APMA 3100-001 (ENGR), Fall 2022

INSTRUCTOR:

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

INSTRUCTOR OFFICE HOURS:

Time: 5:00 PM – 6:00 PM, Thursday, or by email appointment
Location: Instructor's office

TEACHING ASSISTANT:

- Yujia Mu: ym8ct@virginia.edu
- Emily Chang: ec5ug@virginia.edu

TA OFFICE HOURS:

TA: Yujia Mu
Time: Tuesday: 10:00AM – 12:00PM, Friday: 3:00PM – 5:00PM
Location: Thornton C-311 conference room

PART 1: APMA 3100 GENERAL NOTES

APMA WORKSHOP:

Time: The schedule can be found on the Collab-ALL site
Location: Small Hall 108

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

PREREQUISITE: APMA 2120 [Multivariable Calculus] and CS 1110, 1111, or 1112 [Intro to Programming] or equivalent. A working knowledge of double integrals, infinite series, and functions of one and several variables is required. On Collab-ALL site, under "Resources," you will find a review sheet: *Calculus and Probability, a Review*. (It's only 5 pages.) You should also be proficient with Python, Matlab, or Java or an equivalent language.

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. Details about how the honor code applies to each type of assignment are described below.

PRE-CLASS WORK: Before some classes, there will be an assignment for you to complete that will prepare you for the material we will be covering in class. You may choose to work with other students on these assignments, but you must be able to explain/justify any work you submit.

IN-CLASS PRACTICE: 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. 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. You must actively contribute to group discussions and it is challenging to contribute effectively if you have not seen the material prior to class. You should prepare for class by reading ahead in the textbook or the powerpoint notes on Collab-ALL. 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. **Putting your name on an in-class assignment will indicate that you were present for at least 90% of the time the group met and contributed significantly to the work being graded.**

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 last page.) It is strongly recommended that you use them as a supplement to the WeBWorK assignments.

PROJECTS: There will be **three 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. The first project may be completed individually or in pairs. The second and third projects must be completed in groups of 2 or 3. **You are encouraged to discuss your project with your instructor; however, the content of the projects may not be discussed with anyone else outside your group.**

TESTS: There will be **four in-class tests**, each given on a Wednesday. The dates for tests are provided in the last page. Please review each test thoroughly once graded. **Any grading questions must be addressed within one week of the test being returned on Gradescope. Regrade requests will not be considered past this time.**

FINAL EXAM: The final exam will be held Thursday, Dec 8th, 7:00 – 10:00 pm. **The exam will not be given early. Please make travel plans accordingly.**

PART 2: APMA 3100-001 SESSION SPECIFIC NOTES

1. There will be a mid-term course evaluation poll, tentatively in week 9 (after Test 2). This is similar to the course evaluation you typically do after the semester, but I wanted to collect your feedback in the middle of this course, so that I can adjust the teaching to better help you for the second half of this course. The poll will be **anonymous**, and those who participate will gain **1 extra point** in your final grade.
2. I plan to teach a little bit of extra materials that are not covered in the Tentative Schedule (in the last page). This is because I have noticed that for EE/CS/CpE/BME/Sys students, what is commonly covered that aims for *everyone* in Engineering is sometimes insufficient. These materials will be **highlighted** when I teach them.
3. Accordingly, I will add one bonus (sub)question to two tests and the final exam, to cover these extra materials. It gives you a chance to earn up to **3 extra points** in your final grade.
4. I plan to ask for your help in terms of taking notes of the lectures. Everyone will have a chance to participate in one lecture notes taking. If you choose to do so, you will earn **1 extra point** in your final grade.
    a. I will ask for a volunteer in the beginning of the lecture. If you want to help and have not taken notes before, just raise your hands.
    b. It can be hand-written notes or Latex-typed.
    c. You should email me your notes after the lecture, and I may need to iterate with you until the notes are in good shape. Once that is done, I will record your 1 extra point for the final grade.

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

In-Class and Pre-class Work:	12%
WeBWorK:	12%
Projects:	20%
Tests:	36% + 3%
Final Exam:	20% + 1%
Midterm Course Eval:	1%

IMPORTANT DATES: Please be aware of the following dates.

Add Deadline:	Sept 6
Drop Deadline:	Oct 11
Withdrawal Deadline:	Oct 18

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.

Tentative Schedule (subject to minor changes!)			
Week	Dates	Sections	Suggested Textbook Problems
1	Aug 24-26	1.1-1.5	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 29-Sept 2	1.6,2.1-2.4 **Project 1 due Sept 2**	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 5-9	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 12-16	3.3, 3.6, 3.7	3.3.3 ,3.3.5, 3.3.6, 3.3.10, 3.3.14, 3.3.16 3.6.2, 3.6.4, 3.6.7, 3.7.5, 3.7.6, 3.8.8
5	Sept 19-23	4.1-4.4, **Test 1 (Sept 21)**	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 26-Sept 30	4.5,4.6	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
7	Oct 5-7	6.2, 5.1-5.3, 6.1	6.2.2, 6.2.3, 6.2.5,5.1.1, 5.2.2, 5.2.3, 5.2.4, 5.3.2, 5.3.3, 5.3.4 6.1.1, 6.1.3, 6.1.5, 6.1.6
8	Oct 10-14	5.4-5.6, **Test 2 (Oct 12)**	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
9	Oct 17-21	6.4-6.5, 5.7-5.8	6.4.1, 6.4.2, 6.4.4, 6.4.5, 6.5.2, 6.5.3, 6.5.4 5.7.2, 5.7.4, 5.7.5, 5.7.8, 5.8.1, 5.8.3, 5.8.6, 5.8.7
10	Oct 24-28	7.1-7.2,7.4-7.5,9.1,10.1 **Project 2 due Oct 26**	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 with diabetes 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
11	Oct 31-Nov 4	9.5 **Test 3 (Nov 2)**	9.5.1, 9.5.2, 9.5.4, 9.5.7
12	Nov 7-11	9.5,10.2-10.3, 11.1	10.2.1, 10.2.3(omit part (c)) 10.3.1, 10.3.2 11.1.1, 11.1.4, 11.1.5, 11.1.6
13	Nov 14-18	11.2, 10.4, 12.1 **Project 3 due Nov 18**	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
14	Nov 21	12.2	12.2.1, 12.2.4, 12.2.5
15	Nov 28-Dec 2	12.2, **Test 4 (Nov 30)**	
16	Dec 5-8	Review **Final Exam Dec 8**	