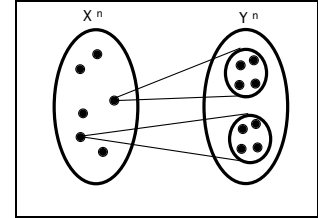


PRAIRIE VIEW A&M UNIVERSITY
DEPARTMENT OF
ELECTRICAL & COMPUTER ENGINEERING
ELEG 6313 – STOCHASTIC PROCESSES
FALL 2011



"Everything existing in the universe is the fruit of chance." - Democritus

"It is a truth very certain that when it is not in our power to determine what is true we ought to follow what is most probable." - Descartes

"While writing my book [Stochastic Processes] I had an argument with Feller. He asserted that everyone said 'random variable' and I asserted that everyone said 'chance variable.' We obviously had to use the same name in our books, so we decided the issue by a stochastic procedure. That is, we tossed for it and he won." - Doob, J. Quoted in Statistical Science

"It is remarkable that a science which began with the consideration of games of chance should have become the most important object of human knowledge." - Laplace, Pierre Simon

Lecturer: A. Anil Kumar, Ph.D.
Office: Room 326, New Electrical Engineering Building
Phone: (936) 261-9909 (Office)
(832) 667-8344 (Home)
e-mail: aakumar@pvamu.edu

Lectures: Thursday 4:00 P.M. - 6:50 P.M., Room 109K, C.L. Wilson Building

Office Hours: Monday-Tuesday – 10 AM-12 Noon, Thursday 11 AM – 12 Noon, 2 PM – 3 PM, and by appointment

Textbook: Probability and Stochastic Processes, by Roy Yates and David Goodman, 2nd Edition, John Wiley & Sons, Inc. 2004. ISBN-10: 0471272140 ISBN-13: 978-0471272144

Reference: Probability, Random Variables and Stochastic Processes, by A. Papoulis and S.U. Pillai, 4th Edition, McGraw-Hill, 2002. ISBN-10: 0071226613 ISBN-13: 978-0071226615

Stochastic Processes – An Introduction, by Peter W. Jones and Peter Smith, 2nd Edition, CRC Press, 2010. ISBN: 978-1-4200-9960-7

COURSE DESCRIPTION

ELEG 6313. Stochastic Processes. (3-0) Credit 3 semester hours. Probability overview, distribution and density functions, moments, time averaging and sampled averaging. Stochastic processes: Gaussian, Markov process, Poisson, Rice, Wiener-Levy processes, bi-model and tri-model processes. Modeling of systems using stochastic processes and system analysis. Karhunen-Loeve transform, bounds and their use in systems. Decision Rules: Maximum likelihood, Minimum Error, Kalman and Wiener filters, Linear and non-linear estimation and Optimization techniques. Prerequisite: MATH 3023

COURSE OBJECTIVES

At the end of the course you should be able to:

1. Demonstrate that you can compute the relevant quantities such as expectation values, moments, correlation functions, etc.
2. Present mathematical models of stochastic processes and specific applications.
3. Demonstrate a comprehension of the relevance of concepts and techniques taught to real world problems in communications.

General Articles

Recent journal papers and articles will be provided to supplement the teaching material.

TOPICS TO BE COVERED

The topics covered will include:

- Experiments, Models, Probabilities, Bayes' Theorem
- Discrete Random Variables and Multiple Discrete Random Variables
- Continuous Random Variables and Multiple Continuous Random Variables
- Moments, moment generating function, central limit theorem
- Characteristic Functions
- Sample mean, laws of large numbers
- Stochastic Processes, correlation, stationary processes, and wide sense stationary random processes
- Markov processes and Markov chains
- Information Theory
- Martingales
- Modeling of systems using stochastic processes and system analysis
- Special Applications:
 - Communication Systems
 - Queuing Theory
 - Renewal theory
 - Gambler's Ruin
 - Brownian Motion
 - Reliability of Systems

HOMEWORK

I will be assigning several problems throughout the semester. However, I will assume a certain level of maturity and independence from you. In other words, I will not be "policing" you. However, student notebooks should be maintained regularly and will be evaluated at the end of the course. These notebooks should include, at the minimum: examinations, take home assignments, homework problems, other worked out problems and design project papers. Some assignments may be given to the class to work as a team.

EXAMINATIONS

There will be two take home examinations, one during the mid-term week and one during the final week.

RESEARCH PAPERS

You will be required to write three technical papers on topics related to the subject material. Assignments will be made in class.

Final Term Paper - Topic will be prescribed later. This paper will deal with how you will utilize the concepts and techniques learned in this class to a real world situation. Details will be provided in the class.

PRESENTATIONS

You will be required to make presentations in the class. Topics and frequency will be discussed in class.

GRADING POLICY

Your grade, in particular the final grade, will be determined on a combination of your examination performance, design projects and your participation in the class: asking questions, working out problems, making suggestions toward alternative ways of solving the same problem. In order to obtain a proper grade, I need to be convinced that you have acquired the necessary knowledge from the course.

The grades will be determined by the following system:

Examination I (Mid-Term) Take Home	100 points
Examination II (Final) – Take Home	100 points
Research Papers 1, 2	200 points
Final Term Paper	150 points
Technical Presentations (3)	150 points
Homework/Take Home Assignments	50 points
Total	750 points

You must make at least 80% in the final examination to pass the course.

No makeup examinations will be given except in cases of emergency. No “WP”s will be given, except under very special circumstances, and even then only while passing. No “I”s will be given, unless the stringent conditions specified in the University Catalog are satisfied.

CONDUCT AND ETHICS – HONOR CODE

A strict code of ethics will be imposed in the class and in the examinations. It is a sign of impoliteness and disrespect to your professor and to your colleagues if you make a practice of coming to the class late. Absolutely no talking or cheating will be permitted during the examinations. You shall take a pledge that you will not copy, steal or plagiarize someone else's work nor will you tolerate anyone else doing the same. You may confer with your colleagues on interpretation and approach to homework problems, but the solutions should be your own work. All work on examinations should be your own unaided work. Projects should conform to accepted academic standards, with any outside references properly documented. It shall be the policy in this course to discourage any dishonest activity to the extent possible rather than punish. **HOWEVER, IN FAIRNESS TO ALL CONCERNED, CHEATING AND PLAGIARISM WILL BE DEALT WITH SEVERELY WHEREVER THEY ARE FOUND.** You are advised to read and abide by the rules and the regulations of the University as mentioned in the Catalog, in particular the Topics Student Life and Academic Regulations. Graduating means more than completing a certain number of hours and obtaining a reasonable GPA. You must strive to develop a code of strict conduct, acquire a sense of discipline, serve as a role model to your juniors and in particular experience the feeling of accomplishment.

If you have any questions or have any problems that you think I may be able to help with, please do not hesitate to contact me. I am here to help.

LET'S PROVE THAT LEARNING CAN BE BOTH FUN AND PRODUCTIVE!

University Rules and Procedures

Disability statement (See Student Handbook):

Students with disabilities, including learning disabilities, who wish to request accommodations in class should register with the Services for Students with Disabilities (SSD) early in the semester so that appropriate arrangements may be made. In accordance with federal laws, a student requesting special accommodations must provide documentation of their disability to the SSD coordinator. There is an Office of Disability Services on the campus located in Evans Hall Room 317, Tel: (936)261-3585. More information is provided on Page 56 of the Graduate Catalog (2008-2010).

Academic misconduct (See Student Handbook):

You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with your Student Handbook, especially the section on academic misconduct. Students who engage in academic misconduct are subject to university disciplinary procedures.

Forms of academic dishonesty:

1. Cheating: deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not mastered; giving or receiving aid unauthorized by the instructor on assignments or examinations.
2. Academic misconduct: tampering with grades or taking part in obtaining or distributing any part of a scheduled test.
3. Fabrication: use of invented information or falsified research.
4. Plagiarism: unacknowledged quotation and/or paraphrase of someone else's words, ideas, or data as one's own in work submitted for credit. Failure to identify information or essays from the Internet and submitting them as one's own work also constitutes plagiarism.

Nonacademic misconduct (See Student Handbook)

The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either (1) the instructor's ability to conduct the class, (2) the inability of other students to profit from the instructional program, or (3) campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. Such incidents will be adjudicated by the Dean of Students under nonacademic procedures.

Sexual misconduct (See Student Handbook):

Sexual harassment of students and employers at Prairie View A&M University is unacceptable and will not be tolerated. Any member of the university community violating this policy will be subject to disciplinary action.

Attendance Policy:

Prairie View A&M University requires regular class attendance. Excessive absences will result in lowered grades. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in assignment of a grade of "F". Absences are accumulated beginning with the first day of class.

Student Academic Appeals Process

Authority and responsibility for assigning grades to students rests with the faculty. However, in those instances where students believe that miscommunication, errors, or unfairness of any kind may have adversely affected the instructor's assessment of their academic performance, the student has a right to appeal by the procedure listed in the Undergraduate Catalog and by doing so within thirty days of receiving the grade or experiencing any other problematic academic event that prompted the complaint.