Ve501 Probability and Random Processes

2018 Fall

3 Credits

Course Objectives

To investigate the concepts of Probability Theory, Random Variables, Random Processes that have applications to electrical engineering. Furthermore, to provide systematic approaches to solve problems involving random and time-varying phenomena, with emphasis on electrical engineering.

Course Pre/Co-requisites

Ve401 Probabilistic Methods in Engineering or graduate standing.

Instructor

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Lecture Time and Location

Tuesday and Thursday 4-5:40pm, CRQ209

Grading

Homework:	15%	
Exam 1:	25%	October 19
Exam 2:	25%	November 16
Final Exam:	35%	TBD

Requests for re-grades of exams must be submitted in writing within one week of exam return. All questions may be re-graded.

Textbooks

- Papoulis and Pillai, *Probability, Random Variables and Stochastic Processes*, 4th edition
- Gallager, *Stochastic Processes: Theory for Applications*, 1st edition

Office Hours

Friday 10-12, JI Room 408.

Teaching Assistant

Will be determined later.

Honor Policies

All students in the class are presumed to be decent and honorable, and all students in the class are bound by the Honor Code of the UM-SJTU Joint Institute (visit http://umji.sjtu.edu.cn/honorcode for more details). You may not seek to gain an unfair advantage over your fellow students; you may not consult, look at, or possess the unpublished work of another without their permission; and you must appropriately acknowledge your use of another's work. Following are specific policies for different types of course assignments:

Individual Assignments. You may discuss individual assignments with your fellow students at the conceptual level, but must complete all calculations and write-up, from scratch to final form, on your own. Verbatim copying of another student's work is forbidden. You may not consult homework solutions from a previous term unless they are made available in a publicly accessible form (no unfair advantage can be sought).

Exams. Each student must complete the exam solely by her or his own efforts. Questions can be asked only of the course instructors. The exam must be completed within the specified time.

Any violation of the above honor policies appropriate to each piece of course work will be reported to the Honor Council, and if guilt is established penalties may be imposed. Such penalties can include, but are not limited to, letter grade deductions, disciplinary sanctions, or expulsion from the Institute and the University. If you have any questions about this course policy, please consult the course instructors.

List of Lecture Topics (subject to adjustment)

1) Introduction to random variables
2) Probability mass function and discrete random variables
3) Probability density function and continuous random variables
4) Total probability and Bayes rule
5) Gaussian CDF
6) Conditional probability
7) Function of a random variable
8) Expectation of a random variable

9) Transform methods and probability generating function
10) Two random variables, independence, two functions of two RVs, one function of two RVs
11) Marginal PDF
12) Conditional PDF, conditional expectation
13) Joint moments
14) Mean square error estimation
15) Markov and Chebyshev Inequalities
16) Random vectors
17) Sample mean
18) Convergence of random sequences
19) Central limit theorem
20) Introduction to random processes
21) Poisson process
22) Brownian motion
23) Complex random variables and processes
24) Stationarity and cyclostationarity
25) Power spectral density, QAM modulation, white noise
26) Response of Systems
27) Linear time-invariant systems and RPs
28) Ergodicity theorems
29) Series expansions
30) Introduction to Markov Processes
31) Classification of states and Markov chains
32) Computing state probabilities
33) Continuous-time Markov chains and queuing