# Statistics 6214: Applied Linear Models Fall, 2021

## 12:45-3:15 Wednesdays

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| **Instructor:** | **Feifang Hu** |
| **Department Phone:** | **8043100383** |
| **Office Hours:** | **3:30-5:00pm Wed**, Phillips Hall 727 |
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| **Office Hours:** | TBD |

**Course Description:** Data arising from both experimental and observational studies and in a range of applications e.g. biomedical, pharmaceutical, social sciences, business, reliability etc. can be typically analyzed using linear models. Applied Linear Models is an applied course aiming to provide the methodological background and computational tools for data analysis. Course Outline:

- Introduction to linear models: simple linear regression examples, assumptions for linear models, ordinary least squares (OLS) estimators, $R^2$, residuals.
- Inference in linear regression: inference for the slope and the intercept, interpretation of results, prediction, F-tests.
- Regression Diagnostics: outliers, influential points, graphical diagnostics, remedies, weighted least squares.
- Regression in matrix notation, multiple regression: estimation, prediction, diagnostics.
- Analysis of variance.

**Prerequisite(s):** Mathematical Statistics (STAT 6201) or equivalent. Previous experience with statistical computing is a plus but not required.

**Required Text:** The required text for the course: *Linear Models with R* by Julian Faraway. CRC Press. Second Edition. ISBN: 978-1-4398-8733-2

https://www.crcpress.com/Linear-Models-with-R/Faraway/p/book/9781439887332

## Learning Outcomes

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| 1. | Demonstrate basic knowledge of linear and matrix algebra; |
| 2. | Demonstrate basic knowledge of distribution theory; |
| 3. | Apply knowledge of linear and matrix algebra to manipulate linear models; |
| 4. | Perform simple and multiple linear regressions; |

5.      Use R software to conduct data analysis;

6.      Conduct regression analysis;

7.      Conduct analysis of variance.

### Grading:    HW Assignments 30%;   Midterm Exam 30%; Final Exam and/or Project 40%.

- *Midterm Exam*: The exam will be given during class time. The date of the midterm is on the  class schedule.
- *Final Exam*: In accord with university policy, the final exam will be given during the final  exam period and not the last week of the semester. The exam will be cumulative (by nature  of the subject) with more of a focus on material covered after the midterm.
- *Project*: Students will complete a data analysis project using the statistical methods discussed  in class.  Students will locate their own data to analyze and will give a project proposal, present  in-class and submit report.

**Class Attendance**

Class discussions will extend the materials covered in the textbook. Therefore, it is important that you attend the class. You are responsible for any materials covered or any announcements made in class, even if you are not present.

**Amount of Time on Direct and Independent Learning:**  It is expected that students spend 150 minutes in classroom on lecture plus 300 minutes of independent learning per week.

**Homework:** Late homework will not be accepted.

**Computing**

**Statistical Packages:** You will need to use a statistical package in order to perform most of the statistical analyses covered in this course.  R is a freeware that we will use extensively in this course. Please google "download R" to download R 4.0.1 and install it to your computer. Please read the Appendix of the textbook for more information about downloading R.

**University policies:**

**University policy on observance of religious holidays**
In accordance with University policy, students should notify faculty during the first week of the semester of their intention to be absent from class on their day(s) of religious observance. For details and policy, see: students.gwu.edu/accommodations-religious-holidays.

**Academic integrity code**

 Academic dishonesty is defined as cheating of any kind, including misrepresenting one's own

work, taking credit for the work of others without crediting them and without appropriate authorization, and the fabrication of information. For details and complete code, see: studentconduct.gwu.edu/code-academic-integrity

## Safety and security

In the case of an emergency, if at all possible, the class should shelter in place. If the building that the class is in is affected, follow the evacuation procedures for the building. After evacuation, seek shelter at a predetermined rendezvous location.

## Support for students outside the classroom

### Disability Support Services (DSS)

Any student who may need an accommodation based on the potential impact of a disability should contact the Disability Support Services office at 202-994-8250 in the Rome Hall, Suite 102, to establish eligibility and to coordinate reasonable accommodations. For additional information see: disabilitysupport.gwu.edu/

### Mental Health Services 202-994-5300

The University's Mental Health Services offers 24/7 assistance and referral to address students' personal, social, career, and study skills problems. Services for students include: crisis and emergency mental health consultations confidential assessment, counseling services (individual and small group), and referrals. For additional information see: counselingcenter.gwu.edu/

### Please note:

1. Please go to blackboard to find various course components.
2. You need to meet minimum technology requirements for participation in the course.
3. Please visit the following website to get support (e.g., technical requirements and support, student services, obtaining a GWorld card, and state contact information) at online.gwu.edu/student-support

## Copy-Right and Privacy:

*Students are prohibited from recording/distributing any Class Activity without permission from the instructor, except as necessary as part of approved accommodations for students with disabilities. Any approved recordings may only be used for the student's own private use.*