University of Alberta Department of Mathematical & Statistical Sciences

MATH 418 – Honors Real Variables II – Fall 2021

MATH 516 – Linear Analysis – Fall 2021

Instructor:	Dr. Arno BERGER
Office:	CAB 683
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Office Hours:	MWF 3:00 – 5:00 pm, or by appointment
Lecture Room & Time:	CAB 365, MWF 10:00 – 10:50 am

Course Web Page:

www.math.ualberta.ca/~aberger/courses/math418_21/math418_21.html

Course Description:

Classical Banach spaces. Hahn-Banach, open mapping and closed graphs theorems. Hilbert spaces, orthonormal bases. Elements of spectral theory, spectra of compact operators, spectral theorem for compact self-adjoint operators.

Course Pre-/Corequisites:

Prerequisite: MATH 417. Corequisite: MATH 447. The undergraduate version of this course (MATH 418) is primarily for Honors students in Mathematics or Physics.

Required Textbook:

No particular textbook is required or will be used. Course notes will be posted on eClass in weekly instalments and discussed in class. In addition, you should be prepared to take careful notes in class as needed. Notes from a previous version of MATH 516 have kindly been provided by Dr. Runde and are available on eClass; they are recommended background reading.

Grade Evaluation:

The final letter grade is determined from the course mark as follows: For MATH 418 a total mark of 50% or more guarantees a passing grade of at least D, whereas for MATH 516 a total mark of 60% or more guarantees a passing grade of at least C+; for both versions of the course, a total course mark of 90% or more guarantees a grade of at least A–. Grades are unofficial until approved by the Department and/or Faculty offering the course. There is no possibility of a re-examination in this course.

Component	Weight	Weight	Date
	MATH 418	MATH 516	
Assignments	21%	21%	due Friday at 6pm, see below
Midterm I	20%	15%	22 October 2021, in class
Midterm II	20%	15%	26 November 2021, in class

Project	N/A	10%	due 10 December 2021, 5pm
Final Exam	39%	39%	21 December 2021, 2 pm, venue TBA

Note: The date of the final examination is set by the Registrar and takes precedence over the final examination date reported in this document. Students must verify this date on BearTracks when the Final Exam Schedule is posted.

Assignments:

There will be a total of **five** assignments during the term, each of equal weight. Problems and submission details will be posted on eClass, and announced in class, as appropriate. Assignments are due on **Friday**, at 6 pm, on 24 September, 15 and 29 October, 19 November, and 10 December. Please submit your work to Assign2 via eClass. Late submissions will not be accepted!

Project:

MATH 516 students will have to complete one project on a specific topic of the course. All details will be provided in class as and when appropriate.

Exam Format:

Both midterms will be 50-minute tests during regular class time that may have multiplechoice components. The final exam will be a 2-hour exam that may have a multiplechoice component. All further details regarding midterm and final exams will be posted on eClass, and announced in class, as and when appropriate.

Representative Evaluative Material:

You are encouraged to have a look at old MATH 418/516 exams (available from the Department of Mathematical & Statistical Sciences). Sample tests may also be made available prior to examinations.

Further Reading:

The following textbooks, mostly available at the University of Alberta or other local libraries, are good sources for further reading:

M. Haase, Functional Analysis. An Elementary Introduction (introductory),
B.D. MacCluer, Elementary Functional Analysis (introductory),
N. Young, An introduction to Hilbert space (introductory),
B. Bollobás, Linear analysis: an introductory course (advanced),
J.B. Conway, A Course in Functional Analysis (advanced),
W. Rudin, Functional analysis (advanced).

IMPORTANT:

MATH 418/516 is a serious mathematics course. Do take it seriously: Thoroughly study the posted course notes, and take careful additional notes in class as needed. Make a true effort on most homework problems, even if you cannot solve them completely. Consider asking questions an important part of your learning experience – don't be shy to ask your fellow students or instructor.

Missed Midterms:

If you cannot write a midterm due to incapacitating illness, severe domestic affliction or other compelling reasons you can apply for an excused absence. In order to do so, you must present supporting documentation pertaining to the absence to the instructor within two working days following the scheduled date of the missed midterm, or as soon as you are able, having regard to the circumstances underlying the absence. In all cases, instructors may request adequate documentation to substantiate the reason for the absence at their discretion. If the reason for your absence is deemed valid, the weight of a missed Midterm I will be transferred in equal parts to Midterm II and the Final Exam, whereas the weight of a missed Midterm II will be transferred to the Final Exam. There will be no deferred midterms.

Note: An excused absence is a privilege and not a right; there is no guarantee that an absence will be excused. Misrepresentation of Facts to gain an excused absence is a serious breach of the *Code of Student Behaviour*.

Excused Absence Where the Cause is Religious Belief:

For an excused absence where the cause is religious belief, a student must contact the instructor within two weeks of the start of Fall classes to request accommodation for the term (including the final exam). Instructors may request adequate documentation to substantiate the student request.

Missed Final Examination:

A student who cannot write the final examination due to incapacitating illness, severe domestic affliction or other compelling reasons can apply for a deferred final examination. Students who failed at the start of term to request exam accommodations for religious beliefs are expected to follow the normal deferred final examination process. Such an application must be made to the student's Faculty office within two working days of the missed examination and must be supported by a Statutory Declaration or other appropriate documentation (see the Academic Regulations/Attendance section of the University Calendar). Deferred examinations are a privilege and not a right; there is no guarantee that a deferred examination will be granted. Misrepresentation of Facts to gain a deferred examination is a serious breach of the *Code of Student Behaviour*. Any deferred final examinations are scheduled for **8 January 2022** at **9 am**.

STUDENT RESPONSIBILITIES

Academic Integrity:

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.governance.ualberta.ca) 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.

All forms of academic dishonesty are unacceptable at the University. Any suspected offence will be reported to the Faculty of Science. Anyone who is found in violation of the *Code of Student Behaviour* may receive a sanction. Typical sanctions include conduct probation, a mark reduction or a mark of zero on an assessment, a grade reduction or a

grade of F in a course, a remark on the transcript, and a recommendation for suspension or expulsion. Students are expected to familiarize themselves with the Academic Integrity resources (covering the topics of cheating, collaboration, plagiarism, and substantial assistance) on the website of the Office of the Dean of Students.

Exams:

Your student photo I.D. is required at exams to verify your identity. During in-person exams, students will not be allowed to begin an examination after it has been in progress for 30 minutes; also, students must remain in the exam room until at least 30 minutes have elapsed.

Recording and/or Distribution of Course Materials:

Audio or video recording, digital or otherwise, of lectures, labs, seminars or any other teaching environment by students is allowed only with the prior written consent of the instructor or as a part of an approved accommodation plan. Student or instructor content, digital or otherwise, created and/or used within the context of the course is to be used solely for personal study, and is not to be used or distributed for any other purpose without prior written consent from the content author(s).

Students eligible for accessibility-related accommodations (students registered with Accessibility Resources):

Eligible students have both rights and responsibilities with regard to accessibility-related accommodations. Consequently, scheduling exam accommodations in accordance with Accessibility Resources deadlines and procedures is essential. Please note that adherence to procedures and deadlines is required for U of A to provide accommodations. Please contact Accessibility Resources (www.ssds.ualberta.ca) for further information.

Academic Success Centre:

Students who want to improve their learning and academic capacity (such as better time management, study skills or examination skills) are encouraged to contact the Academic Success Centre (1-80 SUB).

Disclaimer:

Any typographical errors in this Course Outline are subject to change; corrections will be announced in class.

Policy about course outlines can be found in the Course requirements, Evaluation Procedures and Grading section of the University Calendar.