# Syllabus
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# MAP 6473 – Probability and Potential Theory II

**Time and Location:** M-W-F, Period 5 (11:45 AM – 12:35 PM), LIT 217
**Instructor:** Arnaud Marsiglietti
**Office:** 410 Little Hall
**E-mail:** a.marsiglietti@ufl.edu
**course website:** https://people.clas.ufl.edu/amarsiglietti/courses/spring22-1/

⟶ The course is on **Canvas**

**Office Hours**
Monday 10:30am – 11:20am, Wednesday 10:30am – 11:20am, or by appointment

**Textbook**
There is no required text, but the following textbooks are suggested:

- R. Durrett, Probability: Theory and Examples, 5th edition (**PDF available on Prof. Durrett's website**).
- D. Khoshnevisan, Probability, Graduate studies in mathematics vol. 80, 2007
- P. Mörters and Y. Peres, Brownian Motion, Cambridge University Press (**PDF available on Prof. Mörters' website**).

**Prerequisites**
MAP 6472 - Probability and Potential Theory I

**Scope of the Course**
The aim of the course is to provide students with strong foundations in the area of probability theory. At the end of the course, students will be acquainted with the language of probability and will gain sufficient experience to successfully apply probabilistic tools to most areas of pure and applied sciences.

The course is intended for graduate students as part of their PhD requirement, and for students considering studying probability theory at a research level.

**Topics Covered**
Topics include Conditional Expectation, Martingale, Stopping time, Uniform Integrability, Continuous time stochastic processes (Poisson process, Gaussian process, Brownian motion), Potentials and excessive functions.

**Weekly Schedule**
W1: Review of probability (random enumeration of random variables, $\sigma$-algebra generated by random variables, Lebesgue integral, Lebesgue theorems, etc.).
W2: Conditional expectation, construction in $L^2$, properties of conditional expectation.
W3: Conditional expectation in $L^1$, independence.
W4: Conditional expectation with respect to random variables, special case: discrete/continuous.
W5: Martingale, Doob-Meyer decomposition.
W6: Stopping time, Doob's inequality.
W7: Stopped martingale, stopping theorems.
W8: Convergence of martingales, uniform integrability.
W9: Poisson process.
W10: Brownian motion, Levy's construction of the Brownian motion.
W11: Blumenthal's 0-1 law, law of large numbers for Brownian motion, long-term behavior, nowhere differentiability of the trajectories.
W12: The Brownian motion as a Gaussian process, as a martingale, as a Markov process.
W13: The reflexion principle.
W14: Potentials and excessive functions.

**Homework**
Homework will be assigned on a regular basis, but will not be graded

**Grading System**
- 2 Take Home Exams (dates are tentative)
  → Wednesday, January 26 (Due On Wednesday, February 2)
  → Wednesday, March 23 (Due On Wednesday, March 30)
- 1 Midterm Exam
  → Wednesday, February 26
- **Final Exam Date**
  → Thursday, April 28 (4/28/2022) at 10:00 AM – 12:00 PM in LIT 217

| **Grading (100 points)** | | **Scale** | | | |
|---|---|---|---|---|---|
| Attendance/Participation | **10pts** | A | = 90+ | B− | = 77+ |
| Take Home Exam | 25pts each (total = **50pts**) | A− | = 87+ | C+ | = 73+ |
| Midterm Exam | **20pts** | B+ | = 83+ | C | = 70+ |
| Final Exam | **20pts** | B | = 80+ | C− | = 67+ |

**Course Policies:**

**Absence from Exams**
Missing an exam is permitted **ONLY** for the most compelling reasons. Please notify me **IN ADVANCE**, if possible, if an exam is to be missed. Otherwise you will be given a 0.

**Class Attendance**
Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:

https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

**Honor Code**
UF students are bound by The Honor Pledge which states: "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code". On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code, which can be found at:

https://sccr.dso.ufl.edu/process/student-conduct-code/

specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor in this class.

**Students with Disabilities**
Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the Disability Resource Center (DRC) by visiting

https://disability.ufl.edu/students/get-started/

It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

**Students' Evaluation**
Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at

https://gatorevals.aa.ufl.edu/students/

Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via

https://ufl.bluera.com/ufl/

Summaries of course evaluation results are available to students at

https://gatorevals.aa.ufl.edu/public-results/

**Diversity, Equity, and Inclusion Statements**

The Mathematics Department at the University of Florida is committed to diversity and inclusion of all students. We acknowledge, respect, and value the diverse nature, background and perspective of students and believe that it furthers academic achievements. It is our intent to present materials and activities that are respectful of diversity: race, color, creed, gender, gender identity, sexual orientation, age, religious status, national origin, ethnicity, disability, socioeconomic status, and any other distinguishing qualities.