

PHYS 333: Principles of Medical Imaging

Over the past decades, advances in diagnostic medical imaging have led to significantly improved patient outcomes. This course provides the foundation to help students understand the theory and applications of medical-imaging modalities (X-ray, CT, ultrasound, and MRI), with an emphasis on neuroimaging. Students will study the process of image formation from a signals and systems perspective and will learn the tools necessary to evaluate the performance of diagnostic imaging systems and will thus identify common sources of imaging artifacts. Through group activities and in-class discussions, students will be encouraged to apply their critical-thinking skills to current challenges in medical-imaging research.

Learning Objectives

- Explain how medical images are formed for each imaging modality
- Characterize the performance of diagnostic imaging systems using parameters, such as spatial resolution, signal-to-noise ratio, point spread function, etc.
- Describe and compare common image reconstruction algorithms
- Identify potential sources of imaging artifacts, such as signal bandwidth limitations, digitization, faulty hardware components, physiological motion, etc.
- Evaluate the strengths and weaknesses of different imaging modalities for specific clinical applications

Credits: 2

Class Type: Graduate Course

Prerequisites:

calculus; physics (mechanics, optics, and electromagnetism).

Program: Biochemistry, Chemistry, Pharmacology, and Toxicology