Syllabus: Math 5010, Section 1, Topics in Analysis: Geometric Measure Theory, Fall 2018

Monteith 414 — Monday, Wednesday, Friday, 10:10 – 11:00

This syllabus contains the policies and expectations that the instructor has established for this course. Please read the entire syllabus carefully before continuing in this course. These policies and expectations are intended to create a productive learning atmosphere for all students. Unless you are prepared to abide by these policies and expectations, you risk losing the opportunity to participate further in the course.

Instructor: Prof. Matthew Badger (`matthew.badger@uconn.edu`)
Office: Monteith 326
Office Hours: Wednesdays 11:00-12:00 (or just drop-in)

Course Description

Topics to be covered (time-permitting)

- Vitali and Besicovitch covering theorems
- differentiation of Radon measures
- Lebesgue-Besicovitch differentiation theorem
- vector Riesz representation theorem
- weak convergence and compactness of Radon measures
- Hausdorff measures and Hausdorff dimension
- isodiametric inequality
- Hausdorff density theorems
- Hausdorff measures and Lipschitz maps
- rectifiable sets versus purely unrectifiable sets [Reference 2]
- Hausdorff dimension of the trace of Brownian motion [Reference 3]
- Rademacher's theorem
- area formula and coarea formula
- BV functions and sets of locally finite perimeter
- isoperimetric inequality
- reduced boundary and measure-theoretic boundary
- generalized Gauss-Green theorem
- Federer's criterion for sets of locally finite perimeter
- Analyst's traveling salesman theorem [References 4, 5]
- Reifenberg's topological disk theorem [Reference 6]
- Additional topics may be presented based on interests of students

References

No required textbook for the course.

(1) L.C. Evans and R.E. Gariepy, *Measure Theory and Fine Properties of Functions*, CRC Press, Boca Raton, 1992. This monograph is the main reference for the course; the first edition or the newer "Revised Edition" are equally good references.
(2) M. Badger, "Generalized rectifiability of measures and the identification problem", arXiv:1803.10022.
(3) P. Mörters and Y. Peres, Brownian motion, Cambridge Series in Statistical and Probabilistic Mathematics, 30, Cambridge University Press, Cambridge, 2010.
(4) R. Schul, "Subsets of rectifiable curves in Hilbert space—the Analyst's TSP", arXiv:math/0602675.
(5) M. Badger and R. Schul, "Multiscale analysis of 1-rectifiable measures II: characterizations", arXiv:1602.03823.
(6) G. David and T. Toro, "Reifenberg parameterizations for sets with holes", arXiv:0910.4869.

Evaluation

- **Participation**: Students are asked to attend and participate in lectures as feasible.
- **Problems Sets**: Problems sets based on material in lecture will be assigned sporadically throughout the course. Each student will be asked to turn in a solution to at least one problem during the course.

Disability Support Services

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Center for Students with Disability:

⟨`http://www.csd.uconn.edu/`⟩.

They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Academic Integrity

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instance of academic dishonesty to Community Standards. For more comprehensive information on academic integrity, please refer to the Undergraduate Academic Integrity Policy:

⟨`http://community.uconn.edu/the-student-code-appendix-a/`⟩.

Current as of: August 20, 2018