The Physics of Modern Medicine

Applications in Imaging, Surgery, & Therapy

Winter 2017
Course Outline

• Lasers in Medicine — Light, Surgery & Therapy

• Ultrasound — Sound, Diagnosis & Therapy

• X-rays in Medicine — Light & Interaction of Radiation and Matter, Diagnosis & Treatment

• Nuclear Medicine — Interaction of Radiation and Matter, Diagnosis, Surgery, Therapy, & Treatment

• Radiation Safety

• Magnetic Resonance Imaging — Magnetism, Diagnosis

• Guest Lectures — Special Topics
Course Outline

- Lasers in Medicine
- Ultrasound
Course Outline

- X-rays
- Nuclear Medicine
- Radiation Safety
- MRI
Motivation

• Review physics & the connection between physics and medicine.

• To use physics to probe & study the body.

• To learn how to produce images of the body using technology and the underlying physics.

• To acquaint you with the “tools of the trade” that you’ll encounter in the future.

• To introduce you to professionals in the field.
Some Things We’ll Learn…

• Basic physics (again?).

• Some advanced physics & mathematics.

• Human anatomy & physiology.

• Structure and function of organs

• Biochemistry & biophysics.

• Medical imaging history and current technology.

• How professionals incorporate imaging physics into their fields.
Medical Imaging

• Involves physicians, technicians, medical physicists, nurses, radiation safety staff, maintenance staff.

• Highly non-trivial to produce an image.

• Highly specialized and technical field.

• Long history that spans over a century.

• Non-invasive.
Anatomical Orientations

SAGITTAL (Right-Left)
DEXTRAL (right)
Proximal
Lateral
Distal
r
Sagittal Plane (Midsagittal Plane when at midline)

TRANSVERSE (Top-Bottom)
Medial
Craniocaudal
Superior
Inferior
Transverse or Horizontal Plane

CORONAL (Front-Back)
SINISTRAL (left)
POSTERIOR (back)
DORSAL (toward spine)
VENTRAL (toward sternum)
ANTERIOR (front)
Frontal or Coronal Plane

Physics of the Human Body, Irving Herman, Springer 2007
Anatomical Orientations

Physics of the Human Body, Irving Herman, Springer 2007

http://w-radiology.com/atlas_brain_mri.php

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For Wednesday – Review of Optics

Homework Assignment for January 4, 2016
Read Kane Chapter 1
Read Kane Chapter 2 – sections 2.1 – 2.2

Question: What type of images are these?