

**26:960:577 Intro. to Stat Linear Models**

Fall 2017

1WP Room 118, Newark campus

M 10:00-12:50

**Prof. Mert Gurbuzbalaban**

1WP Room 1056 or Room 1053A

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Office Hours: Mondays 5pm-6pm

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## COURSE DESCRIPTION

The aim of this course is to provide graduate students greater understanding of the analysis and statistics tools used in data analysis and business research. Our aim is to familiarize graduate students with basic techniques in statistics, so that they can use these techniques in their own research for collecting, analyzing and visualizing data in social sciences and applied sciences. We will cover the theory and concepts behind various models for linear and nonlinear regression and their practical implementation in R.

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## COURSE MATERIALS

- Rachel A. Gordon, *Regression Analysis for the Social Sciences*. New York: Routledge, 2010. ISBN: 0415991544
- John Marden, [Multivariate Statistics Old School](#), 2015. This is an online book freely available.
- Julian J. Faraway, [Practical Regression and ANOVA using R](#), 2002. This is an online book about R, freely available.
- Verzani, [Using R for Introductory Statistics](#) : An online tutorial for R programming.
- Supplementary Material: Michael Kutner, Christopher Nachtsheim, John Neter and William Li, *Applied Linear Statistical Models*, Mc Graw-Hill Irwin, 2005. 5th Edition. ISBN: 007310874X.
- Supplementary Material: Anderson, *Statistics for Business and Economics*, 11<sup>th</sup> Edition, ISBN: 0324783256

Other materials may be posted on Blackboard. Please check Blackboard ([blackboard.rutgers.edu](http://blackboard.rutgers.edu)) and your official Rutgers email account regularly.

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## LEARNING GOALS AND OBJECTIVES

- This course is designed to help students develop skills and knowledge in the following area(s):

- *Developing skills: Ability to interpret, visualize and analyze data collected from various resources using tools of basic statistics.*
- *Developing knowledge base: Students will get more familiar with elementary statistical operations so that they can use these operations in their own research both in social sciences and applied sciences. The students will have a good understanding of both the theory and practice for solving basic inference problems arising in the business world.*

- Students who complete this course will demonstrate the following:

- *Ability to apply statistical methods to quantify, analyze, visualize and interpret business data, ability to apply quantitative methods for solving and modeling some fundamental decision making problems arising in the daily business life.*

- Students develop these skills and knowledge through the following course activities and assignments:

- *Students will complete homework assignments, a midterm and a take-home final exam. Lectures will be interactive with students, allowing them to interact with their peers in collaborative class discussions.*

## **PREQUISITES**

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A good knowledge of basic business mathematics and undergraduate-level statistics for social sciences including the essentials of statistical inference such as hypothesis testing and confidence intervals.

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## **ACADEMIC INTEGRITY**

Students are responsible for understanding the RU Academic Integrity Policy, please see the details of the policy at: [http://academicintegrity.rutgers.edu/files/documents/AI\\_Policy\\_2013.pdf](http://academicintegrity.rutgers.edu/files/documents/AI_Policy_2013.pdf). I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment." I will screen all written assignments through *SafeAssign* or *Turnitin*, plagiarism detection services that compare the work against a large database of past work. Don't let cheating destroy your hard-earned opportunity to learn. See [business.rutgers.edu/ai](http://business.rutgers.edu/ai) for more details.

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## **ATTENDANCE AND PREPARATION POLICY**

- Expect me to attend all class sessions. I expect the same of you. If I am to be absent, my department chair or I will send you notice via email and Blackboard as far in advance as possible. If you are to be absent, report your absence in advance at <https://sims.rutgers.edu/ssra/>. If your absence is due to religious observance, a Rutgers-approved activity, illness, or family emergency/death and you seek makeup work, also send me an email with full details and supporting documentation within 5 days of your first absence.

- For weather emergencies, please consult the campus home page. If the campus is open, class will be held.

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## CLASSROOM CONDUCT

- Please silence your cell phones during the lecture time.
- No side conversations, sleeping, phone conversations and texting during lectures please.

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## EXAM DATES AND POLICIES

There are one final exam for this course:

Final Exam: Tuesday, May 9th, Location. [Comprehensive].

During all the three exams mentioned above, the following rules apply:

- If you have a disability that influences testing procedures, provide me an official letter from the Office of Disability Services at the start of the semester.
- No cell phones or other electronics are allowed in the testing room.
- You must show a valid Rutgers photo ID to enter the room and to turn in the exam.
- Your exam will not be accepted unless you sign the Honor Pledge.
- Make-up exam policy: No make-up exams are given under any circumstances.

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## GRADING POLICY

Course grades are determined as follows:

50% Homeworks  
40% Take-home final exam  
10% Class participation

- There will be around 5-7 homeworks assigned once around every two weeks. Homeworks will include programming exercises as well as conceptual questions.
- Extra credit: Extra credit is available for students with an excellent class participation.
- Grade posting: The grades will be posted on the blackboard.
- Grade grubbing: Your final grade is not subject to negotiation. However, if you feel I have made an error, submit your written argument to me within one week of receiving your final grade. Clarify the precise error I made and provide all due supporting documentation. If I have made an error, I will gladly correct it.

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## COURSE SCHEDULE

<u>Date</u>	<u>Topic</u>
Sep 11	Introduction to R and regression: transforming, entering and graphing data
	Reading: Chapters 2 and 3 (Gordon), lecture notes

Sep 18	Review of basic probability and statistics: measures of central tendency and dispersion, normal distributions, sampling distributions, simulating and graphing distributions in R
	Reading: Chapter 4 (Gordon), lecture notes
Sep 25	Univariate linear least squares regression, tests of independence and difference in means, running t-tests and chi-square tests in R
Oct 2	Confidence intervals and hypothesis tests, testing hypotheses in R
Oct 9	Multi-variate regression, statistical inference for regression, goodness of fit and assumptions behind, leverage scores and practical implementations in R
	Reading: Chapter 6 (Gordon), lecture notes
Oct 16	Dummy predictors and interactions, R techniques for categorical variables; graphing results
	Reading: Chapter 7 (Gordon), lecture notes
Oct 23 <sup>rd</sup>	Diagnostics: checking assumptions behind, outliers, collinearity and heteroskedasticity.
	Reading: Chapter 11 (Gordon), lecture notes
Oct 30 <sup>th</sup>	Logistic regression
	Reading: Class notes
Nov 6 <sup>th</sup>	Review of the class
Nov 13 <sup>th</sup>	The generalized linear models and generalized regression
	Reading: Class notes
Nov 20 <sup>th</sup>	ANOVA and Experimental Design
	Reading: Hand-written notes will be provided.
Nov 27 <sup>th</sup>	Mediation: Full versus partial mediation, Sobel's test, bootstrapping
	Reading: Class notes
Dec 4 <sup>th</sup>	Statistical power and power analysis
	Reading: Class notes
Dec 11 <sup>th</sup>	Review of the class so far
Dec 18 <sup>th</sup>	<b>Take-home final exam</b>

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## SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. <https://ods.rutgers.edu>

If you are a military *veteran* or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. <http://veterans.rutgers.edu/>

If you are in need of *mental health* services, please use our readily available services.

Rutgers University-Newark Counseling Center: <http://counseling.newark.rutgers.edu/>

If you are in need of *physical health* services, please use our readily available services.

Rutgers Health Services – Newark: <http://health.newark.rutgers.edu/>

If you are in need of *legal* services, please use our readily available services: <http://rusls.rutgers.edu/>

If you are in need of additional *academic assistance*, please use our readily available services.

Rutgers University-Newark Learning Center: <http://www.ncas.rutgers.edu/rlc>

Rutgers University-Newark Writing Center: <http://www.ncas.rutgers.edu/writingcenter>

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## **ACADEMIC INTEGRITY**

Academic Integrity Policy for RBS Students: All students are expected to know, understand and live up to the Rutgers Universitys Policy of Academic Integrity explained at:

<http://academicintegrity.rutgers.edu/academic-integrity-at-rutgers>.