

Syllabus for Math 497A: Computability, Unsolvability, Randomness

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- Week 1, August 27–31.
register-machine programs, computable functions, recursion.
- Monday September 3, no lecture, Labor Day.
- Week 2, September 3–7.
partial recursive functions, the enumeration theorem, the halting problem.
- Week 3, September 10–14.
unsolvable mathematical problems, many-one reducibility, the arithmetical hierarchy.
- Week 4, September 17–21.
oracles, relativization, Turing reducibility, degrees of unsolvability, the jump operator.
- Week 5, September 24–28.
finite approximation, the structure of the Turing degrees.
- Week 6, October 1–5.
Monday, review; Wednesday, midterm exam.
- Week 7, October 8–12.
machines, prefix-free machines, Kolmogorov complexity.

- Week 8, October 15–19.
the fair-coin probability measure, tests for randomness.
- Week 9, October 22–26.
randomness, strong randomness, weak randomness.
- Week 10, October 29 – November 2.
basis theorems, Turing degrees of random sequences.
- Week 11, November 5–9.
relative randomness, van Lambalgen’s Theorem.
- Week 12, November 12–16.
initial segment complexity, Schnorr’s Theorem.
- November 19–23, no lectures, Thanksgiving week.
- Week 13, November 26–30.
LR-reducibility.
- Week 14, December 3–7.
Monday, last lecture; Tuesday through Friday, study days.
- Week 15, December 10–14.
oral final examinations.