KOM505E – Probability Theory and Stochastic Processes

Fall 2016-2017
Istanbul Technical University, Computer Engineering Department

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Class Meets : 13.30 – 16.30, Tuesday
EEB 5207 (Dr. Ünal)
EEB 5306 (Dr. Kamasak)

Office Hours :

Dr. Ünal
TBA

Dr. Kamaşak
TBA

Textbooks : "Intuitive Probability and Random Processes using MATLAB",
Kay, Steven, Springer, 2012.
(available in the University Library. This is the main textbook.)

"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 (20% each), 4 homeworks (20%), final (40%).
Warning: Homeworks will require **MATLAB** coding.
Hence, you are assumed to know (or ready to learn) MATLAB programming.

VF Conditions : (i) (0.2 *Midterm 1+ 0.2 * Midterm 2 + 0.2*First 3 Homeworks) $\geq$40 (over 100)
(ii) Average grade of 2 Midterm exams should be $\geq$ 20 (over 100)
are required to take the final exam.
Otherwise VF (instead of FF) will be given.
No make-up exam (bütünleme) will be given for VF.

Attendance will not be recorded.

Webpage : http://ninova.itu.edu.tr/:
All lecture announcements, grades and assignments will be published in 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 and random vectors
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
		Deadline for homework #1
5	Oct 18	Prof. Unal away at conference (Uygulama)
6	Oct 25	probability density function, cumulative density functions (discrete and continuous)
7	Nov 1	Standard probability distributions, Expectation and variance, moments
7	Nov 3	**Midterm 1: THURSDAY, Time: 16:30-18:30**
8	Nov 8	**Semester break**
9	Nov 15	Multivariate random variables, joint/marginal/conditional distribution,
		Deadline for homework #2
10	Nov 22	Covariance, correlation, independence
11	Nov 29	Random vectors, multivariate normal distr.
12	Dec 6	Limit theorems: weak law of large numbers, central limit theorem
		Deadline for homework #3
13	Dec 13	**Midterm 2: TUESDAY, Time: 16:30-18:30**
14	Dec 20	Random processes, autocorrelation, autocovariance, stationarity (wide/strict sense)
15	Dec 27	Special random processes (Gaussian, Wiener, Markov, Poisson)
		Deadline for homework #4