

# COURSE OUTLINE FOR “ECONOMETRICS”

## 01:220:322:H7

INSTRUCTOR: PHD STUDENT FREDDY ROJAS CAMA

### Course Information:

Location: [Scott Hall 119](#)  
Time: TTh 06:00 - 10:00 pm  
Office hours: Th 5:00 - 5:50 pm or by appointment  
Course web site: <http://sakai.rutgers.edu>

### Contact Information:

Office: New Jersey Hall; Office 305  
E-mail: [fcama@economics.rutgers.edu](mailto:fcama@economics.rutgers.edu)  
Personal web site: <http://econweb.rutgers.edu/frojas>

## 1. COURSE DESCRIPTION

This course constitutes an introduction to econometrics for undergraduate level. The goal of this course is to provide the statistical and probability-theoretic foundation for engaging in econometric research. Importantly, you are going to learn about the interplay between *economic theory*, *data*, and *statistics*. You also are going to learn how to think carefully about your modeling assumptions and to question, examine and validate them as rigorously as possible.

The course will be centered around six main topics covering the following: 1) the notion of basic statistics and probability, 2) the regression analysis (estimation and inference), 3) heteroskedasticity and serial correlation in the error component, 4) bias, consistency, efficiency and simultaneity, 5) economic modeling or functional form and 6) additional econometric topics. The goal of the first part of this course is to refresh and strengthen the notions of probability and statistics; they are going to be useful for the rest of sections. Then, the instructor will start with a quick motivation and brief introduction into field of econometrics. After this, the instructor will rapidly move to the next topic based on regression analysis. Estimation and inference are the core basis of this course; therefore, the instructor recommends students not to miss those lectures. The lectures will be 3 hour and 20 minutes long; therefore, the instructor recommends that you familiarize yourself with all of the sections; it is strongly suggested to read the respective chapter of the book and prepare questions

related to each topic before each class starts. This is the best strategy for dealing with the daily lectures.

## 2. PREREQUISITES

Students must have taken microeconomics and macroeconomics courses (e.g. 220:102 and 220:103 or 220:200 or 373:121), an introductory statistics class (e.g. 960:211 or 960:285) and Calculus I (e.g. 640:135 or 640:151). This course particularly needs basic knowledge of functions, elasticities and economic relationships. It is assumed that students know basic concepts of probability and statistics; however, do not worry if you feel some weakness in those topics. As it was previously mentioned, students will have a review section of statistics and probability concepts.

## 3. LEARNING OUTCOMES

Students who successfully complete Econ 322 should be comfortable with basic statistics and probability. They should be able to use a statistical/econometric computer package to estimate an econometric model and be able to report the results of their work in a nontechnical and literate manner. In particular, a student who successfully completes Econ 322 will be able to estimate and interpret linear regression models and be able to distinguish between economic and statistical importance. They should be able to critique reported regression results in applied academic papers and interpret the results for someone who is not trained as an economist.

## 4. DEPARTMENTAL MAJOR REQUIREMENTS

Students must receive a grade of **C or better** in this course to fulfill requirements for an economics major.

## 5. ATTENDANCE POLICY

Students are expected to attend all classes. If you expect to miss more than two classes, please use the University Absence Report Website System <http://sims.rutgers.edu/ssra/> to indicate date and reason of your absence. This system will send a report to the instructor.

## 6. TEXTBOOK

The text for this course is

James H., Stock and Mark W., Watson; *Introduction to Econometrics* 3rd edition. Addison and Wesley 2011  
ISBN-10: 0-13-800900-7; ISBN-13: 978-0-13-800900-7.

The instructor recommends students to buy this book, specially if you are interested in an economics major. In addition, the text has an excellent package of data and examples in [http://wps.aw.com/aw\\_stock\\_ie\\_3/](http://wps.aw.com/aw_stock_ie_3/). The instructor will be primarily using his own lecture notes (*posted on sakai as instructor moves along*) those are based on Stock and Watson's book. The lectures will cover additional examples, discussions and empirical analysis. It is valid to follow other guides or notes available on internet, but you must be assured about the reliability of that information; do not hesitate to ask the instructor about what you may find in another sources.

Again, the instructor strongly suggests to review and read the topics before the class starts. Thus, you will be able to have time for reviewing topics you are not familiar with.

## 7. COURSE OUTLINE

### Part 1. Introduction and review

- a. Introduction: Economics and Metrics.
- b. Review of probability concepts.
- c. Review of statistical concepts.
- d. Workout problems.

### Part 2. Regression Analysis: Estimation and Inference

- a. Maximum likelihood and a particular case: Ordinary Least Squares (OLS).
- b. The least squares assumptions, Gauss Markov Theorem and BLUE feature.
- c. Linear regression with one regressor (and constant).
- d. Basic Asymptotics Theory.
- e. Inference I: Hypothesis tests and confidence intervals based on one restriction.
- f. Linear regression with multiple regressors (and constant).
- g. Inference II: Hypothesis tests and confidence intervals based on multiple restrictions.
- h. Measures of fits in regressions:  $R^2$  and adjusted- $R^2$ .
- i. (Intrinsic) data problems; multicollinearity.

### Part 3. Non-Spherical Disturbances

- a. Heteroskedasticity: detection and consequences for the OLS estimator.
- b. Autocorrelation: detection and consequences for the OLS estimator.
- c. Robust variance-and-covariance standard errors: White's and Newey-West's contributions.

### Part 4. Bias, efficiency, sample selection and simultaneity

- a. Omitted variable bias and consistency.
- b. Redundant variables and efficiency.
- c. Measurement error.
- d. Sample selection.

- e. Simultaneity.

## Part 5. Functional Form

- a. Non-linearities (in variables).
- b. Specifications.
  - Polynomials.
  - Logarithms.
  - Regressions with dummies and interactions.
- c. Inference and interpretation of coefficients.

## Part 6. Additional topics (if time permits)

- a. Time series and forecasting.
  - AR models.
  - VAR models.
- b. Binary response.
  - Logit and Probit.
  - Interpretation of coefficients.
  - Measures of Fits: Mcfadden's  $R^2$  and  $R^2$  adjusted by mode.
- c. Panel Data.
  - Fixed effects.
  - Random effects.

The student can track the topics on (specific) dates along the course [here](#).

## 8. SOFTWARE

The software that will be used in this course is STATA 11 or 12. This software is a very good starting point for research and it is well supported by a worldwide community of experts, users and developers. Importantly, this software offers you an efficient way of organizing your data, dealing with estimations, setting up optimization procedures, handling matrices, saving your work and writing your programs. You can buy a 6 months license STATA version (small STATA 12); See <http://www.stata.com/order/new/edu/gradplan.html>. Also, STATA is now available as a site license in every lab and on Rutgers Apps (more information [here](#)).

In the book's website, there is important material about how to deal with STATA. It is strongly suggested to check them. Also, during the second week of classes, students will have a STATA session; thus, the instructor will give you the first steps for using this package. After that session, and at the beginning of each lecture, the instructor will give a quick session (5 minutes) about the usage of useful STATA commands and valuable tips you need to have in mind. Those sessions are going to help you (a lot) with your computer homework.

## 9. METHOD OF EVALUATION

The grading of this course is based on the performance of homeworks and exams. The final grade is constructed by using weights on each evaluation in the course. They are as follows

<i>Category</i>	<i>Weights</i>
Homeworks (2)	25%
Exams (2)	50%
<b>Final exam</b>	25%

All the exams will cover only the material since the last evaluation in the course; the final exam is not cumulative (i.e. it will cover remain topics of the course). If you do not attend exams, you will receive a zero for that grade.

## 10. MAKE-UP POLICY

There are no make-ups for missed exams due to absence or tardiness. A make-up is only allowed under unpredictable and uncontrollable events. The allowance for a make-up needs to be approved by the instructor and each request requires strict verification of documentation (e.g documentation that shows student sought medical attention or medical proof of serious injury). There are no make-ups for homeworks.

## 11. IMPORTANT DAYS IN THIS COURSE

The following table contains the dates and hour of exams; please take in mind all those days

<i>Evaluation</i>	<i>Date</i>	<i>Hour (ET)</i>
Exam 1	Tuesday, July 25th	06:00 pm
Exam 2	Tuesday, August 8th	08:10 pm
<b>Final Exam</b>	<b>Tuesday, August 15th</b>	06:00 pm

The final exam date is scheduled on last day of classes. It is your responsibility to verify the date and time with professor.

It is important you stay on campus before the final period exam is officially over.

## 12. HOMEWORKS

There are two homeworks in this course. The first homework is based on regression-analysis section (estimation and inference). Basically, the instructor requires students to solve a problem set of 10 questions and this homework is individual. The second homework is a computer project using STATA, where you can work in groups of up to 2 people. Each group will turn in one write-up. The instructor recommends student use mathtype for editing mathematical and statistical expressions.

The purpose of the computer project is to use the tools we learn and develop skills in understanding and communicating results from some particular questions in econometrics.

We will talk more about the computer project in class. The purpose of working in groups is twofold. First, by sharing ideas you will be able to learn from each other. Second, to get you accustomed to work with other people, a likely situation in your future jobs. Frequently, a major part of an assignment will be summarized into various components. In order to understand the entire assignment, you should not divide the problems among your group members, but have each person working on each part and discussing what you come up with. Again, the idea of the course is to give you tools, and the instructor expects you to learn as much as you can. Here the schedule of the homeworks.

<i>Homeworks</i>	<i>Open date</i>	<i>Due date and time (ET)</i>
Homework 1	July 13th	July 20nd; 11.59 pm
Homework 2	July 27th	August 3rd; 11.59 pm

All homeworks are submitted electronically on sakai, no hard copies are accepted (*save the trees!*). Also, you can email your homework to the instructor. If you are not able to submit your homework on due date your grade is zero. The instructor does not give extra-credit homeworks or assignments.

### 13. EXAMS

This is the (authorized) material you need for the exams:

- Calculator
- Pencil/pen and eraser.
- Rutgers Identification Card (RU ID)

The instructor will provide statistical tables and further material for examinations in case you need them. The content of the exam will be distributed and read by instructor 3/5 minutes before the exam starts. If you need scratch paper you can ask for additional bluebooks. Also, you need to sign and write your name on a list your instructor is going to provide during the exam; please be sure not to leave the room without signing.

In the instructor's trajectory as professor of econometrics, he has always received questions about how to study or how to be prepared for exams. Specifically for this course, the instructor suggests to work out the exercises in Stock and Watson's book; this material is complementary to his notes/slides and discussion in lectures. As soon as classes start, the instructor will give you a detail of what exercises you need to look through. It is important to say that there are no multiple choice questions on examinations; however, the instructor recommends to review and practice those kind of questions in the website book's material and thus, you can keep working out definitions or concepts; they will absolutely help you in the exams<sup>1</sup>. The exams are comprehensive and will focus on the goals and learning outcomes of this course.

<sup>1</sup>Please check the following link [http://wps.aw.com/aw\\_stock\\_ie\\_3/](http://wps.aw.com/aw_stock_ie_3/)

## 14. DAILY LECTURES

As it was previously said, the material for the daily lectures are instructor's slides. You must read and study the respective chapter of book before the lecture starts (the instructor will provide you of readings based on chapters of Stock and Watson's book). It is your responsibility to keep reading and studying each topic in the book as long as the instructor moves along the course.

## 15. APPEALS

Students can write appeals only for exams. This appeal consists of one electronic sheet with the date of the exam, question and arguments to support why student believe the grade is low (download the format [here](#)). You must send this appeal to the instructor. The appeals are received only 4 (effective) days after the exam is returned to the student but 1 (effective) day for the case of a final exam. Again, no appeals are received for homeworks.

## 16. STUDENT CONDUCT

Academic dishonesty is a serious offense. Any cheating over examinations will mean an F for the student involved and will be reported to authorities of the student's college. There are no warnings. The following actions are recognized as academic misconducts: a) Taking unauthorized materials into exams, b) submitting homeworks that do not belong to the student, the same applies to references and results of computational exercises. c) Improperly prior knowledge of an examination document and/or using it as material for the examination. Please, take a tour on Academic Integrity in the following student-conduct website link: <http://studentconduct.rutgers.edu/academic-integrity>, and instructor suggests to take a 20 minute interactive-tutorial on Plagiarism and Academic Integrity in the following link: <http://www.scc.rutgers.edu/douglass/sal/plagiarism/intro.html>.

## 17. OFFICE HOURS POLICY

Office hours are available for helping students with the topics discussed in class; specifically, office hours are designed to clear up possible missing lines in lectures or just discuss questions, answers in homeworks and work-out problems. Also, you can come by to my office and discuss further econometrics topics you are interested in. You must know that office hours are not a substitute of a lecture class.

Because professor's schedule is tight, the instructor will not be able to spend much time answering questions after class. However, the instructor usually comes to class 5-10 minutes early. Please try to catch the instructor by either come to his office hours, making an appointment or coming early to class.

## 18. OTHER IMPORTANT ISSUES

Inclement weather and/or other emergencies may close college avenue campus or cancel/delay class schedules. Please check the following site

<http://nb.rutgers.edu/about-us/new-brunswick-campus-operating-status>

to find out if a specific Rutgers campus is open and/or operating at a normal schedule. Please be alert to status reports given by the university; any cancellation of lectures are based on these reports.

Please let your instructor know if you have a documented disability, so he can provide any accommodations you may need. Please check the following link for more information: <http://disabilityservices.rutgers.edu/request.html>.