

Course
Website

Course materials will be posted on the course website:

[http://www.cs.princeton.edu/~mbraverm/
pmwiki/index.php?n=Site.AlgMechDesign2014](http://www.cs.princeton.edu/~mbraverm/pmwiki/index.php?n=Site.AlgMechDesign2014)

Instructor
and
Lectures
Info

Instructor	Office	Email	Office Hours
Mark Braverman	CS Building 411	mbraverm@cs.princeton.edu	MTh 4:30-5+pm or by appointment
Matt Weinberg	CS Building 103B	msethwm@princeton.edu	TTh 4:30-5+pm or by appointment

Lecture: *Time:* TTh 3:00-4:20pm *Place:* CS 302

Outline

In this advanced graduate course we will explore mechanism design with a focus on recent algorithmic or complexity theoretic contributions. We will start by introducing some important game theoretic concepts for mechanism design and covering some seminal results, including the Vickrey-Clarke-Groves auction and Myerson's optimal auction. We will then proceed to cover more advanced topics which have seen recent progress due to techniques taken from TCS. We will also cover some advances in pure TCS that are motivated by applications in algorithmic mechanism design. The second half of the course will consist of presentations by students on topics of interest related to the course topic. A secondary objective of the seminar is to develop participants' presentation skills for technical results in TCS.

The tentative list of topics to be covered (not necessarily in this order) includes:

- Basic game theory (i.e. equilibrium) concepts;
- Combinatorial Auctions;
- Optimal multi-dimensional mechanism design;
- Reductions from mechanism to algorithm design;
- Price of Anarchy;
- Mechanisms without money;
- Prophet inequalities;
- Equivalence of separation and optimization;
- Query vs. computational complexity

Additional topics that may be covered depending on interests (possibly by students):

- Mechanism design and privacy;
- Social choice theory;
- Principal-agent problems;
- Mechanism design in healthcare.

Reference
materials

- "Algorithmic Game Theory" by Nisan, Roughgarden, Tardos, and Vazirani;
- "Mechanism Design and Approximation" by Hartline;
- Additional books and especially papers TBD.

Grading

The grading will be based on three components:

- ≈ 2 assignments – 30%;
- participation (which may include scribing) – 25%;
- a presentation and report – 45%.