Instructor: Professor Jeff Frolik  
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Email: jfrolik@uvm.edu  
Office hours: W 13:45 - 14:30 or by appointment.

Class Time & Location: TR 10:05 - 11:20  Votey 305

Catalogue Description: Probability theory, random variables and stochastic processes. Response of linear systems to random inputs. Applications in engineering.  
Pre/co-requisites: EE 171 or ME 111; and STAT 151 or STAT 143.

Course Goals: (1) To develop foundational knowledge on the topic of stochastic processes and advance ones overall competencies in probability theory. (2) To apply developed knowledge to analyze data related to the student’s graduate research.

Learning Objectives: Upon successful completion of this course, students will have...

1. Analyzed, including for their first- and second-order behaviors, AR, MA, ARMA and Markov processes.
2. Analyzed both discrete- and continuous-time signals for their stationarity.
3. Examined the response of linear systems to stochastic signals.
4. Applied the learned stochastic processes techniques to a problem related to their research.

Required Textbook:

References:

Topics and Tentative Schedule:
- Probability* (CH 1 through CH 4)
- Random Variables* (CH 5 through CH 15)
- Stochastic Processes Basics (CH 16)
- Wide Sense Stationary (WSS) Processes (CH 17)
- Linear Systems and WSS Processes (CH 18)
- Gaussian Processes (CH 20)
- Poisson Processes (CH 21)
- Markov Chains (CH 22)
  * Prerequisite material (review only)
Grading:
- Quizzes [25%]
- Paper [25%]
- Midterm [25%]
- Final [25%]

Grade Scale: A [90, 100]; B [80, 90]; C [70, 80]; D [60, 70]; F [0, 60].

Breaks within above ranges are used to set +/-

Teaching Modality: This course will be offered “In Person” with the instructor and all students present in the classroom. Recognizing that throughout the semester students may not be able to be there in person, each class will also be available through Teams both as an interactive live stream and recorded. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your video or image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the “chat” feature, which allows students to type questions and comments live.

Students who will be remote are encouraged to reach out to the instructor in advance and to remain proactive during the course. Students, regardless of in person or remote, will be responsible for completing the same assignments on the same schedule.

Please read this technology checklist to make sure you are ready for classes and contact the Helpline (802.656.2604) for support with technical issues.

COVID-19: The Green and Gold Promise clearly articulates the expectations that UVM has for students, faculty, and staff to remain compliant with all COVID-19 recommendations from the federal CDC, the State of Vermont, and the City of Burlington. This include following all rules regarding facial coverings and social distancing when attending class. If you do not follow these guidelines, I will ask you to leave the class. If you forget your mask, you cannot enter the class and should go back and retrieve your mask. The Code of Student Conduct outlines policies related to violations of the Green and Gold Promise. Sanctions for violations include fines, educational sanctions, parent notification, probation, and suspension.

General: The instructor posts all assignments, solutions, and additional material on the Blackboard site for this class. Any recordings will be found through the complementary Teams site.

Homework problems may be assigned from the text or provided by the instructor. Homework will not be collected or graded but the solutions will be available on Bb. Each week there will be a short quiz covering the previous week’s materials. Students are encourage to work the homework problems in preparation for these quizzes. For in-class quizzes students will be allowed to use one sheet of notes using both sides of the paper. No additional notes or text may be used unless specifically noted.

Both exams will be take home assignments. At least one weeks notice will be given and at least one week will be given to complete the exam. Exams will be comprehensive in nature and will include a significant analysis or simulation component. Students will sign an honor pledge indicating that they “neither gave nor received any assistance during the exam”. Failure to follow this statement will be considered an act of plagiarism and will be dealt with accordingly (see Academic Integrity below). Take home quizzes will follow this same policy.

A portion of the student’s final grade (5%) will be from participating in small group discussions with the instructor. Every three weeks, the instructor will pose a prompt germane to the course subject matter for a ~10 minute chat with the instructor and one or two other students (either in person or via Teams). There will be five prompts in total and you will each submit a short write up after each. Small groups
will be assigned and will vary throughout the term. The grading (@ 1% ea.) will be binary depending on whether you participate or not.

All graded work should be reviewed promptly by students. Any questions in regards to potential grading errors should be brought to the attention of the instructor within one week after the assignment is reviewed in class or solutions are posted. Please clearly document in writing what you believe the error to be and attach that to the original work. After one week, no score adjustments will be made. While final exams will not be returned to the students, students are welcome to review their work against a solution. Other than in the case of grading errors on the final exam, no final course grades assigned will be altered.

Throughout the semester, the course instructor will endeavor to keep you abreast of your standing in the class. Students requiring more feedback should review their performance through by contacting the instructor. During the semester, classes may be cancelled by the instructor. These classes will be made up with online content provided by the instructor. Students are responsible for viewing this material in a timely fashion. The instructor will contact the students through their UVM email account and a Bb posting in advance of the relevant dates. A Teams site will be utilized only for remote learning delivery.

**Paper:** Students will develop a paper in which they show how techniques learned in class were applied to their own research. This will be a 4-6 page, well-referenced technical paper. The paper will be developed in \LaTeX and will follow standard IEEE proceedings-style format (or similar format germane to their discipline). Details on each deliverable will be provided during the semester. Each deliverable will be peer reviewed by a panel of at least three other students prior to submitting. In total, these paper deliverables will account for 25% of the final grade.

- Title & Example ‘Signal’ Set: 10% (9/29)
- 1-Page Problem Description: 10% (10/20)
- 1-Page Technical Approach Summary: 10% (11/3)
- Draft Paper: 20% (11/24)
- Final Paper: 50% (12/3)

**Pre/co-requisites:** STAT 151 is a pre-requisite for this course. Stochastic processes can be thought of random functions of time (e.g., signals). Students will note that the first half of the text pertains to *probability theory* - CH 5 to CH 15. As needed these topics may be reviewed in class but it in general it is expected that the students will have a good understanding of these topics.

Students are also expected to have a background in *signals*, e.g., EE 171 or ME 111. Stochastic processes are often signals that result from engineered systems.

Finally, you can be expected to conduct assignments (including your project) in which you will have to utilize *programming*. You can leverage a language of your choice but recognize that the instructor in most familiar with MATLAB.

**Calculators:** There is no restriction on the type of calculator one may use. Note, however, that the instructor will emphasize concepts and techniques on the exams. Therefore, just having the correct answer will not guarantee you full credit if no work has been shown. Calculators may not be allowed on some exams. Phones may not be used during quizzes or exams as calculators. **Presence of phones during exams or quizzes will result in a zero score.**

**Late Policy:** Late work will not be accepted unless prior arrangements have been made with the instructor. Exam/quiz conflicts should be noted early and you should be prepared to take these in advance of the scheduled dates/times. If you miss a deadline due to an emergency, I will need an official letter from student services to allow you to make up for the work.

**Expectations:**

- You will attend all lectures and you will attend on time. Should you miss a class, you will get
the notes from your classmates. You are responsible for knowing what was covered and what was discussed in class.

- You will be respectful at all times, which includes not talking to your classmates while the lecture is in session. You will not use your cell phone or work on other courses while in class.

- You will review your notes from the previous lecture before coming to class. You will read relevant sections of the textbook on your own.

- If you have questions, ask them.

**Academic Integrity:** It is expected that everything that you submit with your name on is your own work. Anything that is not 100% your own work should be clearly labeled as such (credit your sources, group members, etc.). Students who submit others’ work as their own will not pass the course and will be referred to the Center for Student Ethics and Standards for further discipline. The UVM policy on academic integrity is a useful guide: https://www.uvm.edu/policies/student/acadintegrity.pdf.

**University Attendance Policy:** The lecture notes will form the bulk of materials, so attendance is important (be it physically or virtually). Please refer to the most recent UVM Catalogue: “Students are expected to attend all regularly scheduled classes. The instructor has the final authority to excuse absences.”

**Student Learning Accommodations:** In keeping with University policy, any student with a documented disability interested in utilizing accommodations should contact ACCESS, the office of Disability Services on campus. ACCESS works with students to create reasonable and appropriate accommodations via an accommodation letter to their professors as early as possible each semester. Contact ACCESS: A170 Living/Learning Center - 802-656-7753 - access@uvm.edu.

**Religious Holidays:** Students have the right to practice the religion of their choice. If you need to miss class to observe a religious holiday, please submit the dates of your absence to me in writing by the end of the second full week of classes. You will be permitted to make up work within a mutually agreed-upon time.

**Use of Alcohol/Cannabis:** As a faculty member, I want you to get the most you can out of this course. You play a crucial role in your education and in your readiness to learn and fully engage with the course material. It is important to note that alcohol and cannabis have no place in an academic environment. They can seriously impair your ability to learn and retain information not only in the moment you may be using, but up to 48 hours or more afterwards. It is my expectation that you will do everything you can to optimize your learning and to fully participate in this course.