PMATH 450/650 – Spring 2021
Lebesgue Integration and Fourier Analysis

Instructor: Blake Madill
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Class Website: Learn/Piazza
Social Hour: Friday at 2 pm

List of Topics: Measure Theory: Lebesgue measure on the real line, measurable functions, Lebesgue integration. Hilbert Spaces: separable Hilbert spaces and orthonormal bases. Fourier analysis on the circle: Fourier series, summability kernels, Riemann-Lebesgue lemma, Fejer's theorem, and convergence of Fourier series.

Evaluations: The final grade will calculated by the following grading scheme:

Assignments (x10)	60%
Oral Test 1	15%
Oral Test 2	25%

Note: Graduate students looking to gain credit for PMATH 650 will have a 50% assignment weighting and a final project worth 10%.

Textbook: You may find the following book useful for reference: *Real Analysis*. Royden (and Fitzpatrick). However, the course will be self-contained and this text should be considered highly optional.

Modules: On or before each Monday, the module videos will be posted for the entire week. You will be expected to watch these videos carefully and completely throughout the week. Written notes will not be posted.

Assignments: There will be 10 almost-weekly assignments. Each assignment is due on Tuesday at 6:00 PM ET and is based on the previous week's material. The assignments are designed to help you practice the course material, help you investigate new topics, as well as make sure you do not fall behind watching the module videos. Due dates can be found on the course schedule. Late assignments are not accepted.

Tests: There will be two oral tests, which will be held using MS Teams. Logistical information regarding these tests will be announced closer to the exam dates. They will take place on:

Test 1	June 22 and 23
Test 2	August 3 and 4

Teaching Assistant: Nick (nmanor@uwaterloo.ca) will be in charge of the grading *and regrading* of your assignments:

Academic integrity: In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. [Check the Office of Academic Integrity for more information.]

Grievance: A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4. When in doubt, please be certain to contact the department?s administrative assistant who will provide further assistance.

Discipline: A student is expected to know what constitutes academic integrity to avoid committing an academic offence, and to take responsibility for his/her actions. [Check the Office of Academic Integrity for more information.] A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (e.g., plagiarism, cheating) or about rules for group work/collaboration should seek guidance from the course instructor, academic advisor, or the undergraduate associate dean. For information on categories of offences and types of penalties, students should refer to Policy 71, Student Discipline. For typical penalties, check Guidelines for the Assessment of Penalties.

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals.

AccessAbility Services, located in Needles Hall, Room 1401, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with AccessAbility Services at the beginning of each academic term.

Course Schedule

Week #	Week of	Topics and sections covered	Info
1	May 10	Outer Measure	
2	May 17	Lebesgue Measure I	A1
3	May 24	Lebesgue Measure II	A2
4	May 31	Measurable Functions	A3
5	June 7	Littlewood's Principles	A4
6	June 14	Integration I	A5
7	June 21	Integration II	T1
8	June 28	L^p Spaces	A6
9	July 5	Hilbert Spaces	A7
10	July 12	Fourier Analysis I	A8
11	July 19	Fourier Analysis II	A9
12	July 26	Fourier Analysis III	A10
13	August 2	Study Week	T2

Note: This schedule is subject to change at any time.