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|  | STA4164.0001: Statistical Methods III *Department of Statistics and Data Science, College of Sciences*  Credit Hours: 3 |

# Course Syllabus

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| Instructor: | Nathaniel Simone | Term: | Spring 2024 |
| Office Location: | Technology Commons II (TC2) 211B | Class Meeting Days: | Tuesday/Thursday |
| Office Hours: | 3:00pm-5:00pm Monday/Wednesday,  3:00pm-4:30pm Tuesday/Thursday,  or by appointment. | Class Meeting Time: | 1:30pm-2:50pm |
| Phone: | Department Phone Number:  (407) 823-2289 | Class Location: | ENG1 327 |
| Email: | [nathaniel.simone@ucf.edu](mailto:nathaniel.simone@ucf.edu) (include STA4164 in subject line) | Course Modality: | Face to Face (P) |
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| GTA: | Roger Delgado | Email: | Roger.delgado@ucf.edu |
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## Weekly Help Hours

4:00pm-5:00pm, Tuesday/Thursday, Technology Common II (TC2) 209G

## Course Description

Undergraduate Catalog Description: A continuation of STA 4163, including further study of regression, analysis of variance and covariance and multiple comparisons.

This course is a continuation of STA4163 and provides expanded ideas on regression analysis and ANOVAs through working with real data and statistical theory. Students will build upon the ideas of regression and learn the process of conducting an analysis involving simple and multiple linear regression, ANOVAs, and ANCOVAs. A final course project will lead students through the entire process of building a multiple linear regression model – data acquisition and cleaning, model building, model selection, model diagnostics, and interpretation of results. Students should be able to use multiple predictors, continuous or categorical, to conduct the analysis.

Students will utilize software (R and/or SAS) to build models using a variety of datasets and data types. While not the primary goal of the course, students will have to learn to use statistical software to conduct analysis. The Department of Statistics and Data Science offers support via the learning lab to help students with issues with any software. Knowing when and how to reach out for help is itself a skill.

## Student Learning Outcomes

By the end of this course, students will be able to demonstrate the following.

Through assignments, exams, and quizzes:

* Build a model using one or multiple predictors, continuous or categorical, to predict a continuous response variable.
* Interpret coefficients or code output in plain language without mathematical or technical terms.
* Establish the validity of a model through model diagnostics in numerical and visual means.
* Determine the best set of predictors to use for prediction through model selection.
* Build a model using multiple predictors, continuous or categorical, to predict a categorical or discrete response variable.

Through a group project and report:

* Follow the process of researching a topic, finding and cleaning data relevant to the chosen topic, selecting a full model, and conducting model selection and diagnostics.
* Communicate findings of a statistical model in plain language without jargon.
* Collaborate with other students to effectively plan and execute a full statistical study.

Through a presentation:

* Verbally communicate the findings and interpretations of a statistical research project.

This course relates to the following [Academic Learning Compacts](https://oeas.ucf.edu/about/academiclearningcompacts/) from the department of Statistics and Data Science:

* Students will identify and carry out statistical procedures such as regression analysis and analysis of variance.
* Students will convert raw data into a form which lends itself to statistical investigation.

**STA4164** is designated as a Research-Intensive (RI) course. This designation will be noted on your transcripts. Your active engagement in the research and/or creative scholarship process will be the core of your learning experience in this course. A significant portion of your grade for **STA4164** will be derived from both your active participation in the research process and the tangible course-related project(s) that comes out of said project. If you have any questions about this designation, please ask your course instructor.

## Course Materials and Resources

Required Text: Applied Regression Analysis and Other Multivariate Methods, Fifth Edition, by Kleinbaum, Kupper, Nizam and Rosenberg 9781285051086

We will cover chapters 1-14, 16, 22, 24.

A graphing or scientific calculator will be needed for exams.

## Enrollment Requirements

Prerequisites: STA4163

Recommended Prerequisites: Knowledge of a programming language. This course will involve programming. The programming languages used (R or SAS) will be taught in class, but if you have never programmed before, you may need to spend additional time learning some basics of programming.

## Course Expectations

Participation/Attendance

* Attendance and participation are expected from every student.
* Each class will contain in-class examples which the student is expected to follow along. Certain practice problems will also be solved, and students are expected to solve the practice problems and potentially share their solution with others or to the class.
* While in class, students should be respectful and turn their cell phones off and pay attention to the lecture. Students may be asked to leave if they are being disruptive to the rest of the class.

Other Expectations

* Students should have access to Webcourses and check the site regularly for updates and announcements.
* Standard practice is 2 hours of studying per 1 in class, so for a 3-credit hours class, 6 hours of studying per week is expected. If you are not familiar with programming, this class may take additional time above that 6 hours of studying per week to get familiar with the languages used, as well as the course content.

### Important Dates

* Add/Drop/Swap Deadline – January 12th
* Martin Luther King Jr. Day (No classes) – January 15th
* Spring Break (No classes) – March 18th – March 23rd
* Withdrawal Deadline – March 29th
* Study Day (No classes) – April 23rd

### Exam Dates (Tentatively)

* Exam #1 – February 20th
* Exam #2 – April 2nd

### Pacing Schedule

A more detailed pacing schedule with tentative classes will be posted as an Excel document in Webcourses. Here is when each chapter/topic will be gone over, in general.

* Week 1: Review + Simple Linear Regression
* Week 2: Simple Linear Regression + Introduction to R
* Week 3: Correlation and ANOVA Tables
* Week 4: Multiple Linear Regression Introduction
* Week 5: Multiple Linear Regression Hypothesis Testing
* Week 6: Correlation in Multiple Linear Regression
* Week 7: Exam #1 + Confounding/Interaction
* Week 8: Dummy Variables
* Week 9: ANCOVAs and Regression Diagnostics
* Week 10: Regression Diagnostics and Model Selection
* Week 11: Spring Break
* Week 12: Model Selection
* Week 13: Exam #2 + Logistic Regression Introduction
* Week 14: Poisson Regression + Dedicated Group Work Time
* Week 15: Presentations

### Communication

While I usually respond faster, please allow a minimum of 2 business days (Monday-Friday, 9am-5pm) for a response via email. Communication outside that timeframe is likely, though not guaranteed.

If you have a question solely about the content of the course (such as not understanding a concept), please address them to the GTA.

### Assignment Submission

* Homework assignments should be submitted online via Webcourses. The document submitted should be a word document or a pdf file. **Only 1 file should be submitted for the homework** (if you scan your homework, please ensure that it is a single pdf file and not a file for each sheet of paper). Failure to submit a single document may result in a late penalty to condense the files into one single file, or a 0%.
* Exams and quizzes will be on paper in class.

### Final Exam

According to UCF policy, all courses should have a final examination or assessment and should meet during their designated final exam period. The “final exam” for this course will be submitting the final reports in person.

Time/Date: Tuesday, April 30th, 1:00pm – 3:50pm

## Assessment and Grading Procedures

### Grading Methods

The following grading scheme will be used to convert the overall course percentage to a letter grade. Final grades are rounded to two decimal places that compared to the scheme below.

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| A | A- | B+ | B | B- | C+ | C | D | F |
| ≥90% | ≥88%-90% | ≥86%-88% | ≥80%-86% | ≥78%-80% | ≥76%-78% | ≥70%-76% | ≥60%-70% | <60% |

The overall grade will be made up of the following:

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| **Category** | **Description** | **Weight** |
| Homework/ Assignments | There will be 3 homework assignments throughout the course. The 1st two assignments will be worth 100 points (6% each), and the third assignment will be worth 50 points (3%). Once announced, students will have at least 1-2 weeks to complete said assignment. All assignments are posted on Webcourses.  The homework assignments cover multiple topics, so students should work on the homework as the topics are covered in class. Procrastinating is not recommended for these assignments. | 15% |
| Exam #1 | Chapters 1-10 | 15% |
| Exam #2 | Chapters 11-14, 16 | 15% |
| In-Class Quizzes | * Tentatively, 6 will be given, with 2 quizzes dropped. * Quizzes may be announced or unannounced. * Open note, graded for effort and accuracy. | 10% |
| Project A (Simple Linear Regression) | * Students may choose to work alone or with one other student. * Projects will consist of a report answering a set of questions on a chosen dataset. A simple linear regression model will be used to predict a certain response. * All analysis will be done in R. Other software may be used (such as SAS, SPSS, Python, etc.), but this will not be demonstrated in class. | 10% |
| Project B | The final project uses the cumulative topics of the course. Students will select a topic from the course (typically multiple linear regression, but other topics may include ANCOVA, Logistic Regression, or Poisson Regression).  Groups will be selected by the students. Students will be randomly assigned groups if they do not select a group. Group sizes should be 2-4 people.  Once students identify a data source, they will determine the problem of interest, as well as some preliminary findings (graphs, basic statistics, etc). A short report will be given to present these findings and ensure that the group is heading in the right direction for their chosen data set.  Students will then perform the full analysis on their dataset and present their findings. Feedback will be given to each group after a presentation to improve their analysis.  Students will use feedback to write a final report.  Project B Checkpoint (10%)   * Each group will submit a short report on their chosen data set and their planned analysis. Feedback will be provided to guide each group to ensure they are on the right track for their chosen analysis. More details and guidelines will be provided later in the semester.   Project B Presentations (5%)   * Each group will present their chosen problem during the final examination period. More details and guidelines will be provided later in the semester. * Students must present the final project. *The highest grade a student can achieve is a C* ***in the course*** *if the student misses the project presentation without a documented excuse.*   Project B Report (20%)   * Each group will submit a research paper (5-10+ pages) about their chosen data set and their analysis. More details and guidelines will be provided later in the semester. * In the final report, the percentage effort from each person will be listed to ensure that every group member equally contributed to the project. | 35% |

Additional Details:

* Homework
  + Collaboration is allowed and encouraged. However, you are expected to turn in your own work.
  + You may use the internet to access resources for finding information about a topic, but you may not use internet resources to find solutions to specific problems (i.e. Chegg, Quizlet, etc.).
  + For each problem, all work must be shown. If the problem involves coding or output, please show the relevant code and relevant output to the problem.
  + Only submit 1 file (pdf or Word document) – failure to do so may result in late penalties or a 0 for the grade.
  + Homework may be submitted late at a penalty of 10% per day, up to 50% (5 days). After 2 weeks, the assignment will close and cannot be submitted late, unless by instructor permission.
  + Due dates will not be extended unless there are exceptional circumstances.
  + Graded for accuracy and effort.
* Exams
  + Graded 100% for accuracy.
  + One single sheet of paper (standard sized printer paper, 8.5” x 11” or smaller), front and back, handwritten only, may be brought to each exam. No access to the internet, the textbook, or other notes are allowed. No collaboration with others is permitted.
  + If statistical tables are needed, the instructor will provide them.
  + In general, please arrive at least 5 minutes early so that everyone can receive the full time allotted for the exam.
  + Cell phones should be turned off and out of sight (in a backpack, purse, bag, etc.). This does not include pockets on your person. Nothing should be on the desk other than the exam, note sheet, writing utensil, and a calculator.
  + A scientific or graphing calculator will be needed for each exam.
* Project A
  + Graded for accuracy of answers to the projects regarding the project.
  + Project A will be submitted via webcourses.
  + A 10% penalty will be applied for each day submitted late, up to 50% (5 days). After 2 weeks, the project will be closed and cannot be submitted late, unless by instructor permission.
  + If submitted by a duo, both students must upload their answers. Students should indicate who did which part of the project to ensure that equal effort was taken into account.
* Project B
  + Graded for accuracy of chosen methods.
  + The checkpoint will be submitted via webcourses.
  + The presentation will be live in class. Students must be present on both days, or else they will lose half credit on their presentation if there is no excused absence.
  + A physical copy of the final report must be turned in during the final examination period. All group members must be present. This is so the instructor can physically write on the reports and address any issues the group may have encountered.
  + A digital copy, as well as the R code, should be uploaded to webcourses.
  + If a physical copy is not turned in, the digital copy will be graded at a 20% penalty. This must be turned in by end of day (11:59 pm) the day of the final examination.
  + Late submissions will not be accepted.

Academic Integrity/Breaking of Rules

* Homework
  + If you are caught breaking any of the rules above, some potential consequences (depending on the severity of the situation) could be:
    - Receiving a 0 for the homework assignment.
    - Receiving a 0 for the homework grade weight.
    - Receiving an F in the course.
    - Being reported to the Office of Student Conduct and Academic Integrity.
* Exams
  + If you are caught breaking any of the rules above, some potential consequences (depending on the severity of the situation) could be:
    - Receiving a 0 for the exam.
    - Receiving a 0 for the exam grade weights.
    - Receiving an F in the course.
    - Getting reported to the Office of Student Conduct and Academic Integrity.
* Projects
  + If you are caught breaking any of the rules above, some potential consequences (depending on the severity of the situation) could be:
    - 0 for the specific part of the project
    - 0 for the multiple parts of the project (checkpoint, report, and/presentation).
    - Receiving an F in the course.
    - Getting reported to the Office of Student Conduct and Academic Integrity.

### Missing an Assignment

Unless the student and instructor previously worked something out, only documented excuses may be used for an extension on a homework assignment. An extension must be requested 24 hours prior to the deadline. The following is a non-exhaustive list of what constitutes a documented excuse:

* University-Sponsored Events
* Religious Observations (see below)
* Illness (doctor’s note must be provided)
* Serious family emergencies (death or extreme illness of an immediate family member).
* Jury Duty

If a homework assignment is missed for an unexcused reason, a penalty of 10% will be applied per day, up to five days. After two weeks, the homework assignment will be closed, and the student may earn no credit for that assignment.

### Missing an Exam

If you are expected to miss an exam, please let me know as soon as possible. You must notify me at least 24 hours in advance unless the emergency happens within 24 hours of class.

* A documented excuse allows the student to make-up a quiz/exam, provided the documentation is provided in a timely manner.
* It is up to the discretion of the instructor whether an unexcused absence can be used to make up a quiz or exam.

The following constitutes an excused absence:

* Illness
* Family Emergency (death of an immediate family member)
* Personal Emergency (such as a car accident)
* Religious Observance (see below)
* Military Obligations
* University Activities (see below)
* Severe Weather Conditions

If a student has an excused absence or an accepted unexcused absence, the exam may be made-up.

### AI Tools

* This class will make use of Artificial Intelligence (AI) in various ways. You are permitted to use AI only in the manner and means described in the assignments. Any attempt to represent AI output inappropriately as your own work will be treated as plagiarism.
* AI should be used as a tool to assist you in learning – not doing the work for you. If you decide to use AI for any part of any assignment or the project, please *cite which parts you received assistance from AI, and how you used it (i.e., list the prompt and output).* Interpretations, calculations, and code should all be your own with no AI assistance, but using AI for things such as debugging or looking up concepts will be allowed.

### Extra Credit

* Extra credit may be available on certain exams. If bonus questions are available, a student may get more than a 100% on an exam, meaning that a student may achieve higher than a 100% in the course overall.
* Other extra credit opportunities may be presented but are expected to be extremely limited.

### Regrades

* Any regrades or grade complaints must be made within 48 hours of receiving the feedback to the instructor (not the GTA). Quiz and exam feedback will be handed out in-class. Homework feedback will be posted online. If this request is not made within 48 hours, then that grade will be treated as final and cannot be changed.

### Grade Dissemination

To comply with the Family Educational Rights and Privacy Act (FERPA), grades must not be released to third parties, which includes posting grades by name, SSN, or UCFID. This section can indicate how you will return graded assignments to the individual student. To ensure students have prompt feedback, and knowledge of their progress, faculty members must record all grades in Webcourses@UCF and follow student data classification and security standards.

## Policy Statements

This section should include the required core policy statements and any policies that relate to your course. The standardized core policies are included below. Common additional policy statements are available on the [Faculty Center website](https://fctl.ucf.edu/teaching-resources/course-design/syllabus-statements/) for verbatim use or modification.

**Academic Integrity**

Students should familiarize themselves with UCF’s Rules of Conduct at <https://scai.sdes.ucf.edu/student-rules-of-conduct/>. According to Section 1, “Academic Misconduct,” students are prohibited from engaging in

1. Unauthorized assistance: Using or attempting to use unauthorized materials, information or study aids in any academic exercise unless specifically authorized by the instructor of record. The unauthorized possession of examination or course-related material also constitutes cheating.
2. Communication to another through written, visual, electronic, or oral means: The presentation of material which has not been studied or learned, but rather was obtained through someone else’s efforts and used as part of an examination, course assignment, or project.
3. Commercial Use of Academic Material: Selling of course material to another person, student, and/or uploading course material to a third-party vendor without authorization or without the express written permission of the university and the instructor. Course materials include but are not limited to class notes, Instructor’s PowerPoints, course syllabi, tests, quizzes, labs, instruction sheets, homework, study guides, handouts, etc.
4. Falsifying or misrepresenting the student’s own academic work.
5. Plagiarism: Using or appropriating another’s work without any indication of the source, thereby attempting to convey the impression that such work is the student’s own.
6. Multiple Submissions: Submitting the same academic work for credit more than once without the express written permission of the instructor.
7. Helping another violate academic behavior standards.
8. Soliciting assistance with academic coursework and/or degree requirements.

**Responses to Academic Dishonesty, Plagiarism, or Cheating**

Students should also familiarize themselves with the procedures for academic misconduct in UCF’s student handbook, The Golden Rule <https://goldenrule.sdes.ucf.edu/>. UCF faculty members have a responsibility for students’ education and the value of a UCF degree, and so seek to prevent unethical behavior and respond to academic misconduct when necessary. Penalties for violating rules, policies, and instructions within this course can range from a zero on the exercise to an “F” letter grade in the course. In addition, an Academic Misconduct report could be filed with the Office of Student Conduct, which could lead to disciplinary warning, disciplinary probation, or deferred suspension or separation from the University through suspension, dismissal, or expulsion with the addition of a “Z” designation on one’s transcript.

Being found in violation of academic conduct standards could result in a student having to disclose such behavior on a graduate school application, being removed from a leadership position within a student organization, the recipient of scholarships, participation in University activities such as study abroad, internships, etc.

Let’s avoid all of this by demonstrating values of honesty, trust, and integrity. No grade is worth compromising your integrity and moving your moral compass. Stay true to doing the right thing: take the zero, not a shortcut.

**Course Accessibility Statement**

The University of Central Florida is committed to providing access and inclusion for all persons with disabilities. Students with disabilities who need access to course content due to course design limitations should contact the professor as soon as possible. Students should also connect with Student Accessibility Services (SAS) <http://sas.sdes.ucf.edu/> (Ferrell Commons 185, sas@ucf.edu, phone 407-823-2371). For students connected with SAS, a Course Accessibility Letter may be created and sent to professors, which informs faculty of potential course access and accommodations that might be necessary and reasonable. Determining reasonable access and accommodations requires consideration of the course design, course learning objectives and the individual academic and course barriers experienced by the student. Further conversation with SAS, faculty and the student may be warranted to ensure an accessible course experience.

**Campus Safety Statement**

Emergencies on campus are rare, but if one should arise during class, everyone needs to work together. Students should be aware of their surroundings and familiar with some basic safety and security concepts.

* In case of an emergency, dial 911 for assistance.
* Every UCF classroom contains an emergency procedure guide posted on a wall near the door. Students should make a note of the guide’s physical location and review the online version at <https://centralflorida-prod.modolabs.net/student/safety/index>.
* Students should know the evacuation routes from each of their classrooms and have a plan for finding safety in case of an emergency.
* If there is a medical emergency during class, students may need to access a first-aid kit or AED (Automated External Defibrillator). To learn where those are located, see <https://ehs.ucf.edu/automated-external-defibrillator-aed-locations>.
* To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to [www.getrave.com/login/ucf](http://www.getrave.com/login/ucf) and logging in. On the “My Account” tab, fill out the information, including e-mail address and cell phone number.
* Students with special needs related to emergency situations should speak with their instructors outside of class.
* To learn about how to manage an active-shooter situation on campus or elsewhere, consider viewing this video (<https://youtu.be/NIKYajEx4pk>).

**Campus Safety Statement for Students in Online-Only Courses (In case we need to pivot to online)**

Though most emergency situations are primarily relevant to courses that meet in person, such incidents can also impact online students, either when they are on or near campus to participate in other courses or activities or when their course work is affected by off-campus emergencies. The following policies apply to courses in online modalities.

* To stay informed about emergency situations, students can sign up to receive UCF text alerts by going to [www.getrave.com/login/ucf](http://www.getrave.com/login/ucf) and logging in. On the “My Account” tab, fill out the information, including e-mail address and cell phone number.
* Students with special needs related to emergency situations should speak with their instructors outside of class.

**Deployed Active Duty Military Students**

Students who are deployed active duty military and/or National Guard personnel and require accommodation should contact their instructors as soon as possible after the semester begins and/or after they receive notification of deployment to make related arrangements.

**Make-up Assignments for authorized university events or co-curricular activities**

Students who represent the university in an authorized event or activity (for example, student-athletes) and who are unable to meet a course deadline due to a conflict with that event must provide the instructor with documentation in advance to arrange a make-up. No penalty will be applied. For more information, see the UCF policy at <https://policies.ucf.edu/documents/4-401.pdf>

**Religious Observances**

Students must notify their instructor in advance if they intend to miss class for a religious observance. For more information, see the UCF policy at <http://regulations.ucf.edu/chapter5/documents/5.020ReligiousObservancesFINALJan19.pdf>.

**Title IX policy**

Title IX prohibits sex discrimination, including sexual misconduct, sexual violence, sexual harassment, and retaliation. If you or someone you know has been harassed or assaulted, you can find resources available to support the victim, including confidential resources and information concerning reporting options at <https://letsbeclear.ucf.edu> and <http://cares.sdes.ucf.edu/>.

**This syllabus is subject to change and all changes will be announced in class or through Webcourses.**