

BMED 4786

Medical Imaging Systems: Physics, Engineering, and Applications

Instructor(s):

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Meeting Times and Locations: Tuesday and Thursday, 4:30 pm - 5:45 pm, UAW 1232

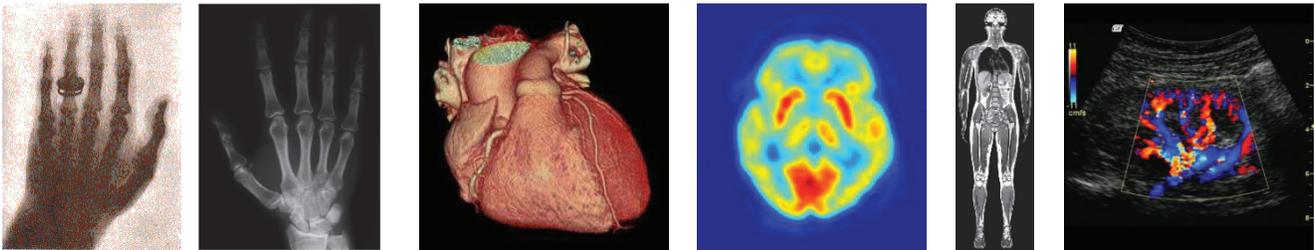
Catalog Description: Introduce major biomedical and clinical imaging modalities including X-ray radiography, computed tomography (CT), nuclear medicine (SPECT and PET), magnetic resonance imaging (MRI), and ultrasound.

Prerequisites: BMED 3110

Course Objectives: Introduce principles, approaches and applications of X-ray and computed tomography, nuclear medicine, magnetic resonance imaging and ultrasound imaging.

Course Description: This course is an introduction to imaging systems. The main goal of this course is to expose you to the world of medical and biomedical imaging with emphasis on principles, approaches and applications of each modern imaging modality. For each imaging modality, the following approach is used: 1) describe basic physics; 2) develop a system model of the imaging system; 3) derive imaging equations; 4) describe hardware and software; 5) analyze signal, noise (sources), contrast, and primary artifacts; 6) discuss biomedical and clinical applications.

The course will be divided into three modules. The first module will cover X-ray imaging and Nuclear Medicine including computed tomography (CT), single photon emission computed tomography (SPECT), and positron emission tomography (PET). In the second part of the course, we will focus on nuclear magnetic resonance covering magnetic resonance imaging (MRI) and MR spectroscopy (briefly). In the final part of the course, ultrasound imaging will be introduced. Overall, fundamental similarities between the imaging equations of the different modalities will be stressed, and vital differences between different modalities will be discussed.



Textbooks: Extensive lecture notes, review papers, tutorials, software, and other materials are available on the class web site: <http://canvas.gatech.edu/>

Teaching Approach: The students will attend three lectures (3 hours). There will be 4 homework assignments, several laboratories or field trips, and 3 projects covering all imaging modalities. In addition, there will be three midterm and final exams.

Grading & Evaluation: The course grade will be determined by homework (25%), class projects (30% total, 10% each), and three midterm examinations (45% total, 15% each).

Further Courses: After successful completion of this course, students interested in Medical Imaging and Instrumentation are encouraged to take:

BMED 8813 MU - Medical Ultrasound

BMED 8813/4813 - OM Optical Microscopy

ME 6449 - Transducers and Signals

BMED 6210 - Magnetic Resonance Imaging

BMED 6780 - Medical Image Processing