ESE 520 Probability and Stochastic Processes

Exam2-Outline

1. Expectation of random variables and its properties.

2. Transformations of random vectors.

3. Covariance and correlation of two random variables and their properties. The covariance matrix of a random vector. The mean vector and the covariance matrix of a Gaussian random vector (non-degenerate).

4. Characteristic and moment generating functions of a random variable and their elementary properties including the relation to the moments of a random variable. The relation between a pdf and the characteristic function of a random variable including in terms of Fourier and inverse Fourier transforms.

5. Characteristic function of a random vector. The characteristic function of a Gaussian random vector.

6. Conditional expectation of one variable with respect to another: know the definition and how to calculate the expectation of one variable given the fixed value of another and how to use it to obtain the actual conditional expectation.

7. Conditional expectation as the best least squares estimate of one variable given the information obtained from another random variable. Know the formula how to find the best least squares estimate of one Gaussian random vector given the information coming from another Gaussian random vector.

8. Notions of convergence of random variables in probability and with probability one (almost everywhere). Weak and strong law of large numbers. The Chebyshev's inequality.

9. Convergence of random variables in distribution. Central Limit Theorem.