EECS 861
Test 1
Topics Fall 2024

Probability

Axioms
Random Variables
- Discrete
- Continuous
- Mixed

Distributions
- Marginal, Joint, Conditional
- Bayes Rule

Expect Value
- Mean
- Variance
- Covariance
- Correlation coefficient

Characteristic and moment generating functions
Random vectors
- Mean Vector
- Covariance Matrix
- Multivariate Gaussian RVs
  - Linear Transformations of Multivariate Gaussian RVs
  - Linear transformation to form i.i.d. Gaussian components
  - Conditional Probabilities

Nonlinear Transformations of RVs
Bounds and Approximations
- Chebyshev Inequality
- Chernoff Bound

Sequences of RV's
- Central Limit Theorem

Random Processes

Definition
Autocorrelation function- $R_{xx}(t_1,t_2)$
Autocorrelation function $R_{XX}(\tau)$
- Properties of $R_{XX}(\tau)$
- Finding μ_X and σ_X given $R_{XX}(\tau)$

Example RPs
- Cosine RP
- Random Binary Waveform
- Markov Processes
- Gaussian Processes
  - Properties
  - $R_{XX}(\tau)$ and conditional probabilities

Stationarity
- SSS
- WSS