PMATH 333: Introduction to Real Analysis  
FALL 2023

- **Instructor**: Spiro Karigiannis  
- **Office**: MC 5326  
- **Lecture Room**: E2 1736  
- **Email**: karigiannis@uwaterloo.ca  
- **Office Hours**: Wednesdays 3:00pm–4:00pm, and on Piazza  
- **Lecture Times**: Mon/Wed/Fri 12:30pm–1:20pm  
- **Course Website**: [https://learn.uwaterloo.ca/](https://learn.uwaterloo.ca/)  
- **The course website is on UW-LEARN (D2L). All course material (assignments, solutions, supplementary material) will be posted there. **It is your responsibility to check the course website on a regular basis. Ignorance is not an acceptable excuse for missing deadlines.**  
- There will be an online discussion forum on Piazza for the course.  
- All assignments must be submitted via CrowdMark.

**Calendar description.** The purpose of the course is to present the familiar concepts of calculus at a rigorous level and to provide students who took the MATH 137/138/237 sequence with the background needed to be successful in PMATH 351 and PMATH 352. Topics discussed include the completeness properties of the reals; the density of the rationals; the topology of real \( n \)-dimensional space: open and closed sets, connectedness, compactness (by open covers), the Heine–Borel theorem, completeness; sequences in real \( n \)-dimensional space: convergence, Cauchy sequences, subsequences, the Bolzano–Weierstrass theorem; multivariable functions: limits, pointwise and uniform continuity, the extreme value theorem, uniform convergence of sequences of functions, Taylor’s theorem, term-by-term differentiation of power series; integration in real \( n \)-dimensional space: Riemann integrability, Fubini’s theorem for continuous functions on rectangles, term-by-term integration of power series.

**Prerequisites:** One of (MATH 128 with at least 70%), (MATH 138 with at least 60%), MATH 148.  
**Corequisites:** (MATH 235 or 245) and MATH 237.  
**Antirequisites:** MATH 247.

**Textbook.** There is no required textbook for this course. Some useful references are the following:


**Marking scheme.** Your course mark will be determined as follows:

- **Assignments**: 24% (six assignments, one every second week, worth 4% each)  
- **Midterm test**: 16% (Monday, October 16, 2023, in-class)  
- **FINAL EXAM**: 60% (date and time TBD)

You may use calculators/computers to do the assignments, but you will not be permitted to use them for the midterm or the final exam. Please note that you are strongly encouraged to work together with your classmates on the assignment problems, but you must write up and turn in your own solutions to the problems. The assignments are an integral part of your evaluation in this course and I encourage everyone to take them very seriously. I will not be sympathetic to requests for leniency after the exam if you have not done the assignments. **There is NO possibility to base your entire course mark on the final exam.**

There will be no opportunity for a make-up midterm test. A student who misses the midterm test without a valid, acceptable excuse (accompanied by documented proof, such as a medical note) will receive a score of zero on the test. Students who miss the midterm for valid reasons will have the points missed transferred to the final exam.

**NOTE:** For information on academic offences and accessibility services, please see the detailed version of the course outline available at: [https://outline.uwaterloo.ca/view/nr66s9](https://outline.uwaterloo.ca/view/nr66s9)