



STA 4321/5325(Class number 13250/21340)

Summer 2024

Introduction to Probability

MTWRF 09:30-10:45

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

**Course Material:** Teaching will be in-person and in class.

- Slides. (Available in Canvas).
- Statistical software R.

**Required Text(s):** *Mathematical Statistics with Applications*, 7<sup>th</sup> Edition

**Author(s):** D. Wackerly, W. Mendenhall, R.L. Scheaffer; **ISBN-13:** 780495110811

**Course Communication:**

- Discussion forum (link to Microsoft Teams available in course website).
- Live office hours via Zoom (available in course website).
- E-mail for questions regarding course policies. (Ensure that STA **4321** is in the subject line. Failure to do so may result in a non-response.)

**Course Description:** The sequence of courses STA 4321-4322 provides a formal and systematic introduction to mathematical statistics. STA 4321 introduces the background in probability that is necessary to understand the classical statistical theory introduced in STA 4322. Major topics include theory of probability, counting rules, conditional probability, independence, additive and multiplicative laws, Bayes Rule. Discrete and continuous random variables, their distributions, moments and moment generating functions. Multivariate probability distributions, independence, covariance. Distributions of functions of random variables, sampling distributions, central limit theorem.

**Prerequisite(s):** MAC 2313 with minimum grade of C.

**Credit Hours:** 3

## Course Objectives

### Course Goals and Objectives:

1. Calculate probabilities of events using counting rules; calculate conditional probabilities; determine independence of events; apply the Law of Total Probability and Bayes' Rule.
2. Calculate probabilities, moments and moment generating functions for discrete and continuous random variables.
3. Recognize commonly used discrete and continuous random variables.
4. Calculate probabilities and moments for multivariate distributions; obtain marginal and conditional distributions; calculate covariance and correlation and determine independence of random variables; obtain expectations and variances for linear combinations of random variables.
5. Find the distribution of a function of random variables using the methods of distribution functions, transformations, and moment generating functions; perform bivariate transformations using Jacobians; calculate joint distributions and moments of order statistics.

**Student Learning Outcomes:** At the end of this course, students will be expected to have achieved the following learning outcomes:

- Understand foundational concepts of probability theory: Students will demonstrate a thorough understanding of probability theory, including counting rules, conditional probability, independence, additive and multiplicative laws, and apply these concepts to solve problems and calculate probabilities of events.
- Apply Bayes' Rule effectively: Students will use Bayes' Rule to update probabilities based on new information, enhancing their decision-making skills in probabilistic contexts.
- Master properties and calculations for discrete and continuous random variables: Students will calculate and interpret moments and moment generating functions for discrete and continuous random variables, and recognize commonly used distributions.
- Analyze multivariate probability distributions: Students will calculate joint, marginal, and conditional distributions; understand and compute covariance and correlation; determine the independence of random variables; and use these skills to analyze relationships between variables.
- Utilize transformation techniques for random variables: Students will apply distribution functions, transformations, and moment generating functions to find the distribution of a function of random variables, including using Jacobians for bivariate transformations and calculating joint distributions and moments of order statistics.
- Implement the Central Limit Theorem in practical scenarios: Students will apply the Central Limit Theorem to approximate the distributions of sample means and sums, essential for statistical inference in real-world applications.

## Course Policies

The instructor reserves the right to update parts of this syllabus in the event of extenuating circumstances. 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](#).

## Assignments

- All **deadlines (excluding exams) are at 23:59** of the due/end date. These are *hard deadlines* meaning that any open or ongoing assignments will automatically be submitted at the deadline. For example you should not start an assignment at 23:58.
- 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 Student Honor and Conduct Code**. Discussion amongst students is encouraged, but when in doubt, direct your questions to the instructor.
- Students are expected to **show and explain their work**.
- All electronically **submitted work must be as one merged file**. In Canvas, all uploaded files automatically get a grade of 0, until the teaching assistant grades them.
- Feedback will be provided within two business days from the assignment deadline.

### Homework/Quizzes

Under each module in e-Learning,

- **Homework** that are based on (primarily) textbook exercises.
- **Quizzes** that are *timed* and range from conceptual to applied.

All deadlines are posted on e-learning. **Assignments are automatically submitted at deadline even if in progress.**

### Exams

There will be two (2) in-class exams that may comprise of multiple choice questions and/or open-ended questions. Exams will emphasize more on conceptual questions. Allowed material:

- Provided formula sheet. Sheet will be provided ahead of time with practise set.
- Scientific/Graphing Calculator. No cell phones.

**Important dates:** (Subject to change)

Exam #1 .....	May 31, 09:30
Exam #2 .....	June 21, 09:30

## Grading

### Grade distribution:

Exams 1, 2	(25% lowest, 35% best)	
Homework	20%	
Quizzes	20%	(includes Intro quiz, lowest quiz dropped)
Total	100%	
Extra Credit	0-1%	(class and discussion forum participation)

Final grade can be calculated using:

$$\begin{aligned} \text{Final} &= 0.25(\text{lowest exam}) + 0.35(\text{best exam}) \\ &+ 0.20 \left( \frac{\sum \text{HW}}{10(\# \text{ of HW})} \times 100 \right) \\ &+ 0.20 \left( \frac{\sum \text{quizzes} - \text{lowest}}{10(\# \text{ of quizzes} - \# \text{ of drops})} \times 100 \right) \end{aligned}$$

### Letter grade assignment

There will be *no rounding up* of scores.

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

- Final grades are not shown on e-Learning as they do not account for the conditional weighing of exams.
- A minimum grade of C is required for any programs within the Department of Statistics, i.e. majors/minors.
- To view the result of the letter grades to your GPA please visit the [UF Grade and Grading Policies](#).

## 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](#) and [Examination Policies](#).

## Addressing Issues

### Technical difficulties

Please contact the UF Help desk via e-Learning “Help” tab. 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 (anonymously) or to 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 the Office of the Ombuds.

## UF and CLAS Policies

### Dropping, Withdrawing and Incomplete

#### Dropping and Withdraw

For late course drops and course withdrawals check the [catalog](#).

#### 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 policy and contract](#).

#### Accommodating Students with Disabilities

Students requesting accommodation for disabilities must first register with 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.

#### U Matter, We Care

[U Matter, We Care](#), through the Dean of Student’s Office, offers care related resources and programs focused on health, safety, and holistic well-being.

## Academic Misconduct

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

## Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

## Tentative Course Outline

Chapter/Week	Content	Textbook
1	Introduction: What is Statistics?	1.1-1.6
2	Probability	2.1-2.13
3	Discrete Random Variables	3.1-3.9, 3.11-3.12
Exam 1		
4	Continuous Random Variables	4.1-4.10, 4.12
5	Multivariate Probability Distributions	5.1-5.9, 5.11-5.12
6	Functions of Random Variables	6.1-6.5, 6.7
Exam 2		