Tentative Syllabus

Week 1
Thursday 9/24 Course Policies, Overview of Imaging Modalities; CT example

Week 2
Tuesday 9/29 X-rays: Basic Physics; Contrast; Source and object magnification.
Thursday 10/01 X-ray imaging solution; Delta functions and signal expansions; impulse response.

Week 3
Tuesday 10/06 Review Signal Expansions; Linearity; Superposition; Shift Invariance; Convolution
Thursday 10/08 X-ray imaging equation; Begin CT;

Week 4
Tuesday 10/13 Radon Transform; Backprojection; Begin Fourier Transforms;
Thursday 10/15 Fourier Transform theorems; Modulation Transfer Function.

Week 5
Tuesday 10/20 Convolution Theorem; CT: Projection Slice Theorem;
Thursday 10/22 Filtered back projection; Sampling: 1D and 2D sampling, Whitaker-Shannon sampling theorem, aliasing; Application to CT

Week 6
Tuesday 10/27 MRI: Overview, Basic physics, Bloch Equation MRI: Gradients, Signal Equation, Spin-warp pulse sequence
Thursday 10/29 Sampling Reviewed; MRI: Resolution and sampling requirements

Week 7
Tuesday 11/03 MRI: Slice Selection; RF Pulse design
Thursday 11/05 MRI: Image Contrast and Noise

Week 8
Tuesday 11/10 MRI: Fast Imaging Methods
Thursday 11/12 MRI: Advanced Image Reconstruction

Week 9
Tuesday 11/17 MRI: Applications
Thursday 11/19 Ultrasound: Overview and basic physics

Week 10
Tuesday 11/24 Ultrasound: Beam formation; Scanning; Sampling Reviewed
Thursday 11/26 NO CLASS: Thanksgiving Holiday

Week 11
Tuesday 12/01 Ultrasound: Phased Array systems, Doppler
Thursday 12/03 Emerging Modalities

Week 12
Finals Week Final project presentations (8 am to 11 am) on day of scheduled final.