BME6180: Principles of Magnetic Resonance Imaging

Course Syllabus

Instructors:

Professor Yi Wang Email: yw233@cornell.edu

Teaching Assistants:

TBD

Lecture hours:

Mon & Wed, 2:55-4:10pm, Room TBD.

Course Overview:

The prerequisite for this course includes calculus based physics and knowledge of Fourier transformation. After a brief overview of all major medical modalities: x-ray, CT, MRI, SPECT/PET, and US, this course will focus on the formulations of spatial encoding and image contrasts as exemplified in MRI. The inverse problem between detected signal and image source will be discussed and the concepts of image resolution, SNR, and scan time will be illustrated quantitatively.

The students will have hands-on experience to scan phantoms at Cornell MRI facility.

The students will also attend field trips to the Cornell University Hospital for Animals and Cayuga Medical Center (Weill Cornell Medical Center for students at NYC campus) to observe imaging in clinical practice.

Textbooks:

Principles of Magnetic Resonance Imaging by Yi Wang at www.createspace.com/4001776 (Required)

Course Schedule:

The first few weeks of the course will be an overview of medical imaging systems.
The remaining weeks of the course will cover the mathematical descriptions of these imaging systems. There will be field trips to local hospitals and MRI facilities.

Grading :

Homework:	50%
Midterm Exam:	25%
Final Project:	25%

Homework:

There will be one homework set for each topic covered in the course. It will either be in the form of a problem set, a MATLAB-based simulation lab, or a combination of both.

Midterm Exam:

There will be one midterm exam sometime in late October or November.

Final Project:

There will be a project paper (in place of a final exam). Students can choose your own topic. The materials for the chosen project consist of a focused and detailed examination of a technique and its clinical applications. For example, a student can choose an SSFP imaging sequence and review its technical details and clinical applications. Students can also choose a clinical oriented topic on imaging a specific disease. For example, a student can choose to review all imaging techniques used in brain function. The method of executing the final project consists of literature search and/or computer simulations.

The final paper length is flexible. A substantial description of the project is expected and may require several thousands of text words, in additional to the necessarily images.

The final paper is due at the midnight of the last day of final exam of the semester.

Grade Disputes:

Grade disputes on homework will be settled at the discretion of the TA. Grade disputes on the semester exams will be settled at the discretion of Professor Wang. In both cases, the disputed problem will be re-graded, making it possible for a student to receive a lower score.

To dispute an exam grade, students must explain **in writing** and staple this to the front of their exam. Prof. Wang will then re-grade your exam.