

APMA 3100 PROBABILITY**I. COURSE DESCRIPTION**

A calculus-based introduction to probability theory and its applications in engineering and applied science. Topics covered include counting techniques, conditional probability, independence, discrete and continuous random variables, expected value and variance, joint distributions, covariance, correlation, central limit theorem, and an introduction to statistical inference.

CALCULATORS: You must use a scientific calculator similar to:

- Casio: fx-260 or fx-260Solar
- Staples scientific calculator
- Texas Instruments: TI-30Xa or TI-30X IIS (solar)
- Sharp: EL-501XBGR (has factorial key but no permutations or combination keys) or EL-531XBWH (has permutation and combination keys, better choice)

You may not use a graphing calculator or any more advanced calculator. For example, your calculator cannot possess any calculus capabilities (such as computing integrals).

II. GRADING SCALE AND BREAKDOWN

Grades will be awarded according to the **UVA grading scale**:

A 10-9	B+ 7,9-7	C 5,4-5	F 4,9-0
A- 8,9-8	B 6,9-6		
	B- 5,9-5,5		

Homework	20%
Midterm exam 1	20%
Midterm exam 2	20%
Final exam	30%
Daily work and participation	10%

Homework (20%)

Some textbook exercises will be assigned every week, due Friday by 21:00 (see the Weekly Homework schedule sent by mail). You should work through them without aid whenever possible.

Midterm exams 1 (20%) and 2 (20%)

There will be two in-class tests, each given on a single class day (preceded by a dedicated review day). The dates are provided below. Please review each test thoroughly once graded.

Final exam (30%)

The final exam will cover all the material taught throughout the course.

Daily work and participation (10%)

Students are expected to comply with the assigned work plan on a daily basis. Coming prepared to class, having completed the assigned reading, is essential to the learning process.

The following rubric is important regarding participation grades:

- A — The student always prepares the class and complies with the work plan assigned daily; he/she participates voluntarily and frequently, works well as a team, and contributes positively to the classroom environment.
- B — The student participates voluntarily and frequently by answering questions from the teacher.
- C — The student participates sporadically when the teacher asks and he/she/they occasionally asks questions.
- D — The student does not make an effort to participate or minimum work is done.
- F — The student is absent and shows disrespect to other peers and to the professor.

III. BIBLIOGRAPHY AND MATERIALS

The reference textbook we will use is Probability and Stochastic Processes. Roy D. Yates and David J. Goodma. Second Edition. *JOHN WILEY & SONS, INC.*

IV. COURSE PLANNING AND CALENDAR (subject to revision)

DATE	CONTENTS AND KEY TOPICS
Mon, Sept. 7	1.1 Set Theory 1.2 Applying Set Theory to Probability
Wed, Sept. 9	1.3 Probability Axioms 1.4 Some Consequences of the Axioms 1.5 Conditional Probability
Mon, Sept. 14	1.6 Independence 1.7 Sequential Experiments and Tree Diagrams
Wed, Sept. 16	2.1 Definitions 2.2 Probability Mass Function
Mon, Sept. 21	2.3 Families of Discrete Random Variables 2.4 Cumulative Distribution Function (CDF)
Wed, Sept. 23	2.5 Averages 3.1 The Cumulative Distribution Function
Mon, Sept. 28	3.2 Probability Density Function 3.3 Expected Values

DATE	CONTENTS AND KEY TOPICS
Wed, Sept. 30	3.4 Families of Continuous Random Variables 3.5 Gaussian Random Variables
Mon, Oct. 5	3.6 Delta Functions, Mixed Random Variables
Wed, Oct. 7	3.7 Probability Models of Derived Random Variables 3.8 Conditioning a Continuous Random Variable
Mon, Oct. 19	4.1 Joint Cumulative Distribution Function 4.2 Joint Probability Mass Function
Wed, Oct. 21	4.3 Marginal PMF 4.4 Joint Probability Density Function 4.5 Marginal PDF
Mon, Oct. 26	Review session (Chapters 1–3)
Wed, Oct. 28	MIDTERM EXAM 1 (Chapters 1–3)
Mon, Nov. 2	4.6 Functions of Two Random Variables 5.1 Probability Models of N Random Variables
Wed, Nov. 4	5.2 Vector Notation 5.3 Marginal Probability Functions 5.4 Independence of Random Variables and Random Vectors 5.5 Functions of Random Vectors
Mon, Nov. 9	5.6 Expected Value Vector and Correlation Matrix
Wed, Nov. 11	5.7 Gaussian Random Vectors
Mon, Nov. 16	Review session (Chapters 4.1–4.6; 5.1–5.8)
Wed, Nov. 18	MIDTERM EXAM 2 (Chapters 4.1–4.6; 5.1–5.8)
Fri, Nov. 20	6.1 Expected Values of Sums 6.2 PDF of the Sum of Two Random Variables
Mon, Nov. 23	9.1 Optimum Estimation Given Another Random Variable
Wed, Nov. 25	10.1 Definitions and Examples
Wed, Dec. 2	10.2 Types of Stochastic Processes 10.3 Random Variables from Random Processes 11.1 Linear Filtering of a Continuous-Time Stochastic Process
Wed, Dec. 9	11.2 Linear Filtering of a Random Sequence
Mon, Dec. 14	12.1 Discrete-Time Markov Chains 12.2 Discrete-Time Markov Chain Dynamics Final course review

DATE	CONTENTS AND KEY TOPICS
TBD	FINAL EXAM (official program schedule — date to be confirmed)

IMPORTANT INFORMATION

1) Use of Spanish at the Center

The use of Spanish at the Center is strongly encouraged. Remember that you have come to Spain to learn Spanish and immerse yourself in its culture, and there is no better way to do so than by using Spanish on as many occasions as possible.

2) Class Attendance and Tardiness

2.1) Attendance and punctuality are essential for the successful completion of the course. Consequently, unexcused absences and lateness will negatively affect the final grade.

2.2) Only one unexcused absence is permitted. Please bear this in mind when planning trips or outings.

2.3) Arriving more than 5 minutes late to class will count as half an absence (1/2). It is the student's responsibility to notify the instructor of an absence before the class begins.

2.4) Arriving more than 30 minutes late to class will be considered an absence.

2.5) Four (4) unexcused absences will result in the student not receiving credit for the course.

2.6) Only documented absences will be considered excused: a religious holiday, a family emergency, or a medical appointment. Medical absences must be supported by a doctor's note and submitted at reception on the day the student returns to class after the incident has ended.

3) Academic Integrity

3.1) The exchange of information is not only permitted but is also a way of enriching the knowledge acquired during the course. However, all work submitted for each course must be individual and original in every respect. Any sources and direct quotations used must be properly cited.

3.2) Remember that the use of artificial intelligence to complete assignments or examinations is strictly prohibited unless an instructor expressly states otherwise. Such use constitutes a lack of authenticity, and may amount to direct plagiarism, in addition to undermining the development of critical thinking and writing skills, which are among the primary goals of this program. Failure to comply with this rule will result in a grade of "F" for the course.

3.3) Any work that has received credit for one course will NOT be accepted for credit in another course. There will be NO exceptions to this rule. Reusing such work will result in immediate failure of the second course. If assignments for two different courses are related in any way and the student has questions about whether the second project is permissible, the matter must be discussed with all instructors involved. This will prevent any possible unintentional violation of this rule.

3.4) As with punctuality, assignments must be submitted on time. Any late submission will result in a reduction of the grade for that assignment.

3.5) Failure to comply with the provisions set out above will result in the loss of the corresponding course credits for the course in which these rules have been violated.

3.6) If you have a documented special need that requires academic accommodations (SDAC), it must be certified by your home institution. Please contact the Head of Studies in Valencia, María Andrés (maria.andres@uvavalencia.org).

4) Activities, Workshops, and Lectures

Throughout the course, various activities, workshops, and lectures are organized. Participation may be voluntary or mandatory if the instructor considers the activity relevant to the course.

5) Classroom Conduct

5.1) It is very important that all students arrive to class on time, prepared, and with the materials needed for the day. During class, students must treat one another and the instructor with respect, demonstrate a positive attitude, and help create a participatory and collaborative environment that supports effective learning. Any violation of these expectations will have direct consequences.

5.2) Electronic devices (laptop, mobile phone, smartwatch) may be used in class only for course-related purposes. If a student uses such technology for personal reasons during class, the student may be penalized with an unexcused absence.

5.3) The use of computer or electronic technology during examinations is prohibited unless the instructor determines otherwise in accordance with the examination format.

6) Course Content

On occasion, and always within the context of the course, certain “sensitive” topics may be addressed both inside and outside the classroom. Therefore, if a student feels offended by such content in a particular class, the student may leave the class, and doing so will not have any negative effect whatsoever on the final grade. Faculty members will always be open to communication and dialogue in order to promote better intercultural understanding.

7) Final Clarification

The instructor may modify or add activities and/or change the dates indicated according to the learning needs of the group. Effective learning requires not only careful planning, but also a certain degree of flexibility.