22SC802 Radiation Detection, Measurement and Dosimetry 3-1-0-4

Course Objectives.

- This course will provide a brief overview of the principles of Radiation Measurement and Dosimetry and its applications in medicine, health physics and radiobiology. The goal for this course is to introduce the students to the field of medical and health physics.

Course Outcomes

At the end of the course students will be able to

CO1	Understand the quantities involved in the measurement of Radiation and Dosimetry
CO2	Be familiar with the Radiation generating equipment, Particle Accelerators, process involved in the production of X-rays and types and quality of X-rays used in Radiotherapy.
CO3	Understand the working of different types of detectors used for the radiation interaction studies and their characteristics.
CO4	Understand the methods of measurement of radiation and the calculation of Probabilities and statistics of radiation interaction.
CO5	Be familiar with the various applications of radiation in the field of medicine and the mechanism of radiation protection.

Skills

- Students will be able to independently do the radiation dosimetry evaluation in radiation therapy

Syllabus

Unit 1:

Radiation and Dosimetry: Tissue equivalent materials, radiation dose. Dose quantities:- Fluence, kerma, exposure, absorbed dose, equivalent dose, Q - factor, effective dose equivalent, Radiation quality.

Unit 2:

Radiation generating equipment: Design of High energy beams - Betatrons, The Linear Accelerator (LINAC), Medical LINACs, Isotope machines, Typical Cobalt - 60 units, The Cyclotron. Particles of Radiotherapy, X- ray Spectra, White Radiation or Bremsstrahlung radiation.

Unit 3:

Radiation detectors - energy resolution, detection efficiency and dead time. Gas-filled detectors, Proportional counters - space charge effects, energy resolution, time characteristics of signal pulse, position-sensitive proportional counters. Multi-wire proportional chambers, Drift chamber, Organic and inorganic scintillators and their characteristics.

Unit 4:

Radiation Measurement: Cavity Theory, ionization chambers and Solid State Devices. Probability and Statistics for radiation interactions.

Unit 5:

Radiation in Medicine: Diagnostic methods, Radiation Therapy, Nuclear Medicine. Radiation Exposure and Safety - Safety, Risk, Radiation Protection.

Text book:

I. Physics of Radiology by Johns and Cunningham, 4th Edition, C C Thomas publisher

References:

1. Introduction to radiological Physics and Radiation Dosimetry by Frank H Attix, WileyVCH publishing

2. Radiation Detection and Measurement by Glenn F. Knoll, 4th Edition, Wiley Publishing

Evaluation Pattern

Assessment	**Internal**	**End Semester**
Periodical 1	15	
Periodical 2	15	
*Continues Assessment (CA)	20	
End Semester		50