

# Math 501 Section 1 - Fall 2009

## REAL ANALYSIS

Instructor: Anna L. Mazzucato  
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Course web page: [www.math.psu.edu/mazzucat/math501/](http://www.math.psu.edu/mazzucat/math501/) (and on ANGEL)  
Office hours: Monday 5 - 6 PM  
Additional office hours (for Math 405 students preferably):  
Wednesday 6 - 7:30 PM and Thursday 5:05 - 6:35 PM

Class meets M W F 11:15 AM - 12:05 PM in 308 Boucke.

**Course Description:** The centerpiece of the course is Lebesgue integration theory. The course also covers basic notions and results about abstract topological and metric spaces, as well as some applications of Lebesgue theory.

**Prerequisites:** A good knowledge of basic Real Analysis (at the level of an advanced undergraduate course, such as Math 403-404) is necessary to understand the course.

**Textbook (required):**

- H. L. Royden, *Real Analysis, Third Edition*, Prentice Hall, 1989.

Excellent reference texts are:

- G. B. Folland, *Real Analysis. Second Edition*, Wiley 1999,
- M. E. Taylor, *Measure Theory and Integration*, AMS, 2006,
- W. Rudin, *Real and complex analysis. Third edition*. McGraw-Hill, 1987.

**Course topics:** Topics in part **1) – 6)** are mandatory and form the material for the Qualifying Exam in Analysis, Part A. Topics in part **7)** will be covered time-permitting.

- 1) Metric spaces.
- 2) Continuity.
- 3) Topological spaces, compact spaces.
- 4) Lebesgue measure, sets of measure zero.
- 5) Integration and differentiation.
- 6)  $L^p$  spaces.
- 7) Possible additional topics:

- (a) Fourier Transform: the inversion formula, Plancherel Theorem.
- (b) Hausdorff measure and Hausdorff dimension. Fractal sets.
- (c) Probability spaces and Brownian motion.

A more detailed list of course topics is available on the course web page and on ANGEL.

**Comments:** I welcome questions both during and outside class. ALL questions are very useful to both the instructor and the students. I also welcome general feedback about the course. An anonymous feedback form is available on the course web page. Office hours may occasionally change due to travel and such changes will be announced in class in advance.

**Assignments.** There will be weekly or biweekly homework, one in-class midterm, and a comprehensive final exam. Homework will be assigned and collected usually on Wednesday. The homework is due in class, in person. Homework assignments and handouts will also be posted on ANGEL and/or the course web page.

The midterm is tentatively set for Friday October 9.

**Grading:** Grades will be based on a 10-point scale (for example, A=90%, B=80%). The final grade, an overall assessment of your performance in the course, may be curved.

- HOMEWORK: 30 %;
- MIDTERM: 30%;
- FINAL: 40%.

**Policies:** Collaborations on homework problems is allowed and encouraged. However, each student must turn in their own individual solutions. NO collaboration is allowed during in-class tests. Cell phones must be turned off during all class activities. Attendance is required for this course.

NO LATE HOMEWORK will be accepted. There will be NO MAKE-UP EXAMS, unless for documented and valid reasons, such as illness. In this case, you must inform me IN ADVANCE of the test.

**Academic Integrity:** "Academic dishonesty includes, but is no limited to, cheating, plagiarizing, . . ., facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with academic work of other students. . . . A student charged with academic dishonesty will be given oral or written notice of the charge by the instructor. If students believe that they have been falsely accused, they should seek redress through informal discussions with the instructor, the department head, dean or campus executive officer. If the instructor believes that the infraction is sufficiently serious to warrant the referral of the case to Judicial Affairs, or if the instructor will award a final grade of F in the course because of the infraction, the student and instructor will be afforded formal due process procedures." From Policies and Rules, Student Guide to the University Policy 49-20.

Based on the University's Faculty Senate Policy 49-20, a range of academic sanctions may be taken against a student who engages in academic dishonesty.