EECS 861 Overview

1. Foundations
    a. Probability
    b. Joint and Conditional Probability
    c. pdfs, joint & conditional
    d. Moments and their properties
    e. Covariance and correlation
    f. Characteristic and Moment Generating Functions
    g. Multivariate random vectors
    h. Multivariate Gaussian random vectors
        i. Conditional means
        ii. Conditional variances
        iii. $P(a<X_2<b|X_1=c)$
    i. Transformations of random variables
    j. Central Limit Theorem
    k. Bounds
2. Random Processes
    a. $X(t, \Lambda)$ 2-dimensional; sample functions and ensembles
    b. Characterization of Random Processes
        i. Joint distribution
        ii. Autocorrelation function
        iii. Power spectral Density
    c. Properties of Random Processes
        i. Stationarity (SSS and WSS)
        ii. Ergodicity
3. Operations on Random Processes
    a. Integration
    b. Time Averaging
    c. Sampling
    d. Quantizing
    e. Decomposition
    f. Filtering with linear time invariant systems
4. Example Random Processes
    a. Poisson
    b. ARMA
    c. Gaussian white noise
        i. Lowpass bandlimited Gaussian white noise
        ii. Bandpass bandlimited Gaussian white noise
5. Application of Random Processes
    a. Detection
        i. MAP
        ii. Bayes
        iii. Neyman-Person
6. Estimation
    a. MAP, MS, ML estimators
    b. Discrete time linear minimum mean square error estimator
    c. Noncausal Weiner Filters