

SUMMER MATH CAMP 2012

Instructor:

Jianfei Shen: jianfei.shen@unsw.edu.au

Room & Time:

OMB 151 (Old Main Theatre, K15 on the map)
12:00 am—4:00 pm, 6 February–14 February

Course Description:

This is a course which covers the basic mathematical tools used in economics and finance (1st year graduate program).

Textbooks:

There is no single text available that covers all relevant material at a suitable level. Thus I will hand out lectures notes (you can download them from <http://jianfeishen.weebly.com/>), but the following two books are very useful:

- [Ok \(2007\)](#): *Real Analysis with Economic Applications*
- [Sundaram \(1996\)](#): *A First Course in Optimization Theory*

[Ok \(2007\)](#) is an advanced textbook and covers much more than we will need in the course. [Sundaram \(1996\)](#) is for optimization theory.

Course Outline:

1. *Multivariable Calculus*. Functions on Euclidean Spaces ⊙ Directional derivative and derivative ⊙ Partial derivatives and the Jacobian ⊙ Gradient and its geometric interpretation ⊙ Continuously differentiable functions and Hessian ⊙ Quadratic forms ⊙ The implicit function theorem ⊙ Homogeneous functions and Euler's formula

2. *Optimization*. Unconstrained optimization ⊙ Equality constrained optimization ⊙ Inequality constrained optimization ⊙ Envelop theorem
3. *Convexity in \mathbb{R}^n* . Convex sets ⊙ Separation theorem ⊙ Convex function ⊙ Convexity and optimization.
4. *Dynamic Programming*. Correspondences ⊙ Contraction Mapping Theorem ⊙ Value function ⊙ Principle of Optimality ⊙ Bellman equation.
5. *Metric Spaces*. Convergent sequences ⊙ Open sets and closed sets ⊙ Continuous functions ⊙ Complete metric spaces ⊙ Compact metric spaces.
6. *Linear and Normed Spaces (if times permits)*.

REFERENCES

- [1] OK, EFE A. (2007) *Real Analysis with Economic Applications*, New Jersey: Princeton University Press. [1]
- [2] SUNDARAM, RANGARAJAN K. (1996) *A First Course in Optimization Theory*, Cambridge, Massachusetts: Cambridge University Press. [1]