AMAT 362—Probability for Statistics—Spring 2022 Syllabus

Instructor: Prof. Justin M. Curry   **Office:** ES 120C   **Email:** jmcurry@albany.edu

Pre-Requisites: Calculus of Several Variables (AMAT 214) and Introduction to Proofs (AMAT 299).

Lecture Place and Times: *ES 143* on *MW 3:00-4:20pm*

Office Hours Place and Times: Thurs 1:30-2:50 or by appt with Robby Green rgreen@albany.edu.

Course Texts:

- *Probability* by Pittman [Pit] is strongly recommended/required.
- *Probability for the Enthusiastic Beginner* by Morin [M] is recommended.

Course Topics: This course is meant to serve as a calculus-based introduction to probability that provides a foundation for statistics as covered in AMAT 363. Additionally, this course is meant to serve as preparation for the *Society of Actuaries* Exam P. The topics for the P exam are listed below, but I will follow my own selection of topics and spend more or less time focusing on topics that I think are important.

(1) General Probability: set theory, Venn diagrams, sample space and events; definition of probability measure, basic axioms; addition and multiplication rules; independence versus mutually exclusive events; calculation of conditional probabilities; combinatorics; Bayes' theorem and law of total probability.

(2) Univariate Random Variables: discrete and continuous univariate random variables (RVs) including binomial, negative binomial, geometric, hypergeometric, Poisson, uniform, exponential, gamma, normal, mixed distributions and their applications; PDFs and CDFs of these RVs; expectation/mean, mode, median, percentile and higher moments; variance, standard deviation, coefficient of variation; probability and moment generating functions; sums of independent RVs, such as Poisson and Normal; transforms.

(3) Multivariate Random Variables: joint probability functions (PFs), PDFs, CDFs; conditional and marginal PFs, PDFs, CDFs and moments for these; covariance and correlation; transforms of multivariate RVs; probabilities and moments for linear combinations of RVs; central limit theorem.

Grading Schema: I grade "on a curve." In other words, I look at the distribution of final numerical grades—computed using the weighting described below—and try to determine clusters of students that deserve similar grades. Although it is theoretically possible that everyone could earn an A, experience suggests that typically 25-35% of students earn some variant of an A, 35-55% for B variants, 20-35% for C variants and typically $\leq 25\%$ for Ds and Es.

- 5% Participation and Attendance
- 15% Take Home Exam 1 — Covers Lectures 1-8
- 20% Take Home Exam 2 — Covers Lectures 9-17
- 25% Take Home Final Exam — Cumulative, but biased towards Lectures 18-24
- 35% Lecture Worksheets

Attendance and Late/Missed Work Policy: Attendance is required, absent a reasonable excuse. Worksheets will be due one week after they're handed out. Worksheets that are handed in late, but before solutions are posted will be penalized $\approx 10\%$. Solutions are typically posted 10 days after the due date. Worksheets that are handed in after solutions are posted will be penalized $\approx 30\%$. The meaning of $\approx$ is the closest integer number of points to this percentage of the total point value. No late exams will be accepted! All work must be handed in with the final exam on Tuesday May 10th, no later.

Policy on Academic Integrity and Collaboration: You are encouraged to collaborate on worksheets with your classmates and tutors, but **do not** post questions to online fora, such as Chegg. Unauthorized collaboration is strictly prohibited on take home exams. **Cheating on exams will result in a Violation of Academic Integrity Report (VAIR) and an automatic zero for the exam in question!**

Monday	Wednesday
Jan 24th Lecture 1	**Jan 26th** Lecture 2
Jan 31st Lecture 3 Due: WS 1	**Feb 2nd** Lecture 4 Due: WS 2
Feb 7th Lecture 5 Due: WS 3	**Feb 9th** Lecture 6 Due: WS 4
Feb 14th Lecture 7 Due: WS 5	**Feb 16th** Lecture 8 Handout Practice Exam 1, WS 6 due.
Feb 21st Due: WS 7 ◇**Take Home Exam 1**◇	**Feb 23rd** Lecture 9 Due: WS 8
Feb 28th Lecture 10 ♠**Exam 1 DUE**♠	**Mar 2nd** Lecture 11 Due: WS 9
Mar 7th Lecture 12 Due: WS 10	**Mar 9th** Lecture 13 Due: WS 11
Mar 14th ♡*SPRING BREAK*♡	**Mar 16th** ♡*SPRING BREAK*♡
Mar 21st Lecture 14 Due: WS 12	**Mar 23rd** Lecture 15 Due: WS 13
Mar 28th Lecture 16 Due: WS 14	**Mar 30th** Lecture 17 Handout Practice Exam 2, WS 15 due.
Apr 4th Due: WS 16 ◇**Take Home Exam 2**◇	**Apr 6th** Lecture 18 Due: WS 17
Apr 11th Lecture 19 ♠**Exam 2 DUE**♠	**Apr 13th** Lecture 20 Due: WS 18
Apr 18th Lecture 21 Due: WS 19	**Apr 20th** Lecture 22 Due: WS 20
Apr 25th Lecture 23 Due: WS 21	**Apr 27th** Lecture 24 Due: WS 22
May 2nd Handout Practice Final, WS 23 due.	**May 4th** Due: WS 24 ◇**Take Home Final**◇