成均館大學校
SUNG KYUN KWAN UNIVERSITY

College of Information and Communication Engineering

Course Information and Instruction

(Graduate ECE5910 Class)

1. Course Name : **Advanced Probability and Random Processes**

2. Instructor : Prof. Kim, Joong Kyu (Rm#: 21225, 031-290-7122, jkkim@skku.edu)

3. Course Objective : To learn the basics on probability, random variables, and stochastic processes in order to apply the concepts to a wide range of electrical, and electronics engineering fields.

4. Course Description : Basic concepts of probability theory. Random variables: discrete, continuous, and conditional probability distributions; averages; independence. Introduction to discrete and continuous random processes: wide sense stationarity, correlation, spectral density.

5. Textbook : **Probability, Random Variables, and Random Signal Principles** by P.Z.Peebles Jr.

6. Reference :*(1)* ***Elements of Engineering Probability & Statistics*** *by R.E.Ziemer*
(2) Probability and Random Processes by W.B.Davenport Jr.
(3) Probability, Random Variables, and Stochastic Processes by A.Papoulis
(4) Probability and Random Processes by A.Leon-Garcia
(5) Probability and Stochastic Processes by Yates and Goodman

7. Classnotes :For your convenience, the classnote in PDF forms will be distributed in advance!!!

8. Grade Policy

:Mid-term Exam	:40%
Final Exam	:50%
Attendance	:10%
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Total	:100%

Note: (1) All the exams are closed books, but you may bring one page of A4 size ***hand-written*** reference sheet to each examination.*(Illegal sheets will be confiscated at the place!!!)*
(2) Homeworks will be assigned during the course of the semester, but you do not need to submit the reports. However, you are strongly encouraged to solve the problem sets by yourselves in each chapter of the textbook as well as the references.
(3) Attendance will be checked every week throughout the semester.

9. Topics & Schedule:

(1) Week # 1 : Concept of probability: probability space, review of set theory, probability axioms.

(2) Week # 2 : Conditional probability, total probability law, Bayes Theorem, independent events, theory of counting.

(3) Week # 3 : Order space, Bernoulli trials, concepts of random variables, and probability distribution function.

(4) Week # 4 : Continuity axiom, classification of random variables, probability density function.

(5) Week # 5 : Gaussian and uniform random variables, conditional distribution and density functions, mathematical expectation.

(6) Week # 6 : Characteristic function, moment generating function, nonlinear function of random variables.

(7) Week # 7 : Extension of above concepts to two random variable cases, statistical independence, correlation.

----- Mid-term Examination -----

(8) Week # 8 : Function of multiple random variables, introduction to estimation theory: LMSE(Least Mean Squared Error) linear and nonlinear estimators.

(9) Week # 9 : Introduction to random processes: basic concept, definition, classification, stationarity and independence, distribution and density functions.

(10) Week # 10 : Ergodic Theorem, correlation functions, introduction to Gaussian random processes.

(11) Week # 11 : *Auto power spectral density of random processes: definition, properties, and relation to autocorrelation function.*

(12) Week # 12 : *Cross power spectral density, concept of white and colored noises.*

(13) Week # 13 : *Random signal response of linear systems: time domain and frequency domain characteristics, system evaluation.*

(14) Week # 14 : *Bandpass, bandlimited, and narrowband random processes: definition and characteristics.*

(15) Week # 15 : *Optimal linear systems: matched filter and Wiener filter.*

(16) Week # 16 : ***----- Final Examination -----***

For more informations, you may visit the homepage of the ***Digital Signal Processing Laboratory*** *at* ***http://dspl.skku.ac.kr***.