Signal and Image Processing (SIP)

Students taking the MS Written Comprehensive Exam with a SIP depth topic will be evaluated with a problem based on 251A (Digital Signal Processing I). The required materials are the class notes and assigned book:

- Oppenheim and R. Schafer. *Discrete-Time Signal Processing*, 3rd Edition (Prentice-Hall, 2010).

The materials to be covered are:

1. Discrete Random Sequences
   a. Auto- and cross-correlation
   b. Characterization of random sequences passed through a linear system
2. Conventional FFT-Based Spectral Estimation
   a. Periodogram
   b. Modified periodogram
   c. Welch's method
   d. Bias and variance properties
   e. Proper normalization for units of power spectral density and power
3. Linear Mean-Squared Estimation
   a. Wiener filtering problem and the orthogonality principle
   b. One-step linear prediction
   c. Recursive solution of the normal equations
   d. Lattice filter structures
4. High Resolution Spectral Analysis
   a. Model-based spectral estimation
   b. Autoregressive (AR) process generation
   c. Linear prediction approach to AR model identification
   d. AR model order estimation