HAMPTON UNIVERSITY
PHYSICS 628 – HEALTH PHYSICS AND RADIATION PROTECTION

Lecturers: Lars A. Ewell

Main Textbook: Introduction to Health Physics, H. Cember
Reference: Radiation Detection and Measurement, G. Knoll

Lecture Schedule
January 15, 2014 – May 2, 2014
9:00 – 10:30AM, Wednesday and Friday

1. Ionizing Radiation (January 17, 2014) Cember Ch. 1, 2, 3, 4, 5
   • Atomic and Nuclear Structure
   • Radioactivity
   • Interaction of Radiation with Matter

2. Units and Radiation Production (January 22, 2014) Cember Ch. 4, 5, 6
   • Units
   • Natural and Artificial Radiation
   • 14C Dating

3. Background and Radioactive Decay (January 31, 2014) Cember Ch. 6
   • Specific Activity
   • Radioactive Decay Chains
   • Nucleosynthesis

4. Common Particles (February 5, 2014) Cember Ch. 6
   • Beta
   • Alpha
   • Gamma
   • Neutron
5. Dosimetry (February 19, 2014) Cember Ch. 6
   - KERMA vs. Dose
   - MIRD
   - Litvinenko

6. Biological Basis for Radiation Safety (February 21, 2014) Cember Ch. 7
   - Dose Response
   - Stochastic vs. Deterministic
   - Linear No Threshold Model

7. Biological Basis for Radiation Safety2 (March 5, 2014) Cember Ch. 7
   - Indirect Action
   - Inhalation/Exhalation
   - Excess Risk Radiation
   - Working Level Month WLM

8. Biological Basis for Radiation Safety3 (March 7, 2014) Cember Ch. 7
   - Criticality Accident
   - Cancer Risk Estimates

9. Radiation Organizations, Limits (March 12, 2014) Cember Ch. 8
   - Gray vs. Sievert
   - Agencies: ICRP, EPA and NRC
   - Annual Dose Limits

10. Radiation Inhalation, Lung Intake (March 19, 2014) Cember Ch. 8
    - ICRP 30
    - Lung Intake

11. Radiation Measurement (March 21, 2014) Cember Ch. 8, 9
    - Radiation Detection
    - Regions of Operation
12. Regions of Operation, Particle ID (March 26, 2014) Cember Ch. 9
   - Particle Identification/Discrimination
   - Gas Avalanche
   - Geiger-Muller

13. Scintillation, Neutron Detection (March 28, 2014) Cember Ch. 8, 9
   - Scintillation
   - Neutron Detection
   - Source Calibration

14. Counting Statistics (April 2, 2014) Cember Ch. 9
   - Binomial Distribution
   - Normal Distribution
   - Poisson Distribution

15. Low Activity Counting, Statistics (April 4, 2014) Cember Ch. 9
   - Poisson Distribution
   - Difference of Means

16. Radiation Safety (April 9, 2014) Cember Ch. 10
   - Shielding
   - NCRP 147

17. Radiation Safety (April 11, 2014) Cember Ch. 11
   - Internal Radiation
   - Chemical Hazard vs. Radiation Hazard
   - Radioactive Waste

18. Radiation Safety (April 16, 2014) Cember Ch. 11
   - High Level vs. Low Level Waste
   - Criticality
   - Criticality Accident

- Neutron Moderation
- Light Water Reactors
- Nuclear Fuel Rods
- First Nuclear Chain Reaction


- Sub Critical vs. Super Critical
- Controlled Fission vs. Uncontrolled Fission
- First Nuclear Weapons
- Fission vs. Fusion


- Electromagnetic Spectrum
- Ultraviolet Light/Radiation
- Health Effects
- Cell Phones

22. Medical Accidents (April 29, 2014)

- Linac
- External Beam Accidents
- High Dose Rate (HDR)
- Brachytherapy

23. American Association of Physicists in Medicine (AAPM) Task Group Reports (May 2, 2014)

- AAPM
- AAPM TG 40
- AAPM TG 51
- AAPM TG 142