

Professor: Scott M. LaBrake, Ph.D. Course: Physics 210 Fall 2009
Email: labrakes@union.edu Phone: 6053 & 6562
Office Hours: MWF: 1:00^{pm} – 3:00^{pm}; Th 9:00^{am} – 10:00^{am} Office: S&E N310 & N008B
By Appointment
Web: <http://minerva.union.edu/labrakes>

Required Text: *Introduction to Physics in Modern Medicine*, 2nd Ed. by Suzanne Amador Kane

Recommended Text: *Physics of Radiology*, 2nd Ed. By Anthony Wolbarst

Other References:

Life Science Applications for Physics, by J. Faughn

Physics of the Body, 2nd Ed., by J. Cameron, J. Skofronick, & R. Grant

Biomedical Applications of Intro. Physics, by J. Tuszynski & J. Dixon

Physics in Biology and Medicine, by P. Davidovits

Human Physiology, 5th Ed., By L. Sherwood

Clinically Oriented Anatomy, 5th Ed., by K. Moore & A. Dalley

Course Description:

This course introduces the technologies used in modern medicine and the basic physical principles that underlie them. Topics will include: laser surgery, ultrasound imaging, laparoscopic surgery, diagnostic x-ray imaging, nuclear medicine, computed tomography (CAT) scans, magnetic resonance imaging (MRI) scans, and radiation therapy. Safety issues involved in the use of each technique will be considered in depth, and discussions will include societal implications of the growing use of technology in medicine.

Specific medical applications discussed will include (but are not limited to): colon cancer screening, arthroscopic shoulder surgery, laser eye surgery, dermatological laser surgery, obstetrical ultrasound, cardiovascular ultrasound, mammography, osteoporosis screening, cancer radiation therapy, and applications of PET and MRI brain scans in neuroscience.

Attendance:

While attendance is not mandatory, it is expected that you will attend class on a regular basis. Material will be covered in a rapid fashion over the fall term; covering about one chapter per week. Past experience dictates that your success in this class is directly proportional to your attending. There will be several guest lectures by experts from different areas of medicine and medical physics. The dates listed for the speakers are tentative and subject to change, but I will keep you updated. These lectures will usually be held on Fridays during class so courtesy dictates that you will try not to miss these.

Course Grade:

Your course grade will be determined based on a professional judgment of your work on the following scale:

- Exams 40% (Mid-term Exam 15% and a Final Exam 25%)
- Research Paper 25%
- Poster Presentation 15%
- Homework 20%

Homework:

The homework assigned is representative of the topics that will be highlighted throughout the term. It is strongly advised that you do the suggested homework as noted in class as well as other relevant problems, of your choosing, on the covered topics from the text.

- The homework will consist of problem solving as well as short answer written responses (remember you're getting WAC credit.)
- In general, several homework problems will be assigned each night (from Wednesday to Tuesday) and the problems will be collected during class the following Wednesday. The solutions to the problems will be posted on my website after class on Wednesday.
- Once the homework solutions have been posted, late homework will be accepted and will be assigned a value of 50% of the points for the assignment.
- I would advise you talk to me, your classmates, or just ponder the question for a day or so. *Too often students' confuse reading the solution to the problem with their actual understanding of the problem.*
- The mathematical complexity of this course is limited to your ability to do algebra as well as basic mathematical operations.

Research Paper:

The research paper gives you an opportunity to investigate a topic that interests you from the field of medical physics. A partial list of topics will be provided for you to peruse and choose from if you like. However, you are of course free to choose your own topic in consultation with me. I'm going to limit the topics to one per person, unless there is significant difference between topics. Since you will be getting WAC credit this paper should be a significant writing project.

Poster Presentation:

From your completed paper you will create a poster and the poster should contain your entire paper, or at least a significant aspect of the paper. The posters will be presented at a mini-symposia held on the last day of class probably in the Olin Rotunda, so make sure you invite your fiends. A power-point template (which is a single slide that when printed will be approximately 32"x42") will be provided for you to use. We have a poster printer in the department to print your posters and since the poster session will be during lunch we will order lunch for all of you.

Proposed Course Schedule:

Week #1

- Introduction and Optics – Applications to endoscopic and arthroscopic surgery

Week #2

- Laser surgery – Applications in ophthalmology, dermatology, general surgery and photodynamic therapy.
- Research paper topics should be chosen

Week #3

- Ultrasound – Applications in obstetrics and cardiology

Week #4

- X-ray imaging – Applications in mammography and osteoporosis screening

Week #5

- X-ray imaging – CT scans.
- Rough draft of research paper due
- Guest lecture by *Dr. Bill Moore, MD*, Department of Radiology, Stony Brook Hospital

Week #6

- Mid-term exam – probably a take home exam; I'll be in Hawaii for a conference.
- I'll also read your research drafts this week while I fly and I'll return them when I come back.

Week #7

- Nuclear Medicine – Applications in radionuclide imaging, bone scans, PET scans and imaging of the brain

Week #8

- Nuclear Medicine – Applications in radionuclide imaging, bone scans, PET scans and imaging of the brain
- Radiation medicine and safety – Applications in cancer therapy.

Week #9

- Radiation medicine and safety – Applications in cancer therapy.
- Guest Lecture by *Dr. Steve Amadon, Ph.D.*, Department of Nuclear Medicine, Brocton Hospital
- Final Research Papers Due

Week #10

- Magnetic resonance Imaging – Applications to sports medicine, breast and brain imaging.
- Guest Lecture by *Dr. Sue Koler, Ph.D.*, Department of Chemistry, Union College
- Poster Presentations on the last day of class
 - o The time will be during the common hour to maximize outside attendance
 - o Lunch will be provided