University of Pennsylvania

STAT 4300 – Probability and Descriptive Statistics (Course Outline)

Instructor: Dr. Michael A. Carchidi

Textbooks:	1.)	*A First Course in Probability* by Sheldon Ross
(Required)		(9^{th} Edition, Pearson Publishers, @2014)
(Recommended)	2.)	*An Introduction to Discrete Mathematics* by Steven Roman
		(Saunders HBJ publishers, @ 1989) – Combinatorics Methods
(Required)	2.)	*Class Notes* placed on line by Michael A. Carchidi

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Week	**Topics Covered**
	Combinatorics – The Art of Counting
1	Introduction to combinatorics, the multiplication rule, the pigeonhole principle, permutations, combinations, binomial and multinomial coefficients, recurrence relations, methods of solving recurrence relations (Chapter 4 in Roman's text)
2	Permutations and combinations with repetitions, integer linear equation with unit coefficients, distributing balls into urns, inclusion-exclusion, an introduction to probability (Chapter 5 in Roman's text)
	Probability and Descriptive Statistics
3	Sets, sample spaces, events, axioms of probability, simple results, equally likely outcomes, probability as a continuous set function and probability as a measure of belief (Chapter 2 in Ross' text)
4	Conditional probability, independent events, Bayes' formula, inverting probability trees (Chapter 3 in Ross' text)
5	Random variables, discrete and continuous, expected values, functions of random variables, variance (Chapter 4 in Ross' text)

Week	Topics Covered
6	Some special discrete distributions: Bernoulli, Binomial, Poisson, Geometric, Pascal (Negative Binomial) Hypergeometric, Negative Hypergeometric (Polya) and Poisson (Chapter 4 in Ross' text)
7	Continuous random variables, expectation and variance, some special continuous distributions: Uniform, Exponential, Gamma, Erlang, Normal, Beta and Triangular (Chapter 5 in Ross' text)
8	The Poisson Process (Chapter 9 in Ross' text)
9	Joint distribution functions, functions of random variables, minimum and maximum or independent random variables, sums of independent random variables, reproduction properties (Chapter 6 in Ross' text)
10	Properties of expectation, sums of random variables, covariance, variance of sums and correlations, moment-generating function (Chapter 7 in Ross' text)
11	The limit theorems, Chebyshev's inequality, law of large numbers, the central-limit theorem, Bernoulli, and Poisson variables (Chapter 8 in Ross' text)
12	Generating random numbers and Monte-Carlo simulation methods (Chapter 10 in Ross' text)
13	*If Time Permits*: Stochastic Processes and Markov Chains, Transition Probabilities, Classification of States, Steady-State Probabilities and Mean First Passage Times (Chapter 9 in Ross' text)
14	*If Time Permits*: Absorbing Markov Chains, Average Number of Visits to Transient States and Standard Deviation in the Number of Visits to Transient States, Random Walks (Chapter 9 in Ross' text)

General Information about the STAT 4300 Course

1.) **Official Class Time:** From 12:00 PM – 1:30 PM on MW in JMHH F50.

2.) **Prerequisites:** Calculus of One and Many Variables (MATH 1040 and MATH 1140).

3.) **Instructor:** Dr. Michael A. Carchidi. I am available in my office at Towne 208, by phone at (215)898-8342, and by e-mail at carchidi@seas.upenn.edu

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4.) **TA/Grader:** See the Canvas site at https://canvas.upenn.edu/

5.) **Grading Policy:** A total of 8-10 homework assignments will be handed out, collected, and graded. The average of these will count for 25% of the final grade. Two midterms will count for 25% + 25% of the final grade and then the Final Exam will count for the remaining 25% of the final grade. When studying for exams, the following order of priority should be adhered to:

1.) Discussions in class (This makes classroom attendance mandatory.)

2.) Examples worked out in the textbook (You should therefore purchase a textbook.)

3.) Suggested problems from the textbook (You should do as many as you can.)

Please note that I encourage students to work together on homework problems since you can learn much from each other. However, if there is a sharp difference of 25 points between your exam grades and your average homework grades, then your homework will only be worth 15% and your exams will be worth 85%. Therefore, I strongly discourage any copying of homework.

6.) **Letter Grades:** (98 – 100) A+, (93 – 97) A, (90 – 92) A-, (87 – 89) B+, (83 – 86) B, (80 – 82) B-, (77 – 79) C+, (73 – 76) C, (70 – 72) C-, (67 – 69) D+, (63 – 66) D, (60 – 62) D-, (0 – 59) F

University Policies and Resources

My objective is to build a comfortable and supportive learning environment in ENM503. As such, there are several policies that we will abide by and resources available to improve learning in the course. Please reach out to me or the graders/TA with any questions or concerns that you may have and note the following:

Code of Academic Integrity

All written assignments must be the product of your own effort, consistent with the University's Code of Academic Integrity, available at

https://provost.upenn.edu/policies/pennbook/2013/02/13/code-of-academic-integrity

You may not refer to other student's(s') work in preparing individual assignments. Violation of University Code of Academic Integrity may result in failure of course.

Sexual Harassment and related policies

All forms of sexual violence, relationship violence and stalking and attempts to commit such acts are considered to be serious misconduct and may result in disciplinary action up to and including expulsion or termination of employment. In addition, such acts may violate federal, state and local

laws and perpetrators of such acts may be subject to criminal prosecution. For more information, please refer to Penn' Sexual Harassment Policy,

http://provost.upenn.edu/policies/pennbook/2013/02/15/sexual-harassment-policy,

as well as the other related policies available at this link.

Students with Disabilities and Learning Differences

Students with disabilities are encouraged to contact Weingarten Learning Resource Center's Office for Student Disabilities Services for information and assistance with the process of accessing reasonable accommodations. For more information, visit

http://www.vpul.upenn.edu/lrc/sds/ or email lrcmail@pobox.upenn.edu.

Counseling and Psychological Services (CAPS)

CAPS is the counseling center for the University of Pennsylvania. CAPS offers free and confidential services to all Penn undergraduate, graduate, and professional students. For more information, visit http://www.vpul.upenn.edu/caps/.