

# ECON5120

## ECONOMETRIC THEORY & APPLICATIONS

### Fall 2023

#### Instructor Information:

Instructor: Xun (Sean) Lu  
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#### Teaching Assistant (TA) Information:

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**Course Overview:** This is a standard first-year PhD-level course in econometrics. It covers the classic topics of linear regressions, large sample theory, endogeneity issues, generalized methods of moments, and panel data models. If time permits, we will also introduce some recently developed machine-learning methods. This course provides a solid background for empirical research and further studies in econometric theory. Matlab and Stata will be used for computer-based calculations.

#### Prerequisites

Undergraduate level multivariate calculus (two semesters), linear algebra (one semester), and probability and statistics (one semester).

#### Textbook

##### Required:

Fumio Hayashi, Econometrics, [Princeton University Press](#), 2001. ([home page for Hayashi's text](#))

##### Recommended:

- Bruce Hansen, [Probability and Statistics for Economists](#), 2021
- Bruce Hansen, [Econometrics](#), 2021
- James D. Hamilton, Time Series Analysis, [Princeton University Press](#), 1994
- Jeffrey M. Wooldridge, Econometric Analysis of Cross Section and Panel Data, (2<sup>nd</sup> edition), [MIT Press](#), 2010
- Halbert White, [Asymptotic Theory for Econometricians](#): Revised Edition, 2000.

#### Course Webpage

I will distribute materials for this class through Blackboard, so please make sure to check Blackboard at least twice per week for announcements and postings.

## Lectures

Tentatively, the classes are conducted face-to-face. Please make sure to attend all the lectures and read the required readings. I will post the lecture notes several days before the lectures. It will be extremely helpful to read the notes in advance.

## Tutorials

We also have some tutorials for this class that are separate from the lectures. The TA will help solve some assignment questions. The tutorial is NOT weekly. Each time, the TA will announce it through Blackboard and send emails several days before the tutorial. More details will be provided.

## Computer Package

We will use the statistical software Stata and Matlab to analyze data.

-You do NOT need to buy Stata or Matlab. Stata and Matlab are available at the computer lab (916) in ELB 9/F, with your "Computing ID" and "PC LAN password". More details will be provided on how to access Stata and Matlab remotely. One good introduction to Stata can be found at <http://data.princeton.edu/stata>.

## Problem Sets

There will be five problem sets, each of which will carry a weight of 3% towards the final grade. The problem sets will involve both theoretical and empirical work. Group study and free discussion are encouraged. But you should submit your own answers.

Each problem set is to be submitted online. Problem sets will not be accepted by email or in department mailboxes. If you need to hand in a problem set early, then please make arrangements with your TA before the problem set is due. Late submission of problem sets will generally not be accepted!

## Examinations

There will be one mid-term exam and one final exam. The mid-term carries a weight of 35%. The final exam will have 50% weight. The final will be cumulative and cover all the course materials.

All exams will be closed book/note. Please bring a basic scientific calculator (non-programmable) to the exams. There will be no make-up exams. If you miss a midterm, you will receive a zero. The only exception is a verifiable medical reason, in which case the weight of the missed mid-term will be shifted to the final exam.

Finally, if you are caught cheating during an exam, you will receive a zero on the exam, may fail the course, and may be subject to further disciplinary action by CUHK.

## Performance Evaluation

The grades in this course will be based on the following:

Assessment Activities	Weighting
Five problems sets	15%
Mid-term exam	35%
Final exam	50%

## Re-grading Policy

All grading problems must be rectified within one week from the time a problem set or an exam is returned. Re-grading of exams may not be allowed if they were written in pencil. Please talk to the TA first regarding the re-grading. If there are some further issues, you can contact the instructor.

## Office Hours/Email

Please drop by during my office hours or the TA's office hours if you need help with anything. Send us an email if you have any concerns; we will try to respond within 24 hours. Please note, however, that emails are not the proper venue to answer particular problem set questions; we can help you with that during office hours or the tutorial.

## Tentative Schedule

Please note here that the schedule below is tentative, meaning that I may need to change things as the session progresses. The exact date of the mid-term depends on the progress of the course and will be announced later. More details on the required readings for each topic will be given during the class.

### Topics

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Topic 1: Review of Basic Linear Algebra and Probability

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Topic 2: Classical Linear Regression Models

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Topic 3: Large Sample Theory

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Mid-term exam

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Topic 4: Generalized Methods of Moments

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Topic 5: Panel Data Models

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Topic 6: Applied Econometrics

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