

**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.