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**ECE 511 - Analysis of Random Signals**

**Fall 2010**

**Instructor: Guillermo Atkin**

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**Office:** SH – 141, 312-567-6810  
**e-mail:** [atkin@iit.edu](mailto:atkin@iit.edu)  
**Office Hours:** PM and 5:30 to 7:00 PM or by appointment  
**Class Hours:** M and W: 3:15 to 4:30 PM, WH – 115

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**Textbook:** Athanasios Papoulis and S. U. Pillai, "Probability, Random Variables, and Stochastic Processes", McGraw-Hill, Fourth or latest Edition.  
[www.mhhe.com/engcs/electrical/papoulis/](http://www.mhhe.com/engcs/electrical/papoulis/) (student resources)

**References:**

- Henry Stark and J. W. Woods, Probability, Random Processes, and Estimation Theory for Engineers, Prentice-Hall, 3<sup>rd</sup> or latest Edition.
- Alberto Leon-Garcia, Probability and Random Processes for Electrical Engineering, Addison – Wesley, 2nd edition.

**Prerequisites:** ECE 308 and ECE 475 or MATH 475

**Course Description:** Probability theory, including discrete and continuous random variables, functions and transformations of random variables. Random processes, including correlation and spectral analysis, the Gaussian process and the response of linear systems to random processes. (3-0-3)

**Course outline** (sections of):

- 1.- Fundamentals of Probability (Chapters 1-2)
- 2.- Repeated trials (Chapter 3)
- 3.- The Concept of a Random Variable (Chapter 4)
- 4.- Functions of random variables (Chapters 5-6)
- 5.- Sequences of Random Variables (Chapter 7)
- 6.- Stochastic Processes (Chapter 9)
- 7.- Random Walks and Other Applications (Chapter 10)

**Grading.**

Coursework will be graded as follows (tentative):

- Homework      15% (every week, due Mondays)
- Exams 1        30% (TBA)
- Exams 2        30% (TBA)
- Final exam     25% (TBA)

**Grade Policy:** A ( $\geq 90\%$ ); B(80 - 89%); C(66 - 79%); D(50 - 65%)

HW should be submitted at the beginning of the class on Mondays (hard copies) or using the Digital Dropbox (Blackboard) for MC students and on Wednesdays 5:00 PM for all other sections (only soft copies). Homework solutions will be posted in the Blackboard on Thursdays. No late HW will be accepted without previous instructor consent.

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### Pre-requisite Courses Description:

<b>ECE -475 RANDOM PHENOMENA IN EE</b>	
<b>College:</b>	ARMOUR COLLEGE OF ENGINEERING & SCIENCE
<b>Department:</b>	Electrical & Computer Engineering
<b>Credits:</b>	3.00
Random Phenomena in Electrical Engineering Prerequisites: ECE 308 Basic axioms of probability. Signals as random variables. Distribution and density functions. Functions of random variables. Applications to the binary symmetric communication channel, square-law and other nonlinear devices. The Gaussian, Poisson, and other distributions. Application to photon counting. The signal-plus-noise problem. The DC and AC value of signals: mean and variances. The meaning of signal-to-noise ratio. Higher moments. Estimation of the mean and the variance. Confidence intervals. Credit will be given for either ECE 475 or MATH 475, but not for both. (3-0-3) 14.1001	

<b>MATH-475 PROBABILITY</b>	
<b>College:</b>	ARMOUR COLLEGE OF ENGINEERING & SCIENCE
<b>Department:</b>	Applied Mathematics
<b>Credits:</b>	3.00
Probability Prerequisites: MATH 251. Credit not granted for both MATH 474 and MATH 475 Elementary probability theory; combinatorics; random variables; discrete and continuous distributions; joint distributions and moments; transformations and convolution; basic theorems; simulation. (3-0-3) 27.0101	

<b>ECE -308 SIGNALS AND SYSTEMS</b>	
<b>College:</b>	ARMOUR COLLEGE OF ENGINEERING & SCIENCE
<b>Department:</b>	Electrical & Computer Engineering
<b>Credits:</b>	3.00
Signals and Systems Prerequisites: ECE 213 Corequisites: MATH333 Time and frequency domain representation of continuous and discrete time signals. Introduction to sampling and sampling theorem. Time and frequency domain analysis of continuous and discrete linear systems. Fourier series convolution, transfer functions. Fourier transforms, Laplace transforms, and Z-transforms. (3-0-3) 14.1001	