STA 3180: Statistical Modeling
Fall 2025

UF Course Catalog: Overview of modern statistical modeling. Topics include linear regression, binary regression and classification, cross-validation, nonlinear regression and smoothing, tree-based methods, the bootstrap, and causal inference. Approaches will be illustrated in R. **Prerequisite:** STA 3100

Instructor: Beth Johnson   **Email**: ejohnson5@ufl.edu
Office: 116-A Griffin-Floyd Hall   **Telephone**: 352-273-1897

Instructor Office Hours: W 4:00 - 5:30pm and R 11:30am - 1:00pm or by appointment
Graduate Teaching Assistants: Xavier Mak
GTA Office Hours/Location: Monday and Wednesday from 12-1pm in FLO 209

Class Meeting Times and Locations

Day: Tuesday   **Day:** Thursday
Time: Period 2 (8:30-9:20)   **Time:** Periods 2-3 (8:30-10:25)
Place: ROL 0205   **Place:** ROL 0205

Course Description and Objectives

Course Description: This course will introduce students to modern statistical methods essential for understanding large and complex data that arise in fields from biology to astronomy to the social sciences. This course emphasizes the practical application of these methods and their proper use and interpretation. This course is designed for students who are not statistics or data science majors and is the third core course in the data analytics certificate program.

Course Objectives:

Upon completion of this course,

Students will be able to use the statistical program R to:

> Analyze data using methods for linear regression

> Analyze data using methods for binary regression and classification

> Analyze data using methods for nonlinear regression and smoothing

> Analyze data using tree-based methods

Students will be able to explain what is necessary to make proper causal inferences.

Students will build collaborative skills by working with a group to complete a project.

Course Materials

Required Textbook: *An Introduction to Statistical Learning with Applications in R*, second edition, by James, Witten, Hastie, and Tibshirani (Springer, 2013), which can be downloaded at no cost from the website for the book (which is maintained by the authors).

Recommended Textbooks:

Hadley Wickham and Garrett Grolemund , 2017. R for Data Science, O'Reilly, Addison Wesley, download free pdf.

Jared P. Lander, 2017. R for Everyone: Advanced Analytics and Graphics, Second Editions, Addison Wesley Data and Analytics Series

Scientific Calculator (around $10 to $15): You will need a calculator capable of basic arithmetic operations and taking square roots will be needed for in-class exams. Internet-enabled electronic devices, such as cell phones or tablets, cannot be used as calculators during exams.

Web-enabled device: You will need some type of web-enabled device such as a laptop, smartphone, or tablet to use in-class to access Canvas as needed.

Course Resources

The Canvas course website will be used extensively throughout the semester to post notes and make course announcements. You must log on using your gatorlink username and password and access the course webpages from there. Important information about the course will be posted here including this syllabus, announcements, notes, assignments and your grades throughout the semester and computer output to supplement the examples done in class. Please check this site often.

Course Computer Software

Some assignments will require you to use the statistical software package, R, to analyze and visualize data. R is free and used around the world. There are now over 13,000 R packages.

The Comprehensive R Archive Network (CRAN) is the primary place to download R. The Lander and Wickham texts above describe obtaining R and RStudio. The free desktop version of RStudio is fine.

Course Approach

In this third core course of the data analytics certificate, we will focus on developing the following skills: using statistical software to analyze data, interpreting results from a statistical analysis, and stating clear conclusions in context for a lay audience.

These skills will all be assessed through various modes such as homework-lab assignments, a class project, and in-class exams.

Help

Remember to ask for help! You can come by during my scheduled office hours or make an appointment to see me. I can also answer some questions via email. *Emails received during the working week will be answered within 24 hours however emails received over the weekend may not be answered until Monday morning.*

- Always use GatorMail for email. I do not check Canvas inbox regularly.
- Always put STA 3180 in the subject line of your email. I teach multiple courses and use course numbers to search emails from students.

Course Assignments

Your final course grade will be based on a combination of assessment types including computer lab activities, in-class exams, and a final group project. Due dates will be posted on the course schedule on the Canvas course page and announced in class.

Computer Lab activities: Participation is an important component of this course as we learn by doing, so **non-attendance on lab days will result in a 10% penalty on the individual lab score**. There will be a lab activity after most course topics to provide you with experience working with data on a small, guided activity. You will work with an assigned group to complete the assignment, but **everyone is required to submit their own report to be graded.** Groups will be rotated during the semester.

Due dates for the lab activities will be posted on Canvas. There will be a 10% penalty per day for late work and no assignments will be accepted more than one day after the due date. Your lowest lab score will be dropped if you complete all seven assignments.

Exams: There will be three in-class exams which will require students to read and interpret statistical output and answer conceptual questions. If an exam is missed, you must inform me on, or soon after, the date of the exam. Documentation must be provided. No early exams will be given under any circumstances. A grade of zero is the minimum punishment of any type of dishonesty on an exam.

Group Project: Students will work in assigned or self-selected teams of no more than four people to complete a research project based on an assigned topic. Each team will: 1) write a statistical paper, of approximately 5-7 pages, and 2) prepare two 10-minute video presentations of the project. The first video will cover the introduction, research questions and the data collection process while the second video will contain the methods, results and conclusions for your project. Rubrics will be provided.

Each group must obtain approval of their data set and research questions before data analysis begins. Each group must submit a statement of each member's duties in the project, i.e., data cleaner, literature reviewer, etc. Each member of a team will be required to utilize a different statistical technique or type of analysis to analyze the common data set and include their own contribution in the final common report and video. If a student fails to perform their duties as part of the group a point deduction may be applied to that student's individual project grade.

It is very important to review the work of your peers so each student will be assigned to view two other group project videos and to provide constructive comments on each video. Discussion topics will be provided.

Grading Scheme:

			Numeric Score	Letter Grade
Exams (3 @ 16% each)	48%		91-100	A
Computer Labs (best 6* @ 5% each)	30%		88-90	A-
Group Research Project:			85-87	B+
Video Presentations	10%		81-84	B
Written Report (rubric will be provided)	10%		78-80	B-
Research Survey (2 @ 1% each)	2%		75-77	C+
			68-74	C
			65-67	C-
			60-64	D
			0-59	E

*All seven must be completed to drop the lowest computer lab

The instructor reserves the right to adjust the percentages if needed.

Your final overall numeric score is rounded to the nearest integer.

So, for example, if your average is 76.4 your grade will be 76.
If your grade is 76.5, your grade will be 77.

Letter grades will be assigned according to the table shown.
Note: No D+ or D- will be assigned.

<u>Course Policies</u>

"This course complies with all UF academic policies. For information on those polices and for resources for students, please see this link."

(The direct link is https://syllabus.ufl.edu/syllabus-policy/uf-syllabus-policy-links/.)

Grading Policies:

Requirements for class attendance and make-up exams, assignments, and other work in this course as well as policies regarding absences, religious holidays, illness, and student athletes are consistent with UF Attendance Policies, see link above.

There is no "extra credit" or forgiven grades – you are responsible for all your work done (or left undone).

If you have a question concerning a graded assignment, you should notify me within <u>seven days after a graded assignment is posted</u> to schedule a meeting.

Incompletes are only assigned when extraordinary circumstances (such as an accident, or extended hospitalization), arising after the date for dropping the course, prevent the student from completing the course requirements. Having a failing grade in the course is not a valid reason for requesting an Incomplete. Information on Medical Withdrawal can be found at https://umatter.ufl.edu/ . Information on how to Drop a class can be found in UF's Academic

Additional make-up policy requests:

- Every effort should be made to complete the assignment/exam during the assigned period. Only extreme situations will warrant a make-up. Contact the instructor prior to the exam – or as soon as you realize you will be unable to take the exam at the scheduled time. Each case will be reviewed individually. Valid and detailed documentation is a prerequisite for scheduling a make-up under such extenuating circumstances.
- Every effort will be made to make up any missed exam within a week of the assignment deadline. The student is responsible for attending scheduled make-up. Instructor reserves the right to utilize the UF posted final exam day as a make-up date.
- The UF Religious Holidays Policy is available using the link above.
- Please reference the most recent Academic Calendar for official holidays and drop dates, https://catalog.ufl.edu/UGRD/dates-deadlines/pdfs/

If you have a disability that requires academic accommodation, contact the Disability Resource Center (DRC). The DRC will provide documentation to the students who must then provide this documentation to the instructor when requesting information. You must submit this documentation prior to submitting any assignments for which you are requesting accommodation.

Honor Code on Exams: You are required to abide by the University of Florida Student Honor Code. Any violation of the academic integrity expected of you will result in a minimum academic sanction of **a failing grade on the assignment or assessment.** Any alleged violations of the Student Honor Code will result in a referral to Student Conduct and Conflict Resolution. Please review the Student Honor Code and Student Conduct Code at sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

Classroom Behavior: During class students should silence their cellular phones and refrain from eating, drinking, reading newspapers, doing homework, listening to music, excessive talking and all other behaviors that are distracting and disrespectful to the instructor and their fellow students.

Privacy Policy: Student records are confidential. Only information designated "UF directory information" may be released without your written consent. This applies to parents or anyone else who contacts me about your grades.

Faculty Course Evaluations: Student feedback is welcomed by the instructor and beneficial to future students in the course. Students are requested to provide feedback on the quality of instruction in this course by completing a brief confidential evaluation towards the end of the semester at https://evaluations.ufl.edu. Summaries of the evaluation results can be found at https://evaluations.ufl.edu/results.

Other University Services:

U Matter, We Care, https://umatter.ufl.edu/ offers care related resources and programs focused on health, safety, and holistic well-being.

Academic Resources:

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Writing Studio: 2215 Turlington Hall, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: Visit the Student Honor Code and Student Conduct Code webpage for more information.

Week	Day	Date	Topic
1	R	21-Aug	Introduction to Statistical Learning
1	R		Simple Linear Regression with Inference and Residual Plots
1	T	26-Aug	Lab 1: Simple Linear Regression
2	R	28-Aug	Transformations, Outliers, and Influential Points
2	R		Multiple Linear Regression with Assumption Checks
2	T	2-Sep	Lab 2: Multiple Linear Regression
3	R	4-Sep	Model Selection and Survey #1
3	R		Review
3	T	9-Sep	Project Introduction
4	R	11-Sep	Exam 1
4	R		Simple Linear and Multiple Regression
4	T	16-Sep	Survey #2 Logistic Regression
5	R	18-Sep	Logistic Regression/Multiple
5	R		Multiple Logistic Regression
5	T	23-Sep	Lab 3: Logistic Regression/Multiple
6	R	25-Sep	Multiple Logistic Regression
6	R		Discriminant Analysis
6	T	30-Sep	Lab 4: Discriminant Analysis
7	R	2-Oct	Project
7	R		Project
7	T	7-Oct	Review Discriminant Analysis
8	R	9-Oct	Exam 2
8	R		Logistic/Multiple Logistic Regression and Discriminant Analysis
8	T	14-Oct	Cluster Analysis
9	R	16-Oct	Cluster Analysis
9	R		Cluster Analysis
9	T	21-Oct	Lab 5: Cluster Analysis
10	R	23-Oct	Principal Components Analysis (PCA)
10	R		Principal Components Analysis (PCA)
10	T	28-Oct	Lab 6: PCA
11	R	30-Oct	Project
11	R		Project
11	T	4-Nov	Review
12	R	6-Nov	Exam 3
12	R		Cluster Analysis and PCA
12	T	11-Nov	Veteran's Day Holiday
13	R	13-Nov	Polynominal Regression
13	R		Cross-Validation and Bootstrapping
13	T	18-Nov	Lab 7: Polynominal Regression
14	R	20-Nov	Project Presentations
14	R		Project Presentations
14	T	25-Nov	Thanksgiving Break
15	R	27-Nov	Thanksgiving Break
15	R		Thanksgiving Break
15	T	2-Dec	Tree Based Methods

Tenative Schedule Fall 2025