Subject Description Form

Subject Code	AP20015
Subject Title	Physics in Radiological Science
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	This subject will provide fundamental background in physics so that the student can better prepare themselves in areas such as Radiography, Medical Physics and Medical Engineering. This course will include radiation physics and medical imaging physics areas.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) describe the structure of the atom and explain the fundamental intra-atomic phenomena; (b) explain the processes in the production of X-rays and the factors which influence them; (c) demonstrate understanding of the physical properties of nuclear radiation and its applications in nuclear medicine; (d) describe and analyse the interaction processes of different types of ionising radiations with matter and explain their roles in medical imaging and radiation therapy; and (e) explain the basic principle of imaging equipment.
Subject Synopsis/ Indicative Syllabus	**Atomic Physics and Radiation**: atomic structure, semiclassical mechanics and quantum mechanics, the electromagnetic spectrum, continuous and characteristic X-rays, atomic theory of the periodic system, molecules, solids and energy bands, fluorescence, phosphorescence and thermoluminescence, radiation quantities and units. **Interaction of Photons with Matters**: attenuation coefficients, photoelectric effect, Compton effect, pair production, energy-transfer and energy-absorption coefficients. **Interaction of Electrons with Matters**: energy-loss mechanisms, collisional stopping power, radiative stopping power, radiation yield, range. **Nuclear Radiation**: nuclear structure and nuclear binding energies, nuclear stability and instability, radioactive decay processes, radionuclide production and radiopharmaceuticals, detection and measurement of nuclear emission. **Introduction to Principle of Medical Imaging Equipment**: CT scanner, MRI scanner, US scanner, RNI scanners: Gamma camera, PET/CT, SPECT/CT, working principle, reconstruction methods, characteristics and clinical applications.
Teaching/Learning Methodology	Lecture and Tutorial.

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks 40% continuous; 60% examination	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
(1) Assignments	10	✓	✓	✓	✓	✓
(2) Short Test	30	✓	✓	✓	✓	✓
(3) Written Examination	60	✓	✓	✓	✓	✓
Total	100					

Assignments evaluate students' understanding of the subject. Short test is a direct way to demonstrate students' understanding and written examination provide an objective and integrative means to assess student's understanding and analytic ability in the subject areas.

Student Study Effort Expected

Class contact:	
• Lecture	33 h
• Tutorial	6 h
Other student study effort:	
• Revision	81 h
Total student study effort	120 h

Reading List and References

Bushong, Stewart C. *Radiologic science for technologists: physics, biology, and protection.* 9th ed. 2008. St. Louis, Mo.: Mosby/Elsevier.

Hendee, W.R. and Ritenour, R. *Medical imaging physics*. 4th ed. 2002. New York: Wiley Liss.

Carlton, Richard R. and Adler, A.M. *Principles of radiographic imaging.* 4th ed. 2006. Clifton Park, N.Y.: Thomson Delmar Learning.

Dendy, P.P. *Physics for diagnostic radiology*. 2nd ed. 1999. Bristol: Institute of Physics Pub.

Graham, Donald T. *Principles of radiological physics*. 5th ed. 2007. Edinburgh: Churchill Livingstone.