

Syllabus

625.661: Statistical Models and Regression

Instructor Contact

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I prefer that students contact me via the email address listed above. Please be sure to include course number in the subject line. I will make every effort to respond to your inquiry within 48 hours. If an issue is urgent, please indicate "urgent" within the subject line of the email and I will respond as soon as is practical.

Office Hours via Zoom

This course will use Zoom to facilitate weekly, synchronous office hours. You are not required to participate in office hours; however, you may find them beneficial for receiving more timely answers to questions related to the course content and assignments. If you will join an office hour, please let me know by sending an email to hhung4@jh.edu at least two hours prior to the office hour. If I do not receive any email for requesting office hour at least two hours prior to the office hour, the office hour is automatically canceled.

During the first week of the course I will conduct a student survey to determine the best day and time of the week to schedule the Office Hours. Once the day and time have been determined, I will set up office hours links within the **Calendar**. Office hours might change during the semester. Students will click that link to access Zoom and participate in the office hours. You are encouraged to post any questions you would like to have answered during the live Office Hour sessions at least 24 hours before Office Hours are held.

For more information regarding Zoom, please see the [Zoom Student Quick Start Guide](#).

Course Description

Introduction to regression and linear models including least squares estimation, maximum likelihood estimation, the Gauss-Markov Theorem, and the Fundamental Theorem of Least Squares. Topics include estimation, hypothesis testing, simultaneous inference, model diagnostics, transformations, multicollinearity, influence, model building, and variable selection. Advanced topics include nonlinear regression, robust regression, and generalized linear models including logistic and Poisson regression.



Prerequisites

One semester of statistics (such as 625.603), multivariate calculus, and linear algebra.

Course Goals

To introduce statistical methods for regression analysis and model building for studying relationship between variables and develop tools for model diagnostics and validation and then apply these methods and tools to real case studies.

Course Objectives

By the end of this course, you will be able to:

- Draw out a plan and process for statistical model building.
- Develop statistical methods for regression model analysis following statistical principle.
- Perform statistical modeling, model diagnostics and validation.
- Identify and apply appropriate analysis methods with statistical modeling to real-world applications.

Course Structure

The course materials are divided into modules which can be accessed by clicking **Course Modules** on the left menu. A module will have several sections including the overview, content, readings, discussions, or assignments. You are encouraged to preview all sections of the module before starting. Most modules run for a period of seven (7) days, exceptions are noted in the **Course Outline**. You should regularly check the **Calendar** and **Announcements** for due dates. In addition, Test #1 will be given in the week between Module 4 and Module 5, Test #2 in the week between Module 6 and Module 7, and Test #3 in the week between Module 10 and Module 11. Please refer to **Course Outline** for when tests are due.

Textbook

Required

Montgomery, D.C., Peck, E. A., Vining, G. G. (2012). *Introduction to linear regression analysis* (5th ed.). Hoboken, NJ: John Wiley & Sons, Inc.

ISBN 978-0-470-54281-1

Textbook information for this course is available online through the appropriate bookstore website: For online courses, search the MBS website at <http://ep.jhu.edu/bookstore>.

Required Software

There is no required software to purchase. You are free to use any mathematical or statistical software, such as MATLAB, R, SAS, MINITAB, web-based statistical software, to help with computations.



Technical Requirements

You should refer to **Help & Support** on the left menu for a general listing of all the course technical requirements.

Student Coursework Requirements

It is expected that each module will take approximately 7–10 hours per week to complete. Here is an approximate breakdown: listening to the audio annotated slide presentations (approximately 1–2 hours for each module), reading the assigned sections of the texts (approximately 2–3 hours for each module), discussion forums (1 hour). If the module includes problem set assignment, it will take approximately 2–4 hours. Test #1 will be given in the week between Module 4 and Module 5, Test #2 in the week between Module 6 and Module 7, and Test #3 in the week between Module 10 and Module 11. Each test will take approximately 5–6 hours.

This course will consist of the following basic student requirements:

Preparation and Participation – Discussion Forum (20% of Final Grade Calculation)

You are responsible for carefully reading all assigned material and being prepared for discussion. The majority of readings are from the course text. Additional reading may be assigned to supplement text readings.

Post your initial response to the discussion questions by the evening of Day 3 for that module week; for example, if Day 1 of the module is Wednesday, Day 3 is Friday of that module week. Posting a response to the discussion question is part one of your grade for module discussions (i.e., Timeliness).

Part two of your grade for module discussion is your interaction (i.e., responding to classmate postings with thoughtful responses) with at least two classmates (i.e., **Critical Thinking**). Just posting your response to a discussion question is not sufficient; I want you to interact with your classmates. Be detailed in your postings and in your responses to your classmates' postings. Feel free to agree or disagree with your classmates. Please ensure that your postings are civil and constructive. Posting response for your interaction in Part two is normally due Day 5 for that module week.

Evaluation of preparation and participation is based on contribution to discussions.

Preparation and participation is evaluated by the following grading elements:

1. Timeliness (50%)
2. Critical Thinking (50%)

Preparation and participation is graded as follows:

- 100–90 = A—Timeliness [regularly participates; all required postings; early in discussion; throughout the discussion]; Critical Thinking [rich in content; full of thoughts, insight, and analysis].



- 89–80 = B—Timeliness [frequently participates; all required postings; some not in time for others to read and respond]; Critical Thinking [substantial information; thought, insight, and analysis has taken place].
- 79–70 = C—Timeliness [infrequently participates; all required postings; most at the last minute without allowing for response time]; Critical Thinking [generally competent; information is thin and commonplace].
- <70 = F—Timeliness [rarely participates; some, or all required postings missing]; Critical Thinking [rudimentary and superficial; no analysis or insight is displayed].

Assignments (30% of Final Grade Calculation)

Assignments will include quantitative problem sets for analytical derivation or statistical analyses. Include a cover sheet with your name and assignment identifier. Also include your name and a page number indicator (i.e., page x of y) on each page of your submissions. Each problem should have the problem statement, assumptions, computations if applicable, and conclusions/discussion delineated. All Figures and Tables should be captioned and labeled appropriately.

You are expected to work on all assignments independently.

All assignments are due according to the dates in the Calendar.

Late submissions will be reduced by one letter grade for each week late (no exceptions without prior coordination with the instructor).

Quantitative assignments are evaluated by the following grading elements:

1. Each part of problem is answered.
2. Assumptions are clearly stated.
3. Intermediate derivations and calculations are provided in detail.
4. Answer is technically correct and is clearly indicated.

Quantitative assignments are graded as follows:

- 100–90 = A—All parts of question are addressed; All assumptions are clearly stated; All intermediate derivations and calculations are provided; Answer is technically correct and is clearly indicated.
- 89–80 = B—All parts of question are addressed; All assumptions are clearly stated; Some intermediate derivations and calculations are provided; Answer is technically correct and is indicated.
- 79–70=C—Most parts of question are addressed; Assumptions are partially stated; Few intermediate derivations and calculations are provided; Answer is not technically correct but is indicated.
- <70=F—Some parts of the question are addressed; Assumptions are not stated; Intermediate derivations and calculations are not provided; The answer is incorrect or missing.

Tests (30% of Final Grade Calculation)

Test #1 will be given in the week between Module 4 and Module 5, Test #2 in the week between Module 6 and Module 7, and Test #3 in the week between Module 10 and Module 11. You will have seven days to complete the tests and they will be due by the time specified on the Calendar. You may use the course text to complete the tests. You are expected to work on all the tests independently.

The tests are evaluated by the following grading elements:



1. Each part of problem is answered.
2. Assumptions are clearly stated.
3. Intermediate derivations and calculations are provided.
4. Answer is technically correct and is clearly indicated.

Tests are graded as follows:

- 100–90 = A—All parts of question are addressed; All assumptions are clearly stated; All intermediate derivations and calculations are provided; Answer is technically correct and is clearly indicated.
- 89–80 = B—All parts of question are addressed; All assumptions are clearly stated; Some intermediate derivations and calculations are provided; Answer is technically correct and is indicated.
- 79–70 = C—Most parts of question are addressed; Assumptions are partially stated; Few intermediate derivations and calculations are provided; Answer is not technically correct but is indicated.
- <70 = F—Some parts of the question are addressed; Assumptions are not stated; Intermediate derivations and calculations are not provided; The answer is incorrect or missing.

Course Project (20% of Final Grade Calculation)

A course project will be assigned in Module 8 and will be due on Sunday right after the end of Module 14 or specified otherwise.

The course project is evaluated by the following grading elements:

1. Student preparation and participation (as described in Course Project Description).
2. Student technical understanding of the course project topic.
3. Student building regression models with rationales and assessing the predictivity of the models.
4. Student making statistical inferences for the study objectives and interpreting analysis results.
5. Student writing a report of the course project.

Course project is graded as follows:

- 100–90 = A—Student Preparation and Participation [work product well prepared]; Student Understanding [rich in content; full of thought, insight, and analysis]; Student Building and Validating Regression Models [with very sound rationales]; Student Making Statistical Inferences [full of insight, technically correct, interpretation correct]; report is well written.
- 89–80 = B—Student Preparation and Participation [work product prepared]; Student Understanding [substantial information; thought, insight, and analysis has taken place]; Student Building and Validating Regression Models [with rationales]; Student Making Statistical Inferences [insight, technically correct, interpretation correct].
- 79–70 = C—Student Preparation and Participation [work product prepared]; Student Understanding [generally competent; information is thin and commonplace]; Student Building and Validating Regression Models [rationales are primitive]; Student Making Statistical Inferences [insight, interpretation is not sound].
- <70 = F—Student Preparation and Participation [work product partially prepared]; Student Understanding [rudimentary and superficial; no analysis or insight displayed]; Student Building and Validating Regression Models [without rationales]; Student Making Statistical Inferences [lack of insight, technically incorrect, interpretation incorrect].



Grading

Assignments are due according to the dates posted in your Blackboard course site. You may check these due dates in the Course Calendar or the Assignments in the corresponding modules.

I generally do not directly grade spelling and grammar. However, egregious violations of the rules of the English language will be noted without comment. Consistently poor performance in either spelling or grammar is taken as an indication of poor written communication ability that may detract from your grade. All hand-written texts, numerical results and mathematical equations must be legible.

A grade of A indicates achievement of consistent excellence and distinction throughout the course—that is, conspicuous excellence in all aspects of assignments and discussion in every week, tests and the course project.

A grade of B indicates work that meets all course requirements on a level appropriate for graduate academic work. These criteria apply to both undergraduates and graduate students taking the course.

100-98 = A+

97-94 = A

93-90 = A–

89-87 = B+

86-83 = B

82-80 = B–

79-77 = C+

76-73 = C

72-70 = C–

69-67 = D+

66-63 = D

<63 = F

Final grades will be determined by the following weighting:

Item	% of Grade
Preparation and Participation – Discussion Forum	20%
Assignments	30%



Item	% of Grade
Tests	30%
Course Project	20%

Help & Support

You should refer to **Help & Support** on the left menu for a listing of all the student services and support available.

Policies and Guidelines

Students are required to work independently on the assignments, tests, and the course project. Students are encouraged to work collaboratively with classmates on discussion forums.

Academic Integrity

Academic Misconduct Policy

All students are required to read, know, and comply with the [Johns Hopkins University Krieger School of Arts and Sciences \(KSAS\) / Whiting School of Engineering \(WSE\) Procedures for Handling Allegations of Misconduct by Full-Time and Part-Time Graduate Students](#).

This policy prohibits academic misconduct, including but not limited to the following: cheating or facilitating cheating; plagiarism; reuse of assignments; unauthorized collaboration; alteration of graded assignments; and unfair competition. You may request a paper copy of this policy at this by contacting jhep@jhu.edu.

Policy on Disability Services

Johns Hopkins University (JHU) is committed to creating a welcoming and inclusive environment for students, faculty, staff and visitors with disabilities. The University does not discriminate on the basis of race, color, sex, religion, sexual orientation, national or ethnic origin, age, disability or veteran status in any student program or activity, or with regard to admission or employment. JHU works to ensure that students, employees and visitors with disabilities have equal access to university programs, facilities, technology and websites.

Under Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990 and the ADA Amendments Act of 2008, a person is considered to have a



disability if c (1) he or she has a physical or mental impairment that substantially limits one or more major life activities (such as hearing, seeing, speaking, breathing, performing manual tasks, walking, caring for oneself, learning, or concentrating); (2) has a record of having such an impairment; or (3) is regarded as having such an impairment class. The University provides reasonable and appropriate accommodations to students and employees with disabilities. In most cases, JHU will require documentation of the disability and the need for the specific requested accommodation.

The Disability Services program within the Office of Institutional Equity oversees the coordination of reasonable accommodations for students and employees with disabilities, and serves as the central point of contact for information on physical and programmatic access at the University. More information on this policy may be found at the [Disabilities Services website](#) or by contacting (410) 516-8075.

Disability Services

Johns Hopkins Engineering for Professionals is committed to providing reasonable and appropriate accommodations to students with disabilities.

Students requiring accommodations are encouraged to contact Disability Services at least four weeks before the start of the academic term or as soon as possible. Although requests can be made at any time, students should understand that there may be a delay of up to two weeks for implementation depending on the nature of the accommodations requested.

Requesting Accommodation

New students must submit a [Disability Services Graduate Registration Form](#)  along with supporting documentation from a qualified diagnostician that:

- Identifies the type of disability
- Describes the current level of functioning in an academic setting
- Lists recommended accommodations

Questions about disability resources and requests for accommodation at Johns Hopkins Engineering for Professionals should be directed to:

EP Disability Services

Phone: 410-516-2306

Fax: 410-579-8049

E-mail: ep-disability-svcs@jhu.edu 

