

508A Course Outline (Syllabus)

Instructor: Junnan He

Email: junnan.he@wustl.edu

Office: Seigle 351

Econ 508A is a 3-week course on essential mathematics (mostly optimization theory) for 1st year graduate students in Economics, Political Science and some of the Business disciplines.

There will be assignments for exercise but they are not due. At the end of the course there will be a take-home exam.

We will try to cover the following topics during the course:

1. Unconstrained optimizations: first/second order conditions, Taylor series, and envelope theorem;
2. Constrained optimization: KKT theorem with convexity/with constraint qualification and envelope theorem;
3. Finite horizon dynamic programming in discrete time: an application of KKT and backward induction;
4. Infinite horizon dynamic programming in discrete time: functional equation problem, value-function iterations;
5. Some basic point set topology: Normed spaces, Cauchy sequences, complete spaces and contraction mapping theorem;
6. The one-shot deviation principle;
7. Optimal control in continuous time: Brachistochrone problem, Euler-Lagrange equation.

No text book is required. Sometimes we may refer to the following books for more advanced details.

Miao “Economic Dynamics in Discrete Time”;

Schattler and Ledzewicz “Geometric Optimal Control”;

Stokey and Lucas “Recursive Methods in Economic Dynamics”;

Sundaram “A First Course in Optimization Theory”;

Turkington “Mathematical Tools for Economics”.

This outline is tentative and may change as we go.