THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Fundamentals of Medical Imaging

BIOMEDE 5170

Credit Hours:
3.00 - 3.00

Course Levels:
Undergraduate (1000-5000 level)
Graduate (5000-8000 level)

Course Components:
Lecture

Course Description:
Fundamentals of mathematical and physical principles and signals and systems concepts involved in medical imaging modalities of x-ray, computed tomography, magnetic resonance and ultrasound.

Prerequisites and Co-requisites:
Prereq: Math 2177, or Grad standing, or permission of instructor.

Course Goals / Objectives:
- 1. Students will be able to apply the fundamentals of mathematical techniques (convolution and Fourier theory) to represent signals and systems (a:2, e:1).
- 2.Students will be able to describe the physical principals, applications and limitations of bioimaging modalities (a:2, e:1 i:1, l:1).
- 3.Students will be able to identify (MRI, CT, PET, ultrasound) bioimaging instrumentation, interpret images and explain differences in imaging equipments for small animal vs. clinical applications (d:2, g:1, m:1).

Course Topics:
- Module 1: Mathematical representation of signals and systems: fourier transform and convolutions, concepts of resolution, contrast, image quality.
- Module 2: X-ray radiography: X-ray production, interaction, detection, Beer-Lambert law, radiation safety
- Module 3: CT and nuclear imaging: radon transform and backprojection, radionucleotides, SPECT/PET
- Module 4: Ultrasound: acoustic waves production, interaction, detection, A, B, C, M-modes, Doppler ultrasound.
- Module 5: MRI: nuclear spin, T1 and T2 relaxation, gradients, spin-echo and inversion recovery pulse sequences.

Designation:
Elective