UNIVERSITY OF GUAM
COLLEGE OF NATURAL & APPLIED SCIENCES

MA551 Introduction to Probability Theory Syllabus

Section Information
Course Delivery Mode: Face-to-Face
WB#1, MW: 4:00-5:20pm

Instructor Information
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Office Location – SC201
Office Hours – MW 2-4pm, F 9-11am
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COURSE CATALOG DESCRIPTION
This course covers probability spaces; combinatorial analysis; independence and conditional probability; discrete and continuous random variables including binomial, Poisson, exponential and normal distributions; expectations; joint, marginal and conditional distribution functions; moment generating functions; law of large numbers; central line theorems. Prerequisites: MA151 or equivalent and grade of C or better in MA302.

COURSE TOPIC/EXAM SCHEDULE
This course introduces students to the useful and interesting ideas of the mathematical theory of probability and to a number of applications. Topics include the basic results and methods of both discrete and continuous probability theory: conditional probability, independent events, random variables, jointly distributed random variables, expectations, variances, covariances. We will cover most of chapters 1-8 from the textbook.
1. Sample spaces, counting and combinatorics, axioms of probability.
2. Conditional probability and Independence, Bayes' Theorem.
3. Discrete random variables. Expected value and variance. Basic discrete distributions (binomial, hypergeometric, Poisson, negative binomial)
4. Continuous random variables. Probability density function. Basic continuous distributions (uniform, normal, exponential, gamma).
5. Joint Distributions of Random Variables. Sums of independent random variables, conditional distributions.
6. Expectation and variance of sums of random variables. Moment generating functions. Conditional expectation and prediction.
7. Limit Theorems. Inequalities, weak law of large numbers, Central Limit Theorem.

TEXTBOOK AND/OR READINGS
Probability and Statistics for Data Science: Math + R + Data (Chapman & Hall/CRC Data Science Series) 1st Edition by Norman Matloff

A First Course in Probability, 8th Edition by Sheldon Ross (optional)

Introduction to Probability for Data Science (probability4datascience.com) (free and nice:)

COURSE LEARNING OUTCOMES

Course SLOs:	Program Learning Outcomes (PLOs)	University Graduate Learning Outcomes (IGLOs)	Method of Assessment
Articulate and apply the basic principles of probability, including the axioms of probability, conditional probability, and Bayes' theorem.	PR-1, PR-2	IGLO-1	Homework Projects
Analyze and apply discrete and continuous probability distributions, such as binomial, Poisson, and normal distributions.	PR-1, PR-2	IGLO-1	Homework Projects
Compute expectations, variances, and interpret these measures in the context of data analysis.	PR-1, PR-2	IGLO-1	Homework Projects
Analyze joint, marginal, and conditional distributions for multiple random variables and assess their independence and relationships using covariance and correlation.	PR-1, PR-2	IGLO-1	Homework Projects
Apply the Central Limit Theorem and the Law of Large Numbers to solve problems in probability and infer conclusions from data.	PR-1, PR-2	IGLO-1	Homework Projects
Use R to simulate random variables, compute probabilities, and visualize distributions, linking mathematical concepts with practical coding skills.	PR-1, PR-2	IGLO-1, IGLO-2	Homework Projects
Apply probability theory to real-world data science problems, using case studies to demonstrate the importance of probabilistic reasoning in data-driven decision-making.	PR-1, PR-2, PR-4, PR-5	IGLO-1, IGLO-2	Homework Projects
Develop critical thinking and problem-solving skills by tackling complex probability problems, both theoretically and computationally.	PR-1, PR-2, PR-4	IGLO-1, IGLO-2	Homework Projects

Discuss and apply ethical considerations in the use of probability theory in data science, recognizing the importance of transparency, accuracy, and responsible data handling.	PR-2, PR-5, PR-6	IGLO-1, IGLO-4, IGLO-5	Homework Projects

MS in Data Science Program Learning Outcomes (PLOs)

PR-1 Design and execute statistical experiments and hypothesis tests to extract meaningful insights from data.
PR-2 Analyze and interpret complex statistical data using advanced statistical methodologies and tools.
PR-3 Visualize data for exploration, analysis, and communication.
PR-4 Develop and implement predictive models and machine learning algorithms to make data-driven decisions.
PR-5 Communicate statistical analyses, findings, and recommendations to both technical and non-technical audiences effectively.
PR-6 Collaborate with interdisciplinary teams to design, implement, and evaluate statistical projects.

Institutional Graduate Learning Outcomes (IGLOs)

IGLO-1: Demonstrate mastery of critical skills, theories, methodologies, and other content knowledge at a level that will enable them to address fundamental questions in their primary area of study;
IGLO-2: Plan, conduct, and complete significant research or creative project;
IGLO-3: Exercise oral and written communication skills sufficient to publish and present work in their field;
IGLO-4: Adhere to the ethical principles of academia and their respective disciplines in coursework, fieldwork, and other appropriate situations; and
IGLO-5: Exemplify, through service, the value of their discipline to the academy and the community at large, interacting productively and professionally with people from diverse backgrounds.

GRADING INFORMATION
Course Grade Scale (Letter to Percent Range)

A+	98-100%
A	93-97%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	70-76%
D	60-69%
F	<60%

UW: Unofficial withdrawal assigned by Registrar—Student stopped attending classes and did not submit/file required documents.
W: Withdrawal assigned by Registrar—Student stopped attending classes and submits/files required documents.

GRADE CATEGORIES: ASSIGNMENTS AND PERCENTAGES

Assessments/Assignments and Grade Percentage

1. Homework/Mini Projects - 60%
2. Midterm- 20%
3. Final Exam - 20 %

EEO and ADA Statement

Americans with Disabilities Act Amendments Act (ADAAA) Accommodation Services

The University is committed to providing an inclusive and welcoming environment for all members of our community free of all forms of discrimination and harassment in all programs, activities, and employment practices as required by Title VII and Title IX and other applicable statutes and policies. If you experience harassment or discrimination, report it immediately to the Director of EEO/ADA & TITLE IX Office, at 671-735-2244, 671-735-2971, 671-735-2244 (TTY) or eeo-ada@triton.uog.edu. For immediate assistance in an emergency call 911.

For individuals covered under the ADA (Americans with Disabilities Act), if you are a student with a disability requiring academic accommodation(s), please contact the Student Counseling and Advising Service Accommodations Office to discuss your confidential request. Please provide an accommodation letter from the Disability Support Services Student Counseling and Advising Service Accommodation counselor. To register for academic accommodations, please contact or visit the School of Education, Room #110, disabilitysupport@triton.uog.edu , or telephone/(TTY) 671-735-2460.

For applicants or employees with a disability requiring employment or workplace accommodation(s), please contact the Director of EEO/ADA & TITLE IX Office to discuss your specific needs. Please provide documentation concerning your disability and the need for employment or workplace accommodation. Our office is located at the Lya Hami Hall, Dorm 2, right side entrance, first floor, Room #104, and our contact numbers are 671-735-2244, 671-735-2971, 671-735-2244 (TTY).

Student Evaluation of Faculty Information

The student course and faculty evaluations for courses will be administered at the completion of the semester within CollegeNet. Student participation is essential and appreciated. Student responses are anonymous and cannot be traced back to individual students. You will need your WebAdvisor login credentials to complete the evaluation. If you experience login issues, please refer inquiries to OIT staff to assist at 735-2630/40.

Plagiarism Statement

Academic dishonesty cannot be condoned by the University. Such dishonesty includes cheating and plagiarism (examples of which are given below), which violate the Student Conduct Code and could result in expulsion from the University.

Cheating includes but is not limited to giving unauthorized help during an examination, obtaining unauthorized information about an examination before it is administered, using inappropriate sources of information during an examination, altering the record of any grades, altering answers after an examination has been submitted, falsifying any official University record, and misrepresenting the facts in order to obtain exemptions from

course requirements.

Plagiarism includes but is not limited to submitting any document, to satisfy an academic requirement, that has been copied in whole or part from another individual's work without identifying that individual; neglecting to identify as a quotation a documented idea that has not been assimilated into the student's language and style, or paraphrasing a passage so closely that the reader is misled as to the source; submitting the same written or oral material in more than one course without obtaining authorization from the instructors involved; or dry-labbing, which includes (a) obtaining and using experimental data from other students without the express consent of the instructor, (b) utilizing experimental data and laboratory write-ups from other sections of the course or from previous terms during which the course was conducted, and (c) fabricating data to fit the expected results.

Communication Policy
 University policy states that official communications will be sent using university assigned (@gotriton or @triton) email addresses. University electronic mail and messaging is to be used to enhance and facilitate teaching, learning, scholarly research, support academic experiences, and to facilitate the effective business and administrative processes of the University. (OIT policy manual, 3.10, p. 36)

Tobacco-Free and Smoke-Free Campus
The University of Guam has in place a Tobacco-Free Policy. Please read the policy at:
https://www.uog.edu/smoke-free-uog.php