BMED 4813-MIS
Medical Imaging Systems: Physics, Engineering, and Applications

Instructor(s):
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Meeting Times and Locations: see course schedule

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. This course is intended for undergraduate students interested in medical imaging. No prior imaging experience is required.

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.

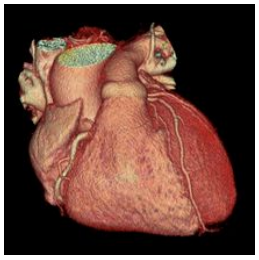
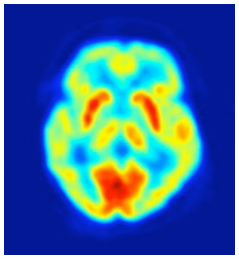
Prerequisites: BMED 3110 or experience with signal analysis.

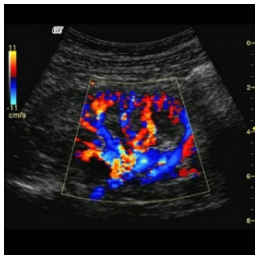
Other Prerequisites:
Desire to learn, common sense, being able to enjoy challenges, ability to work alone and in a team, curiosity, aptitude to modify and control sleep habits, and, finally, some knowledge of digital signal processing and programming in MATLAB.

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

Course Description:
This course is an introduction to imaging systems. The main objective 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 introduce ultrasound imaging. In the second part of the course, we will focus on X-ray imaging and Nuclear Medicine including computed tomography (CT), single photon emission computed tomography (SPECT), and positron emission tomography (PET). In the final part of the course, (nuclear) magnetic resonance imaging (MRI) and MR spectroscopy will be covered. Overall, fundamental similarities between the imaging equations of the different modalities will be stressed, and vital differences between different modalities will be discussed.





Textbook and course materials: Content will be based on extensive in-class and lecture notes. Additional resources will be provided on the class web site: http://canvas.gatech.edu/

Evaluation: Students will demonstrate their ability to apply and extend fundamental principles in 4 homework assignments, 3 projects, and 3 exams, each covering one module of the course.

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