

Principles of Medical Imaging - Fall 2009
(Cornell University, Ithaca Course# BME 6180)

Course Syllabus

Instructors:

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Teaching Assistants:

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Lectures⁺:

Mondays and Wednesday, 08:40 AM - 09:55 AM

⁺Lectures will be delivered from Ithaca via Videoconference

Location:

Weill Greenberg Building
1305 York Avenue, at 70th Street
10th Floor, Clinical Skills Center, Room 10.11

Course Overview:

This course can be taken for one or three credits. The one-credit version requires attendance for the first five weeks of lectures that covers the non-mathematical descriptions of imaging principles. The students must attend field trips to the Cornell University Hospital for Animals (Weill Cornell Medical Center for students at NYC campus) to observe imaging in clinical practice.

The three-credit version requires attendance for the entire semester. The prerequisite for the 3-credit enrollment includes calculus based physics and knowledge of Fourier transformation. After the first five weeks, the remainder of the course focuses on mathematical descriptions of imaging principles. The formulations of spatial encoding and image contrasts are presented for all major medical modalities: x-ray, CT, MRI, SPECT/PET, US. 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 analytically and quantitatively for each of these modalities.

Textbooks:

For 1 credit:

Physics of Radiology by Anthony B Wolbarst and Gordon Cook (Recommended)

For 3 credits:

Fundamentals of Medical Imaging by Paul Suetens (Required)

Course Schedule:

The first five weeks of the course will be an overview of medical imaging systems.

The remaining eight weeks of the course will cover the mathematical descriptions of these imaging systems.

Grading :

Homework:	35%
Midterm Exam:	25%
* <i>Term Paper</i> :	25%
Final Project:	15%

* *one-credit students will be graded solely on the term paper.*

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 between mid-November and Thanksgiving.

Term Paper:

After the first five weeks, every student is expected to write a 2-4 page report on one of the imaging modalities discussed in class. For those taking the class for one credit, the course grade will solely depend on the term paper.

Final Project:

For students enrolled for 3 credits, there will be a project paper (in place of a final exam). You can choose your own topic. The material for your project consists of a focused and detailed examination of a technique and its clinical applications, in a manner similar to the Suetens textbook. For example, you can choose an SSFP imaging sequence in MRI, review its technical details and clinical applications. You can also choose a clinical oriented topic on imaging a specific disease. For example, you can choose to review all imaging techniques used in diagnosing and treating ischemic heart disease. Your method of investigation consists of literature search and/or computer simulations.

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 you to receive a lower score.

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