Economics 890(5): Quant Techniques II Fei Li
Fall, 2013 lifei@email.unc.edu

QUANTITATE TECHNIQUES II

Class Requirements

There will be **5** problem sets. These will be graded coarsely (P+, P, P-). It is **strongly** recommended that you attempt the problem sets yourself. You may discuss difficulties with your classmates, the TA, myself (in that order) if you are stuck.

Further, there will be 2 in-class midterms and a final exam (all are close book). The 2nd midterm will only cover material since the first midterm. The final exam is cumulative. I will make sample exams available about a week before the actual exam.

Grades for the class will be based on:

1. Midterm (20% each) (In class, on September 25, October 30)
2. Problem sets (10%)
3. Final Exam (50%) (In class, December 2)

Readings

There is no required textbook for the class, but you are encouraged to have one of the following real analysis textbooks:

- A. Kolmogorov, and S. Fomin, *Introductory Real Analysis*, Dover Publications, 1975.
- C. Pugh, *Real Mathematical Analysis*, Springer, 2001
- W. Rudin, *Principles of Mathematical Analysis*, McGraw-Hill, 1976.

You might find the following books are also useful for certain topics:

- D. Corbae, M. Stinchcombe, and J. Zeman, *An Introduction to Mathematical Analysis for Economic Theory and Econometrics*, Princeton Univ. Press, Princeton, 2009.
- E. Ok, *Real Analysis with Economic Applications*, Princeton Univ. Press, 2007.
- N. Stokey, and R. Lucas, *Recursive Methods in Economic Dynamics*, Harvard Univ. Press, Cambridge, Massachusetts, 1989.
- R. Sundaram, *A First Course in Optimization Theory*, Cambridge Univ. Press, Cambridge, 1996.
- R. Vohra, *Advanced Mathematical Economics*, Routledge, 2005.

In addition, the previous instructor of this course, Peter Norman, has an excellent lecture notes on his website.

Class Logistics

The class meets on Tuesday and Thursday 12:30-1:45 pm at Gardner Hall 307. You are expected to attend all classes. There is no lecture in the following date: Oct. 16th, and Nov. 27th.

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Assignments will be posted on Sakai. There will be weekly review sessions.
Assignments are due in review session at the beginning of the lecture on the due date.

Contacting Us
My e-mail is lifei@email.unc.edu. My office is Gardner 300B. My office hour is TR 4:45-5:15pm. Your TA is Sam Flanders. His email is samf1986@gmail.com.

Tentative Agenda

1. Set Theory and Functions (~1-2 weeks)
    a. Operations on Sets
    b. Functions and Mappings
    c. Finite and Infinite Sets
    d. Countability
2. Topology in Metric Space (~2-3 weeks)
    a. Open and Closed Sets
    b. Sequences, Limits and Convergence
    c. Continuity
    d. Compactness and Weierstrass Theorem
    e. Completeness
    f. Connectness and Intermediate Value Theorem
3. Function Space (~1 weeks)
    a. Uniform Convergence in $C^0[a,b]$
    b. Compactness and Equicontinuity in $C^0[a,b]$
    c. Uniform Approximation in $C^0[a,b]$
4. Contraction Mapping Theorem and Its Applications (~1-2 weeks)
    a. Contraction Mapping Theorem
    b. Implicit Function Theorem
    c. Applications
5. Linear Space (~2 weeks)
    a. Definition and Properties of Linear Space
    b. Half Space, Hyperplane
    c. Hyperplane Separation (Supporting) Theorem
    d. Farkas Lemma
    e. Applications
6. Optimization in R^n (~2-3 week)
    a. Problem and Existence
    b. Linear Programming
    c. Convex, Concave, and Quasi-Concave Functions
    d. Convex Programming
    e. Maximum Theorem
    f. Envelop Theorem
7. Sup-modularity (optional)