ECE6604 SUMMARY REVIEW

1. Introduction
   a. Frequency reuse and the cellular concept
   b. Path loss
   c. Co-channel interference
   d. Link budget
   e. Interference margin, shadow margin, handoff gain.
   f. Coverage and capacity
2. Flat fading
   a. Propagation mechanism
   b. Envelope distribution
      i. Rayleigh fading
      ii. Rician fading
      iii. Nakagami fading
   c. Received envelope autocorrelation
   d. Doppler spectrum
   e. Isotropic and non-isotropic scattering
   f. Space-time correlation function
      i. At the mobile station
      ii. At the base station
   g. Level crossing rates and fade durations
3. Wideband channel models
   a. Propagation mechanism
   b. Transmission functions
   c. Statistical correlation functions
   d. Wide sense stationary uncorrelated scattering (WSSUS) channels.
   e. Power delay profiles
4. Mobile-to-mobile channels
5. Fading simulators
   a. IIR Filtered white noise
   b. Sum-of-sinusoids
      i. Clarke's model
      ii. Jakes' Method
         1. Auto- and cross-correlations
      iii. Improved deterministic and statistical model
   c. COST207 and COST 259 models
   d. Baud-spaced channel models
6. Path Loss Models
   a. Okumura-Hata model
   b. CCIR model
   c. Lee's Area-to-area model
   d. COST231-Hata model
   e. COST231-Walfish-Ikegami LoS and NLoS model

7. Shadowing and Co-channel interference
   a. Shadow distribution
   b. Shadow simulation
   c. Sums of log-normal random variables
   d. Fenton-Wilkinson approximation
   e. Outage with single and multiple log-normal interferers
   f. Outage with Rician/multiple Rayleigh interferers
8. Modulation Techniques
   a. Linear modulation – QAM, QPSK, π/4-QDPSK
   b. Pulse shaping – root raised cosine and raised cosine.
   c. Multicarrier modulation and OFDM
   d. Continuous phase modulation
      i. Excess phase and tilted phase
      ii. Phase tree, trellis and state diagrams
      iii. CPFSK
      iv. MSK
      v. GMSK
      vi. LGMSK
   e. Orthogonal modulation with Walsh codes
   f. Orthogonal multipulse modulation
9. Power Spectrum of Digitally Modulated Signals
   a. Power spectrum of bandpass signals and their complex envelope
   b. Continuous and discrete spectra
   c. Effects of pulse shaping and data correlation
   d. Power spectrum of single-carrier modulation techniques
   e. Power spectrum of OFDM
10. Digital modulation on flat fading channels
   a. coherent detector
      i. correlation detector
      ii. matched filter detector
      iii. vector representation of received signals
   b. Maximum a posteriori probability receiver
   c. Maximum likelihood receiver
   d. Error probability for slow flat fading channels
11. OFDM on AWGN and ISI Channels
   a. OFDM cyclic guard interval and ISI
12. Multi-antenna techniques
   a. Diversity and diversity combining
      i. Maximal ratio combining
         1. MRC performance
      ii. Selection and switched combining
         1. SC performance
      iii. Optimal combining
         1. Optimal combining performance
   b. MIMO Channels
      i. i.i.d. Model

  ii. Kronecker Model
  iii. Weichselberger Model
 c. Alamouti's transmit diversity scheme
  i. Performance
 d. Massive MIMO
  i. Pilot contamination
  ii. Reverse link performance
  iii. Forward link performance