

ECE4601 SUMMARY REVIEW

1. Channel Capacity
 - a. AWGN Channel Capacity
2. Probability
 - a. Bayes' theorem
 - b. Moments, covariance, generating functions
 - c. Gaussian, multivariate Gaussian
3. Random Processes
 - a. Definition
 - b. Strict stationary and wide sense stationary
 - c. Ensemble averages and time averages
 - d. Moments and autocorrelations
 - e. Ergodic random processes
 - f. Power spectral densities
 - g. Filtered random processes
 - h. Crosscorrelation and crosscovariance
 - i. Gaussian random processes
 - j. Noise, white noise, filtered white noise, noise equivalent bandwidth
4. Matched Filters
5. Error Probability
 - a. Binary antipodal signaling
 - b. On-off keying
6. Orthogonal Expansions
 - a. Gram-Schmidt orthonormalization
 - b. Signal vectors
 - i. Energy
 - ii. Correlation
 - iii. Euclidean distance
7. Coherent signal detection
 - a. Correlation detector
 - b. Matched filter detector
 - c. Minimum distance decisions
8. Error Probability
 - a. Binary (pairwise) error probability
 - b. Voronoi regions
 - c. Union bound
 - d. Simplified upper bounds
9. Binary modulated signals
 - a. Binary PSK
 - b. Binary FSK
 - i. Orthogonal FSK signals

- 10. Non-binary signals
 - a. M-PAM
 - b. M-QAM
 - i. Error probability
 - c. M-PSK
 - d. M-FSK
- 11. Intersymbol Interference
- 12. Nyquist Pulse Shaping
 - a. Conditions for ISI-free transmission
 - b. Ideal Nyquist pulse
 - c. Raised cosine and root raised cosine pulse shaping
- 13. Partial Response Signals
 - a. Duobinary signals
 - b. Precoding
 - c. Modified duobinary signals
- 14. Noncoherent Detection
 - a. Square-law detector
 - b. Non-coherent binary FSK
 - c. Error probability of non-coherent binary FSK
- 15. Differentially coherent detection
 - a. Differential PSK (DPSK)
 - b. Error probability of DPSK