

Tentative Syllabus (Subject to Change)

Week 1

Thursday 9/23 Course Policies, Overview of Imaging Modalities; CT example

Week 2

Tuesday 9/28 X-rays: Basic Physics; Contrast; Source and object magnification.
Thursday 09/30 X-ray imaging solution; Delta functions and signal expansions; impulse response.

Week 3

Tuesday 10/05 Review Signal Expansions; Linearity; Superposition; Shift Invariance;
Convolution
Thursday 10/07 X-ray imaging equation; Begin CT;

Week 4

Tuesday 10/12 Radon Transform; Backprojection; Begin Fourier Transforms;
Thursday 10/14 Fourier Transform theorems; Modulation Transfer Function.

Week 5

Tuesday 10/19 Convolution Theorem; CT: Projection Slice Theorem;
Thursday 10/21 Filtered back projection; Sampling: 1D and 2D sampling, Whitaker-Shannon sampling theorem, aliasing; Application to CT

Week 6

Tuesday 10/26 MRI: Overview, Basic physics, Bloch Equation
Thursday 10/28 MRI: Gradients, Signal Equation, Spin-warp pulse sequence
Sampling Reviewed; MRI: Resolution and sampling requirements

Week 7

Tuesday 11/02 MRI: Slice Selection; RF Pulse design
Thursday 11/04 MRI: Image Contrast and Noise

Week 8

Tuesday 11/09 MRI: Generalized Reconstruction; Parallel Imaging
Thursday 11/11 **NO CLASS; Veteran's Day Holiday**

Week 9

Tuesday 11/16 MRI: Applications to Functional Brain Imaging
Thursday 11/18 MRI: Applications to Brain Connectivity

Week 10

Tuesday 11/23 EEG; Simultaneous EEG and Functional MRI
Thursday 11/25 **NO CLASS: Thanksgiving Holiday**

Week 11

Tuesday 11/30 MEG
Thursday 12/02 Integration of modalities; Emerging Modalities

Week 12

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