6.02 Spring 2009 Lecture #14

- FDM and Data
- Spectrum and Discrete Fourier Transform
- DFT Examples
- Rise Time and Spectrum
Simplified Big Picture

- **Frequency Division Multiplexing Strategy**
  - Represent each channel with a different frequency
    - For LTI systems, frequencies do not mix
      \[ x[n] = A_1 e^{j\Omega_1 n} + ... + A_K e^{j\Omega_K n} \]
      \[ y[n] = H(e^{j\Omega_1}) A_1 e^{j\Omega_1 n} + ... + H(e^{j\Omega_K}) A_K e^{j\Omega_K n} \]
  - Use Filters to Separate Into different Channels
Channel 5, 8 Zeros Filter
Cosine in Time, 2 real nonzero DFT values
Sine in Time, 2 Imaginary DFT values
Constant in Time, one real nonzero DFT value
One Sample in Time, Constant DFT
Medium Even Pulse, Real decaying DFT
Wider Even Pulse, Faster Decay
010010 Bit sequence with Fast Rise
010010 Bit sequence with Slow Rise