

ESE 503: Stochastic Systems

Fall 2025

Instructor:	Dr. Petar M. Djurić Light Engineering, Room 254 tel. (631) 632-8423 email: petar.djuric@stonybrook.edu	Office hours: TU 2:00 PM – 4:00 PM W 4:00 PM - 6:00 PM or by appointment
Class Meetings:	6:30 PM – 9:20 PM Frey Hall 313	
Grading:	One midterm, 40% Final 60%	
Textbook:	A. Papoulis and S. U. Pillai, <i>Probability, Random Variables, and Stochastic Processes</i> , McGraw Hill, 2002	
Topics:	<ul style="list-style-type: none">▪ Introduction to the concept of probability. Probability space. Axioms of probability. Conditional probability. Stochastic independence.▪ Combined experiments. Repeated trials. Bernoulli's theorem.▪ Random variables. Distribution and density functions. Random vectors. Specific random variables.▪ Functions of random variables. Moments.▪ Bivariate distributions. Functions of two random variables. Order statistics. Joint moments. Joint characteristic functions. Conditional expectations.▪ Random vectors. Conditional densities. Multivariate normal distribution.▪ Mean-square estimation. Stochastic convergence. Limit theorems.▪ Monte Carlo methods.▪ Random processes -- general concepts. Stationary processes.▪ Systems with stochastic inputs.▪ Discrete-time processes.▪ Random walks. Wiener processes. Brownian motion. Poisson processes. Gaussian processes.	
Goals:	The goal of the course is to teach students the basics of probability theory and stochastic processes. More specifically, it is to introduce the students to the concept of probability spaces, random variables, random vectors and random processes. The goal is then to apply these concepts to system theory. Exposing the students to applications of probability theory is another important goal.	
Objectives:	Upon completion of this course, students will be able to solve a range of problems that involve random events, variables and vectors as well as systems with stochastic inputs. The students will also be able to solve problems with practical context.	

Student Accessibility Support Center

If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to the following website: <https://ehs.stonybrook.edu//programs/fire-safety/emergency-evacuation/evacuation-guide-disabilities> and search Fire Safety and Evacuation and Disabilities.

Academic Integrity

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Professions, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.

Understand When You May Drop This Course

If you need to drop or withdraw from the course, it is your responsibility to be aware of the tuition liability deadlines listed on the registrar's [Academic Calendar](#). Before making the decision to drop/withdraw you may want to contact me or refer to the University's policies:

- [Undergraduate Course Load and Course Withdrawal Policy](#)
- [Graduate Course Changes Policy](#)

Incomplete Policy

Under emergency/special circumstances, students may petition for an incomplete grade. Circumstances must be documented and significant enough to merit an incomplete. If you need to request an incomplete for this course, contact me for approval as far in advance as possible. You should also read the University's policies that apply to you:

[Graduate Incomplete Policy](#)

Course Materials and Copyright Statement

Course material accessed from Brightspace, Zoom, Echo 360, VoiceThread, etc. is for the exclusive use of students who are currently enrolled in the course. Content from these systems cannot be reused or distributed without written permission of the instructor and/or the copyright holder. Duplication of materials protected by copyright, without permission of the copyright holder is a violation of the Federal copyright law, as well as a violation of Stony Brook's Academic Integrity.