

Linear Analysis

Math 516 – Lecture B1

September – December 2009

Time and Place: MWF 13:00 – 13:50, CAB 657.

Instructor: Alexander Litvak

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Homepage: <http://www.math.ualberta.ca/~alexandr/>

Office Hours: M 11:10 – 12:00, W 12:00 – 12:50, or by appointment (usually I am available MWF 11:10 – 12:50 and MWRF 14:00 – 14:40).

Recommended books (no textbook needed):

1. B. Bollobas, *Linear Analysis. An Introductory Course*, Second Edition. Cambridge University Press, 1999.
2. J.B. Conway, *A Course in Functional Analysis*, Springer Verlag, 1985.
3. N. Dunford and J.T. Schwartz, *Linear Operators*, I. Wiley-Interscience, 1988.
4. M. Fabian, P. Habala, P. Hajek, V. Montesinos, J. Pelant, and V. Zizler, *Functional Analysis and Infinite dimensional Geometry*, CMS Books in Math. 8 (Springer-Verlag 2001).
5. L.V. Kantorovich, G.P. Akilov, *Functional analysis*, Translated from the Russian by Howard L. Silcock. Second edition. Pergamon Press, Oxford-Elmsford, N.Y., 1982.
6. W. Rudin, *Functional Analysis*, Second Edition. McGraw-Hill, 1991.
7. V. Runde, *Math 516 - Linear Analysis*, Lecture notes, <http://www.math.ualberta.ca/~runde/math516.html>.

Prerequisite: Math 418 or equivalent.

Topics to be covered:

1. Normed spaces and Banach spaces;
2. The principles of functional analysis: the Hahn-Banach theorem, the uniform boundedness principle (Banach-Steinhaus theorem), the open mapping theorem, the closed graph theorem;
3. Hilbert spaces and orthonormal bases;
4. Spectral theory of compact normal operators;
5. Fixed point theorems with applications.

Grading Policy:

Your course grade will be based upon your marks in examinations and assignments weighted as follows:

50%	Final (14:00–17:00, CAB 563, Tuesday, December 8)
20%	First Midterm (13:00–13:50, CAB 657, Friday, October 2)
20%	Second Midterm (13:00–13:50, CAB 657, Friday, October 30)
10%	Assignments

There is no deferred midterm. If you qualify for an excused absence on a midterm the weight will be transferred to the final exam. If you miss the final exam and obtain a formal (in writing) University accepted excuse for your absence you might write a **deferred exam** on Saturday, **January 9, 2010** at 9:00–12:00.

Homework Assignments (H/A): H/A as well as their solutions will be posted at my homepage. You will have one homework assignment each second week and they will be due at the **beginning** of the corresponding class. **Please note**, late assignments will not be accepted. The first assignment will be due Friday September 18. There will be 6 H/A and your H/A mark will be based on your **best 5 out of 6**. During lectures you will also be given many exercises (drill problems). I **strongly recommend** that you do all of them.

Dates: First Class: *Sept. 2*; H/A are due: *Sept. 18, Oct. 2, 16, and 30, Nov. 13 and 25*; Midterm exams: *Oct. 2 and Oct. 30*; No classes: *Sept. 7, Oct. 12, Nov. 11*; Last class: *Dec. 2*; Final exam: *Dec. 8*; Deferred exam: *Jan 9*.

University regulations: Policy about course outlines can be found in Section 23.4(2) of the University Calendar. The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.ualberta.ca/secretariat/appeals.htm) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University.

Additional announcements:

1. As usual there will be Functional Analysis Seminar this year. If you are interested in participating, could you please provide me your schedule and e-mail address, so we could find time convenient to everybody.
2. The following courses could be also interesting for you:
 - a. Winter 2010: “*Operator theory and operator algebras*” (MATH 519) by V. Troitsky.
 - b. Winter 2010: “*Topics in Functional Analysis*” (MATH 617) by V. Runde.
 - c. Winter 2010: “*Topics in Analysis*” (MATH 643) by T. Hillen and V. Troitsky.