

COURSE SYLLABUS

Contact Information:

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Office Hours: Tuesday 9:00 - 10:00, Wednesday 9:00 - 10:00, Thursday 2:00 - 3:00

Assignments: There will be an assignment roughly every 2 weeks.

Grade Distribution: Your grade will be determined by the assignments and the final exam.

Pure Math 451

Assignments – 50%

Final Exam – 50%

Pure Math 651

Assignments – 45%

Final Exam – 45%

Talk – 10%

Recommended Text: *Real Analysis: Modern Techniques and Their Applications*, Gerald B. Folland, Wiley-Interscience, 1999 (second edition).

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 www.uwaterloo.ca/academicintegrity/ 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 groups for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4

<http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm>.

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 academic offenses and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g. plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the undergraduate associate dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline,

<http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm>.

For typical penalties, check Guidelines for the Assessment of Penalties,

<http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm>.

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 group. A student who believes he/she has a group for an appeal should refer to Policy 72, Student Appeals,

<http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm>.

Note for students with disabilities: The Office for Persons with Disabilities (OPD), located in Needles hall, Room 1132, 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 the OPD at the beginning of each academic term.

Tentative Outline:

1. Measures

- (a) σ -algebras
- (b) measures
- (c) pre-measures, outer measures, Caratheodory's Theorem
- (d) Borel measures on \mathbb{R} and Lebesgue-Stieltjes measures

2. Integration

- (a) measurable functions
- (b) integrals of complex-valued functions
- (c) convergence theorems
- (d) modes of convergence and Egoroff's Theorem
- (e) product measures and the Fubini-Tonelli Theorem
- (f) n -dimensional Lebesgue integral

3. Signed measures and differentiation

- (a) signed measures, Hahn and Jordan decompositions
- (b) Lebesgue-Radon-Nikodym Theorem and Lebesgue decomposition
- (c) Differentiation on \mathbb{R}^n , Lebesgue Differentiation Theorem
- (d) functions of bounded variation on \mathbb{R} and absolute continuity

4. L^p -spaces

- (a) basic theory, Hölder's and Minkowski's inequalities
- (b) dual spaces
- (c) inequalities, containment relations

5. Radon measures

- (a) positive linear functionals on $C_c(X)$, Riesz Representation Theorem
- (b) regularity and approximation, Lusin's Theorem
- (c) dual of $C_0(X)$