



DS 260 JAN 3:0

Medical Imaging

Instructor

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Teaching Assistant

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Department: Computational and Data Sciences

Course Time: Tuesday, Thursday 8:30 - 10 AM

Lecture venue: CDS 202

Detailed Course Page:

Announcements

Brief description of the course

Gives introduction, system building and physics aspects of Medical Imaging

Prerequisites

Basic knowledge of system theory and Consent from the instructor.

Syllabus

X-ray Physics, interaction of radiation with matter, X-ray production, X-ray tubes, dose, exposure, screen-film radiography, digital radiography, X-ray mammography, X-ray Computed Tomography (CT). Basic principles of CT, single and multi-slice CT. Tomographic image reconstruction, filtering, image quality, contrast resolution, CT artifacts. Magnetic Resonance Imaging (MRI): brief history, MRI major components. Nuclear Magnetic Resonance: basics, localization of MR signal, gradient selection, encoding of MR signal, T1 and T2 relaxation, k-space filling, MR artifacts. Ultrasound basics, interaction of ultrasound with matter, generation and detection of ultrasound, resolution. Doppler ultrasound, nuclear medicine (PET/SPECT), multi-modal imaging, PET/CT, SPECT/CT, oncological imaging, medical image processing and analysis, image fusion, contouring, segmentation, and registration.

Course outcomes

Medical Imaging is an interdisciplinary subject that requires understanding of physics, technology, and practice of each medical imaging modality. This course will cover physics and technology part. Homework, presentations, and exams will test your understanding of physics and technology aspects. Project will involve development of a compact solution to current problem/s in medical imaging, such that it will enhance your understanding of challenges related to medical imaging.

Grading policy

Homeworks: 15%

Class Presentations: 10%

Midterm Exam: 25%

Project: 25%,

Final Exam: 25%

Assignments

Resources

1. The Essential Physics of Medical Imaging, J. T. Bushberg, J. A. Seibert, E. M. Leidholdt Jr., and J. M. Boone, Second Edition, Lippincott Williams & Wilkins Publishers, 2002.
2. Physics of Radiology, A. B. Wolbarst, Second Edition, Medical Physics Publishing, 2005.