Rutgers University
The State University of New Jersey
Department of Economics - CCAS
Fall 2020

Class Information

Course Title: Foundations of Econometrics (index#01319)
Economics 222/Section 01

Instructor: Dr. I-Ming Chiu

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Phone (856) 225 6012

E-mail address: ichiu@camden.rutgers.edu

Class Meeting: Remote Teaching via Zoom (9:35-10:55 AM, Tuesday & Thursday)

Office Hours: 1:00-2:00 PM (Tuesday or by appointment via Zoom)

Course Description: This class shows students how to apply modern statistical methods to explore and quantify essential variables used in business, economics, and other fields (e.g. Childhood Studies, Computer Science, Political Science, etc.). The class begins with a detailed introduction on mathematical fundamentals that include Set Theory, Functions, Counting Rules, Probability Theory, Random Variables & their corresponding distributions (discrete vs. continuous), and Statistical Inferences. After gaining a solid understanding on fundamental concepts in probability theory and statistical inference, the class continues to introduce students to experimental design, analysis of variance, and data fitting using the linear regression models. Bayesian statistics will be briefly explained at the end of the class. The pros and cons between Classical and Bayesian methods will be addressed. We will utilize real as well as simulated data sets to visualize statistical concepts and implement all the statistical methods. The ultimate goal of this class is to equip students with analytical skills, which are essential in today's dynamic workplace. Meanwhile, the rigorous training from this class will also pave the way for students to learn the subject of Data Science. This class is a prerequisite for students who would like to take 'Applied Data Mining' economics course (220:422) offered in spring.

References: Norman Matloff, Probability and Statistics for Data Science (PSDS), CRC Press, 2020. (Paperback/eBook edition can be purchased at the school Bookstore or Amazon.com or Publisher's web site)

David Diez et. al, Introductory Statics with Randomization and Simulation (ISRS), 1st edition, 2014. (Downloaded link: https://drive.google.com/file/d/0B-DHaDEbiOGkRHNndUlBaHVmaGM/edit)

David Diez et. al, OpenIntro Statistics (OpenIntro), 4th edition, 2019. (Maybe downloaded as a free PDF at https://www.openintro.org/book/os/ or direct download link at https://leanpub.com/openintro-statistics)

Jay L Devore and Kenneth N. Berk, Modern Mathematical Statistics with Applications (MMSA), 2nd Edition, Springer, 2012 (eBook can be downloaded via the school library web site).

Gary Oehlert, A First Course in Design and Analysis of Experiments (DOX), W. H. Freeman, 2000.
(Download site: http://users.stat.umn.edu/~gary/book/fcdae.pdf)

Babak Shahbaba, Biostatistics with R: An Introduction to Statistics through Biological Data (BioR), Springer, 2012 (eBook can be downloaded via the school library web site).

Computing: Most of the computations will be done using the statistical software Stata & R. The virtual implementation of Stata can be found at the following site: https://apps.camden.rutgers.edu/novnc/ (NetID login is required).

R Installation: https://www.youtube.com/watch?v=Icawuhf0Yqo (for Mac)
https://www.youtube.com/watch?v=hxj0UG4boGU (for PC)
You may also install RStudio once installing R. RStudio is an IDE (Integrated Development Environment) for R.
**Please notice that the most recent R and RStudio versions are 4.0.2 and 1.3.1073, respectively.

Class Material: Data, handouts, readings, and homework problems will be posted on **Sakai** web site.

Useful Websites: https://www.datacamp.com/ (Learn Data Science online)

https://www.openintro.org/book/os/ (link to the 2nd reference)

http://www.ats.ucla.edu/stat/(Computing learning at UCLA)

http://www.statmethods.net/ (Computing using R web site)

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Fall '20 Calendar: https://registrar.camden.rutgers.edu/academic-calendar-2020-20201

Grading: **Contribution to Final Grade**

- DataCamp training	10%
- Take-home problems	30%
- Midterm Exam	30%
- Final Exam	30%
- Participation in Zoom meetings (extra credits)	5%

Grading Policy: Term grades will be based on the final distribution of the above grading weights.

Exam Preparation: The exam questions will be drawn from three sources: (i) homework assignments, (ii) course lectures, and (iii) reading material.

Class Participation: Class attendance is essential for learning achievement. When missing a class, it would cost you more time to learn on your own. I strongly recommend the following steps for your successful learning: (1) attend every class and take notes; (2) review everything you learn from the class immediately, never put it off; (3) ask questions and participate in class discussions.

Academic conduct: Make up exams will be given **only upon prior notice**. I request prior knowledge of any expected absence from an exam. If this is not feasible, you can document a valid reason for missing the exam. Unexcused absence on any exam will result in a grade of zero. Dishonesty in seeking an excused absence or in the examination process will result in a grade of zero on the exam involved and in university discipline. More detailed information can be found at the following site: https://academicintegrity.rutgers.edu.

Disability Services: Rutgers University welcomes students with disabilities into all of the University's educational programs. In order to receive consideration for reasonable accommodations, a student with a disability must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: https://ods.rutgers.edu/students/documentation-guidelines. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide

you with a Letter of Accommodations. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. To begin this process, please complete the Registration form at https://webapps.rutgers.edu/student-ods/forms/registration.

Here is the link to the Office of Disability Service: https://success.camden.rutgers.edu/disability-services

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Course Outline:

Topic 1	Data Types & Introduction to R
Topic 2	Mathematical Preliminaries
Topic 3	Probability Theory
Topic 4	Discrete & Continuous Random Variables
Topic 5	Sampling Distributions and Major Statistical Theorems
Midterm Exam	**Date: TBA in the class**
Topic 6	Statistical Inferences (I): Point Estimation, Confidence Interval and Hypothesis Testing
Topic 7	Statistical Inferences (II): Point Estimation, Confidence Interval and Hypothesis Testing
Topic 8	Introduction to the Design of Experiments (DOX) and Analysis of Variance (ANOVA)
Topic 9	Joint Distribution, Conditional Mean Function & Linear Regression Models
Topic 10	What's Bayesian? Frequentist vs Bayesian Thinking
Final Exam (school schedule)	8:00-11:00 AM, Thursday, December 17