KOM505E – Probability Theory and Stochastic Processes

Fall 2018-2019
Istanbul Technical University, Computer Engineering Department

Instructor :	Mustafa E. Kamaşak (CRN 14106) EEB 3307 kamasak@itu.edu.tr
Class Meets :	13.30 – 16.30, Thursday Bilisim Enstitusu 411
Textbooks :	"Intuitive Probability and Random Processes using MATLAB", Kay, Steven, Springer, 2012. (available in the University Library.) "Introduction to Probability", Dimitri P. Bertsekas, John N. Tsitsiklis,Bertsekas, 2008, (available in the University Library) "Probability ans Statistical Inference", Nitis Mukhopadhyay, Marcel Dekker, Inc., 2000. (available in the University Library) "Probability, Random Variables and Stochastic Processes", Athanasios Papoulis, Mcgraw-Hill College. (available in the University Library) "A First Course in Probability", Sheldon Ross, Pearson (available in the University Library)
Grading :	2 midterms (30% each), final (40%).
VF Conditions :	You can take final exam if Midterm 1 + Midterm 1 $\geq$ 30 (over 100) Otherwise VF (instead of FF) will be given. Attendance will not be recorded.
Webpage :	http://ninova.itu.edu.tr/: Course management (announcements, grades etc) will be at the Ninova system.

Learning Objectives of the Course:

1. Define laws and axioms of probability and be able to work with set theoretical rules of events and probabilities
2. Construct probabilities and conditional probabilities; use them in Bayes law to model simple real life problems
3. Know and utilize random variables (r.v.s), important standard models of probability density functions (pdfs) and cumulative density functions in both continuous and discrete space
4. Express multiple r.v.s with joint pdfs, relating to marginal pdfs and conditional pdfs, as well as to concepts of independence and correlatedness
5. Estimate means, variances, covariances, moments of random variables
6. Calculate best predictors in minimum mean squared sense both for linear and nonlinear predictors
7. Know the meaning and implications of limit theorems : Law of large numbers and Central limit theorem
8. Define random processes, their properties as well as standard random process models such as Gaussian, Poisson, and Markov processes.

Tentative Schedule

Week	Date	Topics
1	Sept 20	Introduction, set theory,
2	Sept 27	Axioms of probability, binomial law
3	Oct 4	Conditional probability, independence, random variables
4	Oct 11	Bayes theorem
5	Oct 18	Probability density function, cumulative density functions (discrete and continuous)
6	Oct 25	Functions of random variables
7	Nov 1	**Midterm 1**
–	Nov 8	**Semester break**
8	Nov 15	Standard probability distributions, Expectation and variance, moments
8	Nov 22	Multivariate random variables, joint/marginal/conditional distribution, covariance
10	Nov 29	Correlation, independence, random vectors, multivariate normal distr.
11	Dec 6	Limit theorems: weak law of large numbers, central limit theorem
12	Dec 13	**Midterm 2**
13	Dec 20	Random processes, autocorrelation, autocovariance, stationarity (wide/strict sense)
14	Dec 27	Special random processes (Gaussian, Wiener, Markov, Poisson)