

# BIOEN 5401 Medical Imaging Systems

## **Instructor:**

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## **Grading Scheme:**

Homework problem sets*	40%
Exam 1 (X-ray / CT / NM)**	30%
Exam 2 (US / MRI)**	30%

\* *Students are presumed to have access to the Internet and Matlab.*

\*\* *Make-up quiz/exam requires advance or official excuse.*

## **Required Textbook:**

Medical Imaging Signals and Systems by J. L. Prince and J. M. Links, Pearson Prentice Hall, 2006, ISBN 0130653535.

## Preliminary Course Outline

1. Introduction and Linear Systems Review
2. Physics of Radiation
  - a. X-ray generation
  - b. Interactions with matter
  - c. Detection
3. Projection Radiography
  - a. Instrumentation
  - b. Image formation
  - c. Image quality
4. Computed Tomography
  - a. Instrumentation
  - b. Image formation
  - c. Image quality
5. Physics of Nuclear Medicine
  - a. Nuclear decay
  - b. Statistics of nuclear decay
6. SPECT and PET
  - a. Instrumentation
  - b. Image formation and quality
  - c. Radiotracers and applications
7. Review and Exam 1
8. Physics of Ultrasound
  - a. Wave equation
  - b. Doppler effect
9. Ultrasound Imaging
  - a. Instrumentation
  - b. Scan modes
10. Physics of MRI
  - a. Formation of magnetization
  - b. Spin motion
  - c. Relaxation
11. MRI
  - a. Instrumentation
  - b. K-space and pulse sequencing
  - c. Image quality
12. Review and Exam 2