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. Noncoherent detection
    a. Noncoherent orthogonal FSK
    b. Noncoherent ASK
14. Block Codes
    a. Generator and parity check matrix
    b. Systematic codes
    c. Weight distribution and minimum distance
    d. Error detection and correction
    e. Standard array decoding
    f. Syndrome decoding
15. Convolutional Codes
    a. Generator sequences
    b. State diagram
    c. Augmented state diagram and transfer function
    d. Viterbi algorithm