Measure and Integration Winter 2025

PMATH 451 / PMATH 651

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Class Schedule

Course	Meet Days	Meet Time	Location	Instructor(s)
PMATH 451 / PMATH 651 001 [LEC]	**Mon, Wed, Fri** *Jan 6 - Apr 4*	12:30PM - 01:20PM	MC 4064	M. Brannan *m2branna@uwater...*

schedule data automatically refreshed daily

Instructor & TA (Teaching Assistant) Information

Instructor: Michael Brannan

E-mail: michael.brannan@uwaterloo.ca

Office Hours: TBA

TA: Jennifer Zhu (jennifer.zhu@uwaterloo.ca). The TA will be in charge of the grading ***and regrading*** of your assignments. .

Course Description

> *Calendar Description for PMATH 451 / PMATH 651:*
>
> General measures, measurability, Caratheodory Extension theorem and construction of measures, integration theory, convergence theorems, Lp-spaces, absolute continuity, differentiation of monotone functions, Radon-Nikodym theorem, product measures, Fubini's theorem, signed measures, Urysohn's lemma, Riesz Representation theorems for classical Banach spaces.
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> PMATH 451: View requirements for PMATH 451 (https://acal.fast.uwaterloo.ca/course/1251/PMATH/451)
>
> PMATH 651: View requirements for PMATH 651 (https://acal.fast.uwaterloo.ca/course/1251/PMATH/651)

Learning Outcomes

By the end of this course students should be able to:

Tentative Course Schedule

Week #	Week of	Topic	Due:
1	Jan 6	Very brief review of Lebesgue measure and integral. Abstract Measure and Integration I	
2	Jan 13	Abstract Measure and Integration II	
3	Jan 20	Construction of Measures - Caratheodory's Theorem	A1
4	Jan 27	Lebesgue-Stieltjes Measures	
5	Feb 3	Measure Theory on Locally Compact Spaces I	A2
	Feb 10	Measure Theory on Locally Compact Spaces II	
6	Feb 17	Reading Week	
7	Feb 24	Measure Theory on Locally Compact Spaces III	A3
8	March 3	Lp-Spaces	
9	March 10	Complex Measures, Radon-Nikodym Thoerem	A4
10	March 17	The Riesz Representation Theorem	
11	March 24	Integration on Product Spaces	
12	March 31	Fubini's Theorem and Applications	A5
13	April 5	Exam Period	

Texts / Materials

Note: Any prices provided in course outlines are best estimates based on recent online prices and do not include shipping or taxes. Prices may vary between retailers.

Title / Name	Notes / Comments	Required	Price (CAD)
Real and Complex Analysis	Author: Walter Rudin	No	
Notes for Pure Math 451	Author: Ken Davidson	No	
Real Analysis: Modern Techniques and their Applications.	Author: Gerald B. Folland	No	

Ken's notes are available here. (http://www.math.uwaterloo.ca/~krdavids/MT/PMath451Notes.pdf)

Student Assessment

Component	Value
Assignments (x5)	60%
a) Assignments will be due two weeks after their posting date. b) There will be a zero tolerance policy for late assignments. (c) All assignments should uploaded to the CrowdMark site for PMATH 451/651 by the deadline (11:59PM on the due date). An assignment is considered late if it is submitted more than 24 hours past the deadline.	

Component	Value
Final Exam	40%
Scheduled by the Registrar.	

You may work in groups on assignments, but you must write up your solutions independently. No resources external to the course (Eg. looking up a solution online) may be used.

Graduate students looking to gain credit for PMATH 651 will have a final exam weighting of 30% and a final presentation worth 10%.

Assignment Screening

No assignment screening will be used in this course.

Administrative Policy

University Policy

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 (https://uwaterloo.ca/academic-integrity/) for more information.]

Grievance: A student who believes that a decision affecting some aspect of their university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4 (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) . 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 their actions. [Check the Office of Academic Integrity (https://uwaterloo.ca/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 (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) . For typical penalties, check Guidelines for the Assessment of Penalties (https://uwaterloo.ca/secretariat/guidelines/guidelines-assessment-penalties) .

Appeals: A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-70) (other than a petition) or Policy 71, Student Discipline (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-71) may be appealed if there is a ground. A student who believes they have a ground for an appeal should refer to Policy 72, Student Appeals (https://uwaterloo.ca/secretariat/policies-procedures-guidelines/policy-72) .

Note for students with disabilities: AccessAbility Services (https://uwaterloo.ca/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.

Turnitin.com: Text matching software (Turnitin®) may be used to screen assignments in this course. Turnitin® is used to verify that all materials and sources in assignments are documented. Students' submissions are stored on a U.S. server, therefore students must be given an alternative (e.g., scaffolded assignment or annotated bibliography), if they are concerned about their privacy and/or security. Students will be given due notice, in the first week of the term and/or at the time assignment details are provided, about arrangements and alternatives for the use of Turnitin in this course.

It is the responsibility of the student to notify the instructor if they, in the first week of term or at the time assignment details are provided, wish to submit alternate assignment.