Power Spectral Density, $S_x(f)$
- $E[X(t)]$
- $\text{Var}[X(t)]$
- Bandwidth and correlation time
- % In-band power
- Random sequences

Properties of time averages- Integration of $X(t)$
- $E[\text{Time Average}]$
- $\text{Var}[\text{Time Average}]$

Independent Increments – Point Processes – Poisson Process

Bandwidth: $B_c = \frac{1}{2} \frac{R_{xx}(0)}{S_x(0)}$

Variance of time averages
- For large $2BT$, Number of uncorrelated samples in $T(\text{sec}) \sim 2B_c T$

Ergodicity
Decomposition of RPs
Sampling of random processes
Quantizing
Major classes of RP
- Bandlimited White Noise
- ARMA, output = $Y[n]$
  - $E[Y[n]]$
  - $\text{Var}[Y[n]]$
  - $R_{Y}[k]$

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