APMA 3100-001 (ENGR), Fall 2021

INSTRUCTOR:

Prof. Cong Shen
Office: E-317 Thornton Hall
E-mail: cong@virginia.edu
Phone: (434) 924-8940

INSTRUCTOR OFFICE HOURS:

Time: 3:00 PM – 5:00 PM, Wednesday
Location: Instructor's office

TEACHING ASSISTANT:

Kristin Morrow
E-mail: kdm5uc@virginia.edu

TA OFFICE HOURS:

TBD

APMA WORKSHOP: This is the same as TA office hours.

Time:

- Monday 2:00 PM – 5:00 PM
- Tuesday 2:00 PM – 5:00 PM
- Wednesday 9:00 AM – 11: 00 AM

Location: Small Hall 108

TEXT: *Probability and Stochastic Processes*, 3rd edition by R. D. Yates and D. J. Goodman.

PREREQUISITE: APMA 2120 [Multivariable Calculus] or equivalent. A working knowledge of double integrals, infinite series, and functions of one and several variables is required. On UVaCollab, under "Resources," you will find a review sheet: *Calculus and Probability, a Review*.

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.

OBJECTIVES: By the end of the course, students will

1. solve problems by recognizing and applying appropriate areas of probability theory
2. solve problems by recognizing and using statistical inference
3. use simulation to create, analyze, and interpret data
4. work effectively on teams to problem solve and produce written reports that communicate

the methods and results of their work
5. use programming to develop, test, and refine mathematical conjectures

LEARNING NEEDS: The University of Virginia strives to provide accessibility to all students. If you require an accommodation to fully access this course, please contact Student Disability Access Center (SDAC) at (434)243-5180 or sdac@virginia.edu. If you are unsure if you require an accommodation, or to learn more about their services, you may contact the SDAC at the number above or by visiting their website at http://studenthealth.virginia.edu/student-disability-access-center/faculty-staff.

If you require accommodations for testing, you should schedule your test with me at least one week in advance and the final exam at least two weeks in advance.

CALCULATORS: You may 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). You may use an online scientific calculator such as https://www.desmos.com/scientific.

HONOR CODE: The Honor Code will be strictly observed in this course. Please remember to pledge each project, midterm, and the final exam. Any violation of the honor code will be reported formally to the Honor Committee; it will also incur an automatic failure in the course with a grade of F.

HOMEWORK: Each week, there will be an online assignment administered via WeBWorK (usually due Monday night). All WeBWorK assignments are open-book and open-note, but you should work through them without aid whenever possible. You'll learn the most by carefully working through the solution process from start to finish without any type of assistance. In addition, several textbook exercises will be assigned every week. (See next page.) It is strongly recommended that you use them as a supplement to the WeBWorK assignments.

CLASS MEETINGS: We will meet most days for at least part of our assigned class time. You will need to be present, prepared, and actively participating in each class. You should prepare for class by reading ahead in the textbook or the powerpoint notes on Collab/ALL. You will spend part of class time working on problems with other students. You must actively contribute to group discussions and it is challenging to contribute effectively if you have not seen the material prior to class.

IN-CLASS PRACTICE: During some class meetings, you will work with other students on assigned activities which will be graded and returned with feedback that you should read thoroughly. Sometimes these activities will ask to explore a new topic or procedure, and other times they will give you the opportunity to practice what we have recently discussed. To allow for emergencies that may prevent you from attending class, the lowest 2 scores will be dropped when calculating your in-class practice score, in lieu of makeups.

PROJECTS: There will be four projects assigned during the semester that will build on and extend knowledge you will gain in class. Due dates are posted on the schedule on the next page.

TESTS: There will be four in-class tests, each given on a Wednesday. The dates for tests are provided below. Please review each test thoroughly once graded. Any grading questions must be addressed within 1 week of the test being returned.

FINAL EXAM: The final exam will be held Thursday, Dec 16th, 7:00 – 10:00 pm. **The exam will not be given early. Please make travel plans accordingly.**

COURSE GRADES: The following table lists the weight of each form of assessment used in this class.

In-Class Work:	9%
WeBWorK:	9%
Projects:	21%
Tests:	36%
Final Exam:	25%

STUDENTS WITH DISABILITIES OR LEARNING NEEDS: It is my goal to create a learning experience that is as accessible as possible. If you anticipate any issues related to the format, materials, or requirements of this course, please meet with me outside of class so we can explore potential options. Students with disabilities may also wish to work with the Student Disability Access Center to discuss a range of options to removing barriers in this course, including official accommodations. Please visit their website for information on this process and to apply for services online: sdac.studenthealth.virginia.edu. If you have already been approved for accommodations through SDAC, please send me your accommodation letter and meet with me so we can develop an implementation plan together.

DISCRIMINATION AND POWER-BASED VIOLENCE: The University of Virginia is dedicated to providing a safe and equitable learning environment for all students. To that end, it is vital that you know two values that I and the University hold as critically important:

1. Power-based personal violence will not be tolerated.

2. Everyone has a responsibility to do their part to maintain a safe community on Grounds.

If you or someone you know has been affected by power-based personal violence, more information can be found on the UVA Sexual Violence website that describes reporting options and resources available - www.virginia.edu/sexualviolence.

As your professor and as a person, know that I care about you and your well-being and stand ready to provide support and resources as I can. As a faculty member, I am a responsible employee, which means that I am required by University policy and federal law to report what you tell me to the University's Title IX Coordinator. The Title IX Coordinator's job is to ensure that the reporting student receives the resources and support that they need, while also reviewing the information presented to determine whether further action is necessary to ensure survivor safety and the safety of the University community. If you wish to report something that you have seen, you can do so

at the **Just Report It** portal. **The worst possible situation would be for you or your friend to remain silent when there are so many here willing and able to help.**

RELIGIOUS ACCOMMODATIONS: It is the University's long-standing policy and practice to reasonably accommodate students so that they do not experience an adverse academic consequence when sincerely held religious beliefs or observances conflict with academic requirements. Students who wish to request academic accommodation for a religious observance should submit their request in writing directly to me by Piazza private message as far in advance as possible. Students who have questions or concerns about academic accommodations for religious observance or religious beliefs may contact the University's Office for Equal Opportunity and Civil Rights (EOCR) at UVAEOCR@virginia.edu or 434-924-3200.

UNDERGRADUATE PROGRAMS TEAM: You have many resources available to you when you experience academic or personal stresses. In addition to your professor, the School of Engineering and Applied Science has three staff members located in Thornton Hall who you can contact to help manage academic or personal challenges. Please do not wait until the end of the semester to ask for help!

Lisa Lampe, Director of Undergraduate Education (academic), ll4uu@virginia.edu

Blake Calhoun, Director of Undergraduate Success (academic), bic4sc@virginia.edu

Alex Hall, Assistant Dean of Students (non-academic issues), aec5d@virginia.edu

In addition to having an Assistant Dean of Students embedded in Engineering, we are also fortunate to have two CAPS counsellors embedded in our School. You may schedule time with *Elizabeth Ramirez-Weaver* or *Katie Fowler* through Student Health (https://www.studenthealth.virginia.edu/getting-started-caps). When scheduling, be sure to specify that you are an Engineering student.

IMPORTANT DATES: Please be aware of the following dates.

Add Deadline:	Sept 7
Drop Deadline:	Oct 14
Withdrawal Deadline:	Oct 26

Tentative Schedule			
Week	Dates	Sections	Suggested Textbook Problems
1	Aug 25-27	1.1-1.4 and Conditional Independence	1.1.2, 1.2.2, 1.3.1, 1.3.4 ,1.3.6 1.4.1, 1.4.3, 1.4.5 ,1.4.6, 1.4.8 ,1.5.1, 1.5.2
2	Aug 30-Sept 3	1.5,1.6,2.1-2.3 **Project 1 due Sept 3**	1.6.6 ,1.6.8, 1.6.10, 2.1.4, 2.1.6, 2.1.9 2.2.5, 2.2.6, 2.2.7, 2.2.12, 2.3.1, 2.3.3, 2.4.1, 2.4.2, 2.4.3
3	Sept 6-10	2.4,3.1,3.2,3.4,3.5,3.8	3.2.2, 3.2.4, 3.2.5, 3.2.6, 3.4.2, 3.4.3, 3.4.7, 3.5.2, 3.5.3, 3.5.5, 3.5.7, 3.5.12 ,3.5.14, 3.8.1, 3.8.4, 3.8.6
4	Sept 13-17	3.3, **Test 1 (Sept 15)**	3.3.3 ,3.3.5, 3.3.6, 3.3.10, 3.3.14, 3.3.16
5	Sept 20-24	3.3, 4.1-4.4	4.2.2, 4.2.4, 4.3.2, 4.3.4 ,4.3.6, 4.4.2, 4.4.4, 4.4.6, 4.4.7
6	Sept 27-Oct 1	4.5,4.6,5.1-5.3	4.5.4, 4.5.5, 4.5.6, 4.5.7, 4.5.10, 4.5.12, 4.6.3, 4.6.4, 4.6.6, 4.6.10 5.1.1, 5.2.2, 5.2.3, 5.2.4, 5.3.2, 5.3.3, 5.3.4
7	Oct 4-8	5.4-5.8, 3.6-3.8 **Test 2 (Oct 6)**	5.4.2, 5.4.3, 5.5.2, 5.5.3, 5.5.5, 5.5.8, 5.6.2, 5.6.6, 5.6.7 5.7.2, 5.7.4, 5.7.5, 5.7.8, 5.8.1, 5.8.3, 5.8.6, 5.8.7 3.6.2, 3.6.4, 3.6.7, 3.7.5, 3.7.6, 3.8.8
8	Oct 13-15	6.1,6.2	6.1.1, 6.1.3, 6.1.5, 6.1.6,6.2.2, 6.2.3, 6.2.5
9	Oct 18-22	6.4,6.5, 7.1,7.2 **Project 2 due Oct 22**	6.4.1, 6.4.2, 6.4.4, 6.4.5, 6.5.2, 6.5.3, 6.5.4 7.1.1, 7.1.3, 7.1.7*, 7.2.2, 7.2.3, 7.2.4, 7.2.6, 7.2.7 * use Gaussian(160,40) for patient w/ diabetes
10	Oct 25-29	7.4,7.5, 9.1,10.1	7.4.4, 7.4.5, 7.4.6, 7.5.1, 7.5.3 9. 1.1, 9.1.2, 9.1.3, 9.1.5 10.1.1, 10.1.3, 10.1.4 9.5.1, 9.5.2, 9.5.4, 9.5.7
11	Nov 1-5	9.5, **Test 3 (Nov 3)**	10.3.1, 10.3.2
12	Nov 8-12	10.3, 10.2	10.2.1, 10.2.3(omit part (c)) 11.1.1, 11.1.4, 11.1.5, 11.1.6
13	Nov 15-19	11.1, 11.2	11.2.1, 11.2.2*, 11.2.4 *use: exp(1/3); mu = 3, 6, 10 in lieu of 60, 120, 200; omit part (f) 12.1.3, 12.1.4, 12.1.5, 12.2.1, 12.2.4, 12.2.5
14	Nov 22	12.1	
15	Nov 29-Dec 3	12.2, **Test 4 (Dec 1)**	
16	Dec 6	Review	
17	Dec 16	**Final Exam: 7-10pm**	