18.S097 Introduction to Proofs
IAP 2015
Syllabus

Description: An introduction to writing mathematical proofs, including discussion of mathematical notation, methods of proof, and strategies for formulating and communicating mathematical arguments.

Topics covered will include: introduction to logic and sets, rational numbers and proofs of irrationality, quantifiers, mathematical induction, limits and working with real numbers, countability and uncountability, introduction to the notions of open and closed sets. Additional topics may be discussed according to student interest.

Location: 4-149.
Schedule: Jan. 5–9, 10am-12pm; Jan 12–16, 10am–12pm.
Website: http://math.mit.edu/classes/proofsiap/

Instructor: Eric Baer, ebaer@math.mit.edu.
Office: E18–308.
Office Hours: Wednesdays, 12–1pm.

Course polices:

- If you are taking the class for credit, attendance at lectures is mandatory (please be sure to sign the attendance sheet during each lecture); at most two unexcused absences are permitted in order to receive a passing grade.
- We will have five short homework assignments (assigned Monday, Wednesday and Friday of the first week, and Monday and Wednesday of the second week).

Grading: This IAP, the 18.S097 course is graded on a P/D/F scale. Grades will be assigned based on attendance and completion of homework assignments.

Tentative outline of topics:

(1) Introduction and overview of methods of proof.
(2) Overview of logical implication, and the notions of sets, functions, and quantifiers. Practice formulating and writing proofs involving these concepts.
(3) Working with integers: rational numbers and proofs of irrationality. Recursion and mathematical induction. (2 days)
(4) How to gauge the size of sets, part I: countability and uncountability.
(5) Working with real numbers: completeness, limits, continuity and derivatives.
(6) Open and closed sets. How to gauge the size of sets, part II: sets of measure zero. Construction of the Cantor set. (2 days)
(7) How to gauge the size of sets, part III: dimension and fractal sets (2 days).

Student support services: If you are dealing with a personal or medical issue that is impacting your ability to attend class or complete work, please discuss this with Student Support Services (S^3). The deans in S^3 will verify your situation, and then discuss with you how to address the missed work. You may consult with Student Support Services in 5–104 or at (617)253–4861. Also, S^3 has walk-in hours Monday–Friday, 9:00–10:00am.

Student disability services: MIT is committed to the principle of equal access. Students who need disability accommodations are encouraged to speak with Kathleen Monagle, Associate Dean, prior to or early in the term so that accommodation requests can be evaluated and addressed in a timely fashion. Even if you are not planning to use accommodations, it is recommended that you meet with SDS staff to familiarize yourself with the services and resources of the office. You may consult with Student Disability Services in 5–104 or at (617)253–1674. If you have already been approved for accommodations, please speak with me so that we can work together to get your accommodation logistics in place.