

DEPARTMENT OF PHYSICS
LEHIGH UNIVERSITY

Physics 196: Physics of Medical Imaging II
Spring Semester 2017

SYLLABUS (Please read carefully)

Physics 196 follows Physics 195 (Physics of Medical Imaging II). Like PHY 195, PHY 196 emphasizes ideas and concepts of modern physics that are used in several medical imaging techniques. In addition to a description of the physical principles behind some imaging techniques, which will serve as a continuation of the quantum physics and electromagnetism that was introduced in PHY 13, we will learn how experimental data are collected and analyzed to create the image that a physician will eventually interpret for clinical purposes.

During this semester we will learn mostly about radiography (X-ray imaging) and CT-scans. The last part of the semester will be a continuation of the study of Nuclear Magnetic Resonance (NMR) we started in PHY 195; we will learn how sequences of pulses can be used to get the three-dimensional image of the human body collected during Magnetic Resonance Imaging (MRI), and how image contrast can be improved with contrast agents. Depending on the time left, before returning to NMR, we will learn the basics of nuclear imaging (for example PET- and SPECT-scans).

Instructor

Prof. Paola M. Cereghetti
cereghetti@lehigh.edu
Office: LL 410

Office hours: I will be available after each class. If you need a lot of help, please e-mail me in advance – preferably the day before, – this way I will be able to get organized and stay at least until 7pm. Thank you!

Class Meetings

Monday and Wednesday: From 5:10pm to 6:00pm in room LL512
We will meet until 7:00pm a couple of times for student presentations. To be discussed.

Textbook and Class Notes

No textbook is required, I will be teaching from a variety of sources, and I will provide the material. Two interesting books are: 1. *Physics of Medical Imaging (3rd. edition)* by Jerrold T. Bushberg *et al.*, and 2. *Introduction to Physics in Modern Medicine (2nd. edition)* by Suzanne Amador Kane *et al.* The second book is more introductory, but excellent in its simplicity and clarity. Note that this is a two credit class, and that it will be literally impossible to cover all the topics you can find in these books!

Homework

The amount of work will be geared towards a 2 (or 3) credit class. Homework will be assigned every lecture and will be due the following one; it will be in the form of problems to clarify the material, as well as reading assignments to prepare for the following class.

Attendance

Attendance is mandatory and will count towards your course grade. Should you miss a class for a valid reason or other extenuating circumstances: 1. Please let me know, possibly in advance, an e-mail is enough 2. Talk with me to discuss your absence and to make sure you understand the material you missed.

Exams and Presentation(s)

There will be 2, mainly multiple choice, exams (on Monday, March 6, 2017, and on Monday, April 17, 2017). To simplify your studying, I will provide a summary of concepts to know. There will be no final exam, instead you will do research about a special topic related to a particular imaging technique, and prepare a paper and a presentation (minimum 15 minutes, maximum 25 minutes).

Students Taking the 3-credit Course

We will meet in a smaller group to discuss the additional work required.

Students Who Did not Take PHY 196

In the first weeks of the semester, we will meet in a smaller group to discuss how to catch up the NMR concepts necessary to understand MRI.

Grading:

Your numerical grade in the course will be determined as follows:

Attendance	10
Homework	20
2 Hour Tests	20
Presentation	20

Total	70

Accommodations for Students with Disabilities:

If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, Williams Hall, Suite 301 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

The Principles of Our Equitable Community:

Lehigh University endorses The Principles of Our Equitable Community [http://www.lehigh.edu/~inprv/initiatives/PrinciplesEquity_Sheet_v2_032212.pdf]. We expect each member of this class to acknowledge and practice these Principles. Respect for each other and for differing viewpoints is a vital component of the learning environment inside and outside the classroom.