EECS 861
Topics for Test 2
Fall 2024

Power Spectral Density, $S_X(f)$

- E[X(t)]
- Var[X(t)]
- Bandwidth and correlation time

  Bandwidth- $B_e = \frac{1}{2}\frac{R_{XX}(0)}{S_x(0)}$

- % In-band power
- Random sequences

Properties of time averages- Integration of X(t)

- E[Time Average]
- Var[Time Average]

Independent Increments – Point Processes – Poisson Process

Variance of time averages

- For large 2BT, Number of uncorrelated samples in T(sec) ~ $2B_eT$

Ergodicity

Decomposition of RPs

Sampling of random processes

Quantizing

Major classes of RP

- Bandlimited White Noise
- ARMA, output = Y[n]
  - E[Y[n]]
  - Var[Y[n]]
  - $R_{YY}[k]$

Response of Systems to Random Inputs

- Discrete time systems
- Continuous time systems
- Output power spectral density
- Output autocorrelation functions
- Output S/N

Detection

- MAP rule
- Detector performance, $P_{\text{false alarm}}$, P_{Hit}, P_{miss}, P_{error}
- Bayes detection with cost
- Neyman-Pearson rule
- ROC