241/PHY/SE201-A

Skill Enhancement Course

COURSE ID: 241/PHY/SE201

RADIATION PHYSICS

Marks (Theory): 35 **Credits: 2**

Marks (Internal Assessment): 15 **Time: 2 Hours**

Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering entire syllabus. The question paper is expected to contain problems to the extent of 20% of total marks. The examinee will be required to attempt 5 questions; selecting one question from each unit and the compulsory.

Course Outcomes:

After successful completion of the course on Radiation Physics, a student will be able:

- *Define and explain different interactions of ionizing radiation with matter.*
- *Understand the basic working principles of radiation detectors.*
- *Grasp the concept of radiation dose and analyze the effect of radiation on the functioning of living cells.*
- *Evaluate radiation hazards and get familiar with radiation dose limitations.*

Unit – I

Interaction of Radiation with Matter: Type of nuclear radiation, modes of interaction: ionization, excitation, elastic and inelastic scattering, Bremsstrahlung, Cerenkov radiation, concepts of specific ionization, mean free path, interaction of light charged particles with matter, interaction of heavy charged particles with matter, interaction of electromagnetic radiations with matter, interaction of neutrons with matter.

Unit – II

Radiation Detectors: Principles of radiation detection, gas-filled radiation detectors: ionization chambers, proportion counters, GM counters, scintillation counter, semiconductor detectors (Si and Ge) and their applications, Thermo- Luminescent dosimeters (TLD), SSNTD.

Unit – III

Radiation quantities and units: Exposure, Dose, Equivalent Dose, Effective Dose, KERMA, Annual Limit on Intake (ALI), and Derived Air Concentration (DAC); Biological Effects of Ionizing Radiation, Principles of Radiological Protection: Justification of Practice, Optimization of Practice, and Dose Limitations; Internal Exposure, Dose Limit for (i) Radiation Workers (ii) Public, Occupational Exposure of Women, Apprentices and Students

Ranjit

Unit – IV

Radiation Hazard Evaluation and Control: Radiation Hazard: Internal Hazards and External Hazards; Evaluation and Control of Radiation Hazard, Radiation Shield, Monitoring of External Radiation, Control of Internal Hazard: (i) Containment of Source (ii) Control of Environment (iii) Contamination (iv) Air Contamination Monitoring (v) Personal Contamination Monitoring (vi) Decontamination Procedures; Radiation Emergency and Preparedness.

References/Books:

1. Introduction to Radiological Physics and Radiation Dosimetry, by Frank H. Attix, John Wiley & Sons, 1986.
2. Radiation Detection and Measurement 4th Edition by Glenn F. Knoll
3. Physics and Engineering of Radiation Detection by Syed Ahmed, Laurentian University, Ontario, Canada.
4. Measurement and Detection of Radiation, Fourth Edition by Nicholas Tsoulfanidis and Sheldon Landsberger.
5. Introduction to Experimental Nuclear Physics by R. M. Singru.
6. Elements of Nuclear Physics by W. E. Meyerhof.
7. Nuclear Radiation Detectors by S. S. Kapoor and V. S. Ramamurthy
8. Introduction to High Energy Physics (2nd edition) by D. H. Perkins.
9. Techniques For Nuclear and Particle Physics Experiments by William R. Leo.

Detailed Syllabi of Pool Courses for M. Sc. (Physics)

Semester-III

Multi-Disciplinary Course

COURSE ID: 241/PHY/MD301

RADIATION SAFETY

M Marks: 50 **Credits: 3**

Marks (Internal Assessment): 25 **Time: 2 Hours**

Note: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist of at least 4 parts covering entire syllabus. The question paper is expected