APMA 990 – Special Topics

Mathematical and Computational Aspects of Medical Imaging

Graduate Course in the Department of Mathematics, Spring 2007 (1071)

This course will touch on a number of mathematical and computational topics arising in medical imaging. Although many of these topics are fundamental to medical imaging, this course is not a comprehensive introduction to the subject. In particular, we will concentrate on problems related to image reconstruction.

Recommended text: Charles L Epstein, **Mathematics of Medical Imaging**
Prentice Hall; 1st edition **ISBN:** 0130675482

Outline

1) Introduction
    i) Image Modalities (CT, MRI, PET, SPECT)
    ii) The Reconstruction Problem
    iii) Radon Transform, X-Ray Transform
2) Analysis and Signal Processing Background
    i) Fourier Transform
    ii) Convolution
    iii) Radon Transform
    iv) Fourier Series and Discrete Fourier transform
    v) Sampling
    vi) Filters
3) Reconstruction
    i) Fourier Based Reconstruction
    ii) Algebraic Reconstruction Techniques
    iii) Probabilities and the ML-EM Algorithm
4) Ill-posed problems. Regularization. Dynamic Imaging.

Grading: 20% participation, 40% homework, 20% quiz, 20% project

Lectures:	Wednesday	10:30 – 12:10 8500 Tasc 2
	Friday	10:30 – 12:10 8500 Tasc 2 (note day and room change!)

First class: Wednesday, January 10, 2007
Quiz: Friday, March 16 (Tentative Date!)
Project: Due Wednesday, March 28 (Tentative Date!)