

TITLE of course: RADIATION PHYSICS: APPLICATIONS AND SAFETY**Nodal Department of HEI to run course:****Broad Area/Sector:** Healthcare**Sub Sector:** Radiation therapy**Nature of course:** Progressive**If Progressive:** Level I**Suggestive Sector Skill Council:** Healthcare Sector Skill Council**Aliened NSQF Level:****Expected Course Fees:** Free/ Paid**Stipend to student expected from Industry:****Number of Seats:****Course Code:** (Credits-3: Theory-01, Practical-02)**Max. Marks:** Internal + External (25+75) **Min. Passing Marks:****Name of proposed Skill/Training Partner:****Job prospects (Expected Fields of Occupation):** Nuclear Power Plants/Imaging Centres/
Radiotherapy centres.

about the protective measures against the radiation exposure. This will prepare the work force for jobs in industry and health care sector.

Syllabus					
Unit	Topics	General/Skill component	Theory/Practical/ OJT/Internship/Training	No. of Theory Hours	No. of Skill Hours

I	BASICS OF ATOMIC AND NUCLEAR RADIATION PHYSICS	Electromagnetic radiation spectrum, X ray characteristics and production, Continuous and characteristic X-Rays, Natural and artificial radioactivity, Basic concept of Alpha, Beta and Gamma radiation Interaction of X-ray with matter, Interaction of gamma radiation with matter, Interaction of light (electron and positrons) and heavy charged Particles with matter, Interaction of Neutrons with matter. (Qualitative treatment only)	<ol style="list-style-type: none"> 1. Study of characteristics of GM tube and determination of operating voltage and plateau length using background radiation as source (without commercial source). 2. Study of absorption of beta particles in Aluminium using GM counter. 	7	20
II	MEASUREMENT OF RADIATION EXPOSURE AND DOSE	Ionising radiations and applications (Qualitative treatment): Sources of ionising radiations in the environment, Technologically enhanced radiation sources, Artificial radiation sources, Application of radioisotopes in medicine, Radiation shielding. Basic idea of different units of activity, Types of radiation dose, Photon fluence and energy fluence, LET, Radiation exposure and its measurement, KERMA, CEMA, Absorbed dose and its relation to exposure, biological effectiveness, Tissue equivalence	<ol style="list-style-type: none"> 1. Study the background radiation levels using Radiation meter. 2. Study of range of beta particles in Aluminium using GM counter. 3. Verification of Inverse square law using GM counter. 	4	25
III	DOSIMETRY CONCEPTS AND DOSIMETERS	Internal and external dosimetry, Calculation of integral dose due to internal deposition, Specific effective energy, Annual limit on intake (ALI), Derived air concentration (DAC),	<ol style="list-style-type: none"> 1. Study visits to X-ray centre/ Radiology department. 	4	15

		Relationship between the dosimetry quantities. Dosimeters, Primary and secondary dosimeters. Pocket dosimeters, films, TLDs.			
--	--	--	--	--	--

Suggested Readings:

Burcham, W. E. and Jobes, M. "Nuclear and Particle Physics", Pearson Education Ltd., England, 1995, 1e.

Ghoshal, S. N., "Nuclear Physics", S. Chand & Company Pvt. Ltd., New Delhi, 2016, revised enlarged edition.

Knoll, G. F., "Radiation Detection and Measurement", John Wiley & Sons, Inc., 2010, 4th Edition.

Segre E., "Nuclei and Particles", W. A. Benjamin, Inc., Massachusetts, 1977, 2e.

Eisenbud M., "Environmental Radioactivity", Academic Press, Orlando, 1987, 3e.

Attix F. H. "Introduction to Radiological Physics and Radiation Dosimetry", WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, 2004, 1e.

Suggested Digital platforms/ web links for reading and Online Virtual Lab Experiments

- Uttar Pradesh Higher Education Digital Library:
<http://heecontent.upsdc.gov.in/Home.aspx>
- Swayam Prabha-DTH Channel: <https://www.swayamprabha.gov.in/index.php/home>

https://www.gigaphysics.com/gmtube_lab.html

<https://www.cpp.edu/~pbsiegel/vertuallab/jscounter.html>

<https://www.cpp.edu/~pbsiegel/vertuallab/mcaxatten.html>

<https://vlab.amrita.edu/?sub=3&brch=45&sim=539&cnt=906>

Suggested OJT/Internship/Training/Skill partner: Hospital/Medical College/Paramedical college

Suggested Continuous Internal Evaluation (CIE) Methods:

Assessment Criteria for Outcomes: Theory/MCQ/Practical/Project/Viva

Theory: Test / Quiz / Assignment / Seminar/ Class Interaction.

Practical: Record File (depending upon the no. of experiments performed out of the total assigned experiments)/ Viva Voce/ Class Interaction

Course Prerequisites: To study this course, a student must have the subject: Physics in 12th / Mathematics in 12th / Biology in 12th.

Suggested equivalent Online Courses

1. Swayam - Government of India, <https://swayam.gov.in/>
2. National Programme on Technology Enhanced Learning (NPTEL), <https://nptel.ac.in/course.html>

Any remarks/ Suggestions

The institution may add/modify the experiments of the same standard in the paper.

Books published in Hindi & other Reference/Text Books may be suggested/added to this list by individual institutes.

Other Digital Platforms/Web Links and Equivalent Online Courses may be suggested/added by individual institutes.
