

Course Information
Lecturer: Ronitt Rubinfeld

Lectures: TTh 11:00-12:30, Room 4-149.

Instructor: Ronitt Rubinfeld, ronitt@csail.mit.edu, G32-698, 253-0884.

Teaching Assistant: Amartya Shankha Biswas, asbiswas@mit.edu,

Course Website: <http://people.csail.mit.edu/ronitt/COURSE/S20/index.html>

Course topics The course will consist of a subset of the topics mentioned below. The list is subject to change due to my personal whims, class interest and timing issues. The topics will not be covered in the order given below.

- Some uses of randomness: algorithms (parallel algorithms, small space algorithms for graph connectivity, uniform generation and approximate counting, property testing), probabilistic proofs and constructions of combinatorial objects (e.g., expander graphs, Lovasz Local Lemma, efficient codes, Szemerédi partitions).
- Randomness vs. predictability:
 - Computational learning theory (predictability): learning vs. predictability, learning constant depth circuits, learning decision trees, learning noisy parity functions, weak learning, boosting.
 - Pseudorandomness (unpredictability): pseudorandomness vs. unpredictability, pseudorandom generators (prg's) based on hard problems, derandomization, randomness from weak random sources, randomness extractors, extractors vs. prg's, techniques for recycling randomness, derandomizing space bounded computation, sample spaces with limited independence, deterministic connectivity in logspace.
- Tools: Influence of a variable on a function, random walks on graphs, expander graphs, list decoding, limited independence, Fourier representation of a function, simple additive number theory, Szemerédi regularity lemma.

Course Requirements Weekly homework sets (55%). Scribe notes (15%). Final project (20%). Class participation (10%). As part of class participation, students may be asked to help with grading of assignments and the preparation of solution sets.

Scribe policy The first version of the scribe notes is due *two days* after the lecture. The final version is due *one week* after the lecture. A sample scribe tex file is available on the course website. Both tex and pdf files should be emailed to the course staff.

Prerequisites 6.046 or 6.045 or 6.840 (or permission of instructor).

Office hours By appointment.