

Syllabus

Summer 2022 Applied Economics Math Review

Meeting time : Monday to Friday; 9:00am to 12:00pm

Venue : McNeal Hall 33 / zoom (see last page for link)

Instructor : Mwaso Mnensa

Email : mnens001@umn.edu

Phone : 612-300-3676

Office Hours : By appointment on zoom (see last page for link)

Description

This is a non-credit course that is intended to prepare you for the concepts and methods that you will use in the Microeconomic Theory and Econometric Analysis sequences of the first year PhD in the Applied Economics and other related departments. Some, if not most, of the concepts will be familiar to you and others may be relatively new. The aim of the course is to help prepare you for the more advanced and in-depth economic and econometric analysis presented in the APEC8001-04 as well as APEC8211-14 subjects.

The class will be mainly in the form of lectures, however active participation will be expected from everyone, and you will be required to solve problem sets in class. Solutions to example problems will be circulated on Canvas after every class. Problem sets will not be graded.

The class will be hybrid in form; therefore, you will have the choice to attend in person or on zoom. Office hours will be held on zoom upon request.

References

I will heavily rely on Simon and Blume for class materials and problem sets. Hansen's book is particularly good for the probability and statistics topics. These and other books that would be useful for you are listed below. Although you may find it helpful for you to do so, you are not required to buy any book for this class. I will prepare lecture slides and upload them on canvas before every class. I will also rely on work that was produced by Math Review instructors for the previous years, particularly Matt Bombyk (2021), Ling Yao (2020) and Vanee Dusoruth (2017).

- Simon and Blume: Mathematics for Economists

- Bruce E Hansen: Introduction to Econometrics
- Stewart: Calculus
- Chiang: Fundamental Methods of Mathematical Economics
- DeGroot and Schervish: Probability and Statistics
- Greene: Econometric Analysis
- Mas-Colell, Whinston, and Green: Microeconomic Theory
- Strang: Linear Algebra and It's Applications
- Velleman: How to Prove It

Course Schedule

Week 1	
Monday	<ul style="list-style-type: none"> • Introduction • logic and proofs (Simon and Blume, A1.3)
Tuesday	Sets (Simon and Blume A1.1, Ch.12.3-5, MWG M.G) <ul style="list-style-type: none"> • basic topology • convex sets • separating hyperplane theorem
Wednesday & Thursday	Single variate calculus (Simon and Blume Ch.2,3,4 and A4) <ul style="list-style-type: none"> • derivatives • chain rule • mean value theorem • approximation • convexity and critical points • integration
Friday	Multi-variate calculus (Simon and Blume Ch.14,15,20) <ul style="list-style-type: none"> • Matrix representation • Partial and total derivatives • Implicit function theorem • Homogeneous functions • Homothetic functions • Concavity and convexity
Week 2	
Monday	Functions (Simn and Blume Ch.13,21) <ul style="list-style-type: none"> • continuity • fixed point theorems concavity and quasi-concavity

Tuesday/ Wednesday/ Thursday	Optimization (Simon and Blume Ch.17,18,19 MWG MJ-L) <ul style="list-style-type: none"> • unconstrained optimization • constrained optimization • nonlinear programming • concave programming • maximum theorem • envelope theorem • comparative statics
Friday	Practice questions/recap of optimization
Week 3	
Monday	Linear algebra (Simon and Blume Ch.7-9, Hansen A18-20) <ul style="list-style-type: none"> • matrix algebra • linear systems • linear independence
Tuesday	Linear algebra <ul style="list-style-type: none"> • determinants • inverse • eigenvalues and eigenvectors • symmetric matrices • definiteness • vector spaces
Wednesday	Probability theory (Hansen Ch.1) <ul style="list-style-type: none"> • random variables • expectations and variance • common distributions
Thursday	Statistics <ul style="list-style-type: none"> • least squares • inference • law of large numbers • central limit theorem • asymptotic theory
Friday	We will use this time to cover any topics that may be of interest or those not adequately covered within the stipulated time.

Zoom link

<https://umn.zoom.us/j/2160010635?pwd=bTUzYWUyYk5WmlVSGdlaHMybjQ4UT09>

Meeting ID: 216 001 0635

Passcode: 4xNEfk