Applied Mathematics & Statistics 553.701
Real Analysis: Preparation for the Ph.D. Introductory Examination
Fall, 2018 (4 credits)

Instructor
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Office hours: Fridays 3:00–4:30 pm, and by appointment

Teaching Assistant
T.B.A

Meetings
Monday, Wednesday and Friday 10:00–10:50 am, Whitehead 304

Textbook
Required:
- *Elementary Classical Analysis*. 2nd edition. J. E Marsden and M. J Hoffman. 1995.

Additional useful references:
- *Principles of Mathematical Analysis*. 3rd edition. W. Rudin. 1976.

Online Resources
Please log in to Blackboard for all materials related to this course.

Course Information

- This course is meant as a preparation for incoming AMS PhD students to the Real analysis part of the mandatory Introductory Exam. It will cover all undergraduate level real analysis notions with a strong focus on exercise and problem solving as well as proof writing and exposition.

- **Prerequisites**
  Calculus 3 (AS.110.202 or equivalent)

Course Topics

- Basic set theory. Topology of the real line: limits, completeness., construction of real numbers, series.
- General topology of metric spaces. Convergent and Cauchy sequences, completeness. Connected and compact sets.

- Functions. Continuous, uniformly continuous and bounded functions. Lipschitz functions, Banach fixed point theorem. Functions on the real line, intermediate value theorem.
- Sequences and series of functions. Point wise/uniform convergence. Stone-Wierstrass and Ascoli theorem. Power series.
- Differentiability of multivariate functions. Differential map, partial derivatives, chain rule, Taylor's formula. Inverse and implicit functions' theorems. Optimality and constrained optimality criteria.
- Integration of functions. Riemann integral, fundamental theorem of calculus. Properties of the integral: Fubini's theorem, Lebesgue domination convergence theorem, differentiation inside integrals. Change of variables formula.
- Extras: Fourier series, Fourier transform.

Course Expectations & Grading
Final grade will be obtained as the average of in-class mock exams (approximately 3 to 4 throughout the semester).

Assignments & Readings
Frequent reading of specific sections in the textbook will be required before actual classes.

Ethics
The strength of the university depends on academic and personal integrity. In this course, you must be honest and truthful. Ethical violations include cheating on exams, plagiarism, reuse of assignments, improper use of the Internet and electronic devices, unauthorized collaboration, alteration of graded assignments, forgery and falsification, lying, facilitating academic dishonesty, and unfair competition.
Report any violations you witness to the instructor.

You can find more information about university misconduct policies on the web at these sites:

- For undergraduates: http://e-catalog.jhu.edu/undergrad-students/student-life-policies/
- For graduate students: http://e-catalog.jhu.edu/grad-students/graduate-specific-policies/

Students with Disabilities
Any student with a disability who may need accommodations in this class must obtain an accommodation letter from Student Disability Services, 385 Garland, (410) 516-4720, studentdisabilityservices@jhu.edu .