



STA 3032 (Class number )

Spring 2019

Engineering Statistics

**Instructor:** Demetris Athienitis

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**Teaching Assistants:**

**Course Website:** [e-Learning](#)

**Course Notes:** Available [online](#). Notes do deviate from textbook and you are responsible for material as taught in the notes.

**Course Communication:** Via e-learning.

- Discussion forum in e-Learning.
- Office hours (posted under “Pages” in e-Learning).
- E-mail for questions regarding course policies. (Ensure that **STA 3032** is in the subject line. Failure to do so may result in a non-response.)

**Required Text(s):**

1. *Probability & Statistics for Engineers & Scientists*, 9<sup>th</sup> Edition

**Author(s):** Walpole, Myers, Myers, Ye

**ISBN-13:** 978-0-13-411585-6

Pearson All-Access is useful but not necessary. Details in class and on Canvas.

2. The Book of R: A First Course in Programming and Statistics

**Author(s):** Tilman M. Davies

**ISBN-13:** 9781593276515

**Course Description:** A survey of the basic concepts in probability and statistics with engineering applications. Topics include probability, discrete and continuous random variables, confidence interval estimation, hypothesis testing, correlation, regression, and analysis of variance.

**Prerequisite(s):** MAC 2311

**Credit Hours:** 3

**Software:** You will need a computer for the homework assignments and practise. The main software used in class will be R. For more help and resources visit <http://www.stat.ufl.edu/~athienit/software.html>

### Course Goals and Objectives:

1. Access, manipulate and analyse data using statistical software.
2. Produce appropriate graphs and descriptive statistics for one and two variables, for both categorical and continuous data.
3. Interpret graphs and descriptive statistics for one and two variables.
4. Know and apply the basic probability rules, the concepts of expected value and variance for discrete and continuous variables.
5. Know and apply the Central Limit Theorem, which is crucial for inference.
6. Understand confidence intervals and hypothesis tests.
7. Carry out and interpret one-sample and two-sample analyses for means and proportions.
8. Carry out and interpret statistical modeling using multiple regression and analysis of variance.
9. Know and apply basic quality control procedures.

## Course Policies

The instructor reserves the right to update any parts of this syllabus as necessary. Students will promptly be notified of any changes.

## Demeanor

All members of the class are expected to follow rules of common courtesy in all classroom discussions, email messages, threaded discussion and chats. Please refer to [expected class netiquette](#) online and during class.

## Electronic devices

During class time, only laptops and tablets are allowed. Cell phones, smartphones, and phablets are not permissible unless otherwise specified by the instructor. A student found using said device or permissible device used for non-classroom related activities during class time will be asked to leave the classroom which may result in missing any remaining assignments administered during class time.

## Assignments

- Students are expected to work independently, unless otherwise specified in writing. **Offering** and **accepting** solutions from others is an act of **plagiarism**, which is a serious offense and **all involved parties will be penalized according to the UF Honor Code** receiving a 0 on the assignment and an incident report filed. Discussion amongst students is encouraged, but when in doubt, direct your questions to the instructor.

- **No late assignments will be accepted under any circumstances.**
- Students are expected to show and explain how the answers were obtained.
- All electronically **submitted work must be in pdf format** or a standard file format such as doc, jpeg, etc.

### Homework/Quizzes

- There will be homework assigned on a regular basis as *suggested homework* (not to be turned in) containing data analysis problems and/or book exercises. A (one attempt) *timed quiz* assignment based on the topics covered in class (and loosely based on the suggested homework) will be administered the day of the suggested homework deadline. It is highly encouraged to use a **reliable device** with a **reliable wired ethernet internet connection** and to use a browser such as **Chrome** (Safari may not render some images). (As soon as work is submitted a grade of 0 will show up as a placeholder until the assignment is graded.) For the best preparation students are encouraged to complete the full suggested homework set by the deadline posted on the suggested homework. Solutions to suggested homework will not be posted, but solutions to the quizzes will be.
- A programming homework assignment is posted and is based on questions from the “The Book of R” textbook. This homework is to be submitted in its entirety on the posted deadlines.

### Exams

There will be three (3) **in-class** exams that may comprise of multiple choice questions ( $\approx 90\%$ ) and some open-ended questions ( $\approx 10\%$ ). Exams will emphasise more on conceptual questions while HW/Quizzes will be more computational (not always).

Allowed material:

- Formula sheet will be provided (and can be previewed under “Practice sets”)
- Scientific/Graphing Calculator.

### Important dates:

Exam #1 ..... July 15th at 11:00  
 Exam #2 ..... July 26th at 11:00  
 Exam #3 ..... August 9th at 11:00

## Grading

### Grade distribution:

|                  |   |
|------------------|---|
| Exams 1, 2 and 3 | 65% (10% lowest, 25% second best, 30% best)         |
| Homework/Quizzes | 25% (lowest 2 scores are dropped out of the 11)     |
| Programming      | 10% (6 assignments)                                 |
| Extra Credit     | 0-1% (discussion forum and classroom participation) |

### Letter grade assignment:

|    |            |           |            |            |            |
|----|------------|-----------|------------|------------|------------|
|    | A          | 91 to 100 | A-         | 88 to < 91 |            |
| B+ | 84 to < 88 | B         | 80 to < 84 | B-         | 77 to < 80 |
| C+ | 74 to < 77 | C         | 70 to < 74 | C-         | 67 to < 70 |
| D+ | 64 to < 67 | D         | 60 to < 64 | D-         | 55 to < 60 |
| E  | < 55       |           |            |            |            |

To view the result of the letter grades to your GPA please visit the [UF Grade and Grading Policies](#).

**Final grades shown on Canvas are not accurate because they do not account for the conditional weighing of exams and quizzes.**

Final grade **will not be rounded up** and can be calculated with exams as a % (out of 100) and quizzes out of 10 points

$$\begin{aligned} \text{Final} &= 0.10(\text{worst exam}) + 0.25(\text{second best exam}) + 0.30(\text{best exam}) \\ &+ 0.25(100) \left( \frac{\sum \# \text{ total quizzes} - \sum \# \text{ drops lowest}}{10(\# \text{ of quizzes} - \# \text{ of drops})} \right) \\ &+ 0.10(100) \left( \frac{\sum^6 \text{ programming}}{60} \right) \\ &(+\text{Extra}) \end{aligned}$$

## Make-up

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](#)

### Additional make-up policy requirements:

- Every effort should be made to complete the assignment/exam during the open period. Only extreme situations will warrant a makeup. Contact the instructor prior to the exam - as soon as you realize you will be unable to take the assignment/exam at the scheduled time. Each case will be reviewed individually. Valid and detailed documentation is a prerequisite for scheduling a makeup under such extenuating circumstances.
- If you have an emergency on the day of the assignment/exam, the instructor must be contacted by midnight of the day of the assignment/exam.
- Make-ups need to be scheduled within a week from the assignment deadline. Student is responsible for scheduling.
- Additional Note: Being on vacation or booking a trip prior to the completion of the semester is not a valid reason to request a makeup. Please reference the most recent [Academic Calendar](#)

## Addressing Issues

### Technical difficulties

Please contact the UF Help desk via e-Learning “Help” tab or [UF IT Service Portal](#). Any requests for make-ups due to technical issues must be accompanied with appropriate documentation/proof including screenshots and communication with the help desk. You MUST contact your instructor within 24 hours of the technical difficulty if you wish to request a make-up.

### Grievances/Commendations

Should you have any grievances or commendations with your experience in this course you can always address them

- to the instructor at [athienit@ufl.edu](mailto:athienit@ufl.edu), or
- the [Department of Statistics](#).

For issues that are not satisfactorily resolved at the department level or which seem to be broader than one department, students are referred to [Student Complaints On-Campus](#) or [On-Line Students Complaints](#)

## UF and CLAS Policies

### Dropping, Withdrawing and Incomplete

#### Dropping and Withdraw

For late course drops and course withdrawals please visit <https://catalog.ufl.edu/UGRD/academic-regulations/dropping-courses-withdrawals/>

#### Incomplete

An incomplete grade may be assigned at the discretion of the instructor as an interim grade for a course in which the student has completed a major portion of the course with a passing grade, been unable to complete course requirements before the end of the term because of extenuating circumstances, and obtained agreement from the instructor and arranged for resolution of the incomplete grade in the next term. Instructors are not required to assign incomplete grades. For complete details please visit [CLAS incomplete grade policies and forms](#).

#### Accommodating Students with Disabilities

Students requesting accommodation for disabilities must first register with the [Dean of Students Office](#). The Dean of Students 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.

## Academic Misconduct

Students are held accountable to the [UF Honor Code](#).

## Evaluations

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

## Tentative Course Outline

\* Additional topics included

| Mod.                             | Week | Content  | Notes   | Video | Textbook              | Sug. HW/Quiz/R |
|----------------------------------|------|--|---------|-------|-----------------------|----------------|
| 1                                | 1    | Summary Statistics                                   | 1.2     | 1     | 1.1-1.5               | 1.1/1.1/R1     |
|                                  |      | Graphical Summaries                                  | 1.3     | 2     | 1.6                   |                |
| 2                                | 2    | Sample Space, Events and Probability                 | 2.1-2.2 | 3     | 2.1-2.2, 2.4-2.5      | 2.1/2.1        |
|                                  |      | Counting Methods                                     | 2.3     | 4     | 2.3                   |                |
|                                  |      | Conditional Probabilities and Independence           | 2.4     | 5     | 2.6, 2.7              |                |
|                                  | 3    | Random Variables: Properties (I)                     | 2.5     | 6     | 3.1-3.3               | 2.2/2.2        |
|                                  |      | Random Variables: Properties (II)                    | 2.5     | 7     | 4.1-4.2, 4.4          |                |
|                                  |      | Random Variables: Properties (III)                   | 2.5     | 8     | 3.4, 4.1              |                |
|                                  | 4    | Random Variables: Properties (IV)                    | 2.5     | 9     | 4.2, 4.3              | 2.3/2.3/R2     |
|                                  |      | Random Variables: Binomial, Geometric, N.B., Poisson | 2.5     | 10    | 5.1-5.2, 5.4-5.5      |                |
|                                  |      | Random Variables: Uniform, Normal, Chi-Square, t, F  | 2.5     | 11    | 6.1-6.4, 6.7, 8.6-8.7 |                |
|                                  | 5    | Central Limit Theorem                                | 2.6     | 12    | 8.3-8.4               | 2.3/2.3/R2     |
| Normal Probability/Quantile Plot |      | 2.7  | 13      | 8.8   |                       |                |
| Exam 1                           |      |  |         |       |                       |                |
| 3                                | 6    | Inference for Population Mean (I)                    | 3.1     | 14    | 9.1-9.5               | 3.1/3.1        |
|                                  |      | Inference for Population Mean (II)                   | 3.1     | 15    | 10.1-10.4             |                |
|                                  | 7    | Inference for Population Proportion                  | 3.2     | 16    | 9.10, 10.8            | 3.2/3.2/R3     |
|                                  |      | Inference for Population Variance                    | 3.3     | 17    | 9.12, 10.10           |                |
|                                  |      | Distribution Free Inference (I)                      | 3.4     | 18    | 16.1-16.2             |                |
| 4                                | 8    | Inference for Population Means: Confidence Intervals | 4.1     | 19    | 9.8, 9.11             | 4.1/4.1/R4     |
|                                  |      | Inference for Population Means: Hypothesis Tests     | 4.1     | 20    | 10.5, 10.9            |                |
|                                  |      | Inference for Population Variances                   | 4.2     | 21    | 9.13, 10.10           |                |
|                                  | 9    | Distribution Free Inference (II)                     | 4.3     | 22    | 16.2-16.3             |                |
|                                  |      | Contingency Tables: Test of Independence (Pearson)   | 4.4     | 23    | 10.12                 |                |
| Exam 2                           |      |  |         |       |                       |                |
| 5                                | 10   | Simple Linear Regression (I)                         | 5.1     | 24    | 11.1-11.4, 11.8       | 5.1/5.1        |
|                                  |      | Simple Linear Regression (II)                        | 5.1     | 25    | 11.5-11.6             |                |
|                                  | 11   | Checking Assumptions and Transforming Data           | 5.2     | 26    | 11.10                 | 5.2/5.2/R5     |
|                                  |      | Multiple Regression (I)                              | 5.3     | 27    | 12.1-12.2, 12.4       |                |
|                                  | 12   | Multiple Regression (II)                             | 5.3     | 28    | 12.5-12.6             |                |
|                                  |      | Qualitative Predictors                               | 5.4     | 29    | 12.8-12.9             |                |
| 6                                | 13   | Completely Randomized Design (CRD)                   | 6.1     | 30    | 13.1-13.3             | 6.1/6.1/R6     |
|                                  |      | CRD: Post Hoc comparisons                            | 6.1     | 31    | 13.6                  |                |
|                                  |      | Randomized Block Design (RBD)                        | 6.2     | 32    | 13.7-13.8, 13.11      |                |
| Exam 3                           |      |  |         |       |                       |                |