PHE 509: RADIATION SOURCES AND HAZARDS (open elective) [39 hrs.]

Learning Objectives:

- To provide good knowledge of Radiation Sources, Gamma chamber, Particle Accelerators.
- To introduce radiation biophysics, basic aspects of cell biology and physiology.
- To familiarize Radiation hazard, evaluation, control and radiation protection.
- To study radiation protection standards

Course Outcome (CO)

CO1 The student will have a good knowledge of Radiation Sources, Gamma chamber, Particle Accelerators.
CO2 Will know about radiation biophysics, basic aspects of cell biology and physiology.
CO3 Will have a good understanding of Radiation hazard, evaluation, control and radiation protection.
CO4 Will have good understanding of radiation protection standards.

Unit I Radiation Sources, Gamma chamber, Particle Accelerators – DC accelerators, Linac, Cyclic accelerators, Synchrotron Radiation Sources. Accelerator as photon,neutron and other particle sources. Accelerators in medical and industrial applications. Safety aspects of accelerators. [13 hrs]

Unit II Radiation biophysics Basic aspects of cell biology and physiology. Mechanism of direct and indirect action of radiation at cellular level. Nature of radiation damage at molecular, subcellular and cellular level. Induction of chromosomal aberrations and its application in biological dosimetry of absorbed radiation. Cell killing and induction of mutations. Physical, chemical and biological modifiers of cellular response. Radiation effects on human beings – deterministic and stochastic effects, Dose limits. [13 hrs]

Unit III Radiation hazard, evaluation, control and radiation protection

Hazard evaluation by calculation, area monitoring, personal monitoring. Detection and measurement of contamination on work surface and person. Methods of decontamination. Planning of medical and industrial radiation installations.

Radiation protection standards: Need for protection, philosophy of radiation protection. ALARA principle. Time, distance, shielding. External and internal exposure. [13 hrs]

Text Books:

1. Attix F H et al, „Radiation Dosimetry", Vol. I, II and III (Academic Press, NY, 1968)
2. Knoll G F, „Radiation Detection and Measurements" (Wiley, New York, 1989)
3. Erich J Hall, „Radiology for the Radiologists", III Edn. (J B Lippincott Company, New York, 1988)
4. Herman Cember, „Introduction to Health Physics" (Pergamon Press, 1983)

Reference Books:

1. Glasstone S, „Source book on Atomic Energy" (East West Press, New Delhi, 1975)
2. Greening J R, Bristol, Adam Hilger, „Fundamentals of Radiation Dosimetry",(Medical Physics Hand Book 6, 1981)
3. Morgan K Z and Turner J E, „Health Physics" (Wiley, NY, 1978)
4. Horowitx Y S, Boca Raton (eds.), „Thermoluminescence and TL Dosimetry", Vol. I, II and III, (CRC Press, 1984)
5. Mann W B, Et al, „Radioactivity and its Measurements", (Pergamon Oxford, 1980)
6. Dillman L T, et al, „Radionuclide Decay Scheme and Dose Estimation" Society of Nuclear Medicine, NY, MIRD Pamphlet No. 10, 1975
7. Taylor L S, „Radiation Protection Standards", (CRC Press, Cleveland, Ohio, 1971)
8. Richard F. Mould, „Radiation Protection in Hospitals Medical Sciences Series", (Adam Hilger Ltd, Bristol and Boston, 1985)
9. Kenneth R Kase, Bjarngard B E and Attix F H, „The Dosimetry of ionising radiation", Vol I & II (Academic Press, 1985 & 1987)
10. Ronald L. Kathren, „Radiation Protection", (Adam Hilger Lt, International Publishers Services, 1985)
11. Merril Eisenbud, „Environmental Radioactivity", (Academic Press, Orlando, 1987)
12. James E Turner, „Atoms, Radiation & Radiation Protection", (Pergamon Press, 1986)