall 2019

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Instructor: Dr. G. Dafni, Office: LB 927-15 (SGW), Phone: 848-2424, Ext. 3216
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Lectures: M-W 16:15-17:30, LB 769-6.

Office Hours: To be announced.

Optional text: *Functional Analysis,* by W. Rudin.

Other references: If possible, these references will be put on reserve in the Webster library.

Functional Analysis, Sobolev Spaces and Partial Differential Equations, by H. Brezis.

Foundations of Modern Analysis, by A. Friedman.

Generalized functions and partial differential equations, by A. Friedman.

The analysis of linear partial differential operators, by L. Hörmander.

An introduction to Harmonic Analysis, by Y. Katznelson.

Elements of the theory of functions and functional analysis, by A. N. Kolmogorov & S. V. Fomin,

Methods of Modern Mathematical Physics, by M. Reed and B. Simon.

Functional Analysis, by F. Riesz and B. Sz.- Nagy.

Real and Complex Analysis, by W. Rudin.

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

Introduction to Fourier Analysis on Euclidean Spaces, by E. M. Stein & G. Weiss.

Topological vector spaces, distributions and kernels, by F. Treves.

Théorie des distributions, by L. Schwartz.

Topics:	1. Topological vector spaces, metric spaces, normed spaces 2. Completeness, the three basic principles, convexity, Hahn-Banach 3. Linear functionals, dual spaces, weak topology, adjoint operators 4. Test functions and distributions 5. The Schwartz space and tempered distributions 6. The Fourier transforms on the line and on R^n 7. Sobolev spaces, Sobolev's lemma, embedding theorems 8. Applications to PDE and harmonic analysis

Undergraduates: Undergraduate students in MATH 494 will cover the same material, but the marking will be on a separate scale.

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 may also be included in the exams.

Pre-requisites: Previously: 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, during lecture or via Moodle. In the case of an absence, it is the student's responsibility to find out the homework assignment. **Late homework will not be accepted.**

You should submit your homework handwritten on paper, not electronically, and provide complete arguments. Some assigned problems may not be marked. Understanding of the homework is essential to success on the exams.

Students must follow the University's policy on Academic Integrity:
http://www.concordia.ca/students/academic-integrity.html

Exams: To be announced.

Evaluation: Homework assignments 40%, Exams 60%.

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.

Note: **An updated and more detailed outline will be provided at the beginning of the semester.**

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]*