Syllabus for Radiological Physics and Dosimetry
Instructor, G. Coutrakon, email: gcoutrakon@niu.edu
PHYS 634 Spring 2016

Jan 20	Interactions of X-rays in matter (10 keV to 20 MeV) X-ray generators for diagnostic x-rays (10 keV– 100 keV) Relativistic kinematics and energy units Interactions of charged particle beams in matter Janni tables for proton range and energy loss Reading Ch 3 and 5, Faiz Khan
Jan 27	Definition and units of exposure for X-rays, Kerma and absorbed dose – Ch. 6 and sections 8.1- 8.2 , Faiz Khan
Feb .3	Bragg-Gray cavity theory and measurement of dose with air ionization chambers. The depth vs. dose curves for X-rays and charged particles (CP) in water. Reading in Faiz Khan Chapters 6 - 8
Feb. 10	
Feb. 17	Equations for dose to water for megavoltage x-ray beams. Equations for dose to water for charged particle beams. Bragg Gray cavity theory for dose calculations from ion chamber measurements
Feb. 24	Relativistic kinematics for electron and proton therapy beams, Bethe-Block (energy loss) equation for electrons and protons,
March 2	Particle range calculations in water for electrons (1 to 20 MeV), protons (50-250 MeV), and heavier ions, (100 – 400 meV/amu)
March 9	Mid Term exam
March 16	Radiation biology – Part 1. Cell survival curves; cell survival vs. dose for tumor cells and normal tissues. Linear Energy Transfer and Relative Biological Effectiveness (RBE)
March 23	Radiation biology - Part 2 , Normal Tissue dose tolerances, Cellular and tissue response to radiation; Tumor Control Probability (TCP), radiation toxicity- Normal Tissue Complication Probability (NTCP).
March 30	Beam delivery systems for x-ray and proton therapy. Calibration of dose monitors in the beam line. Definition of dose monitor units for

	dose monitoring.
April 6	Systems of dose calculations for x-rays
April 13	Intensity Modulated (x-ray) Radiation Therapy (IMRT)
April 20	Treatment planning and dose distributions for cancer and normal tissues. Dose Volume Histograms and Normal tissue Complication Probability (NTCP)
April 27	To be Determined
May 4	Review for final exam
May 11	Final exam

Text Book-The course will use Faiz Kahn's textbook, "The Physics of radiation Therapy"

Grading for the course

The course grade will consist of graded HW assignments, approximately 8 for the Semester, one midterm exam and a final exam. The weighting will be 50% for HW , 20% for the mid term exam, and 30% for final exam.