Course Type	Course Code	Name of Course	L	T	P	Credit
DC	**GPC207**	**Radiometric Method**	3	0	0	9

Course Objective
The primary objective of the course is to introduce mathematical methods concerned with problems of geoscientific relevance. The purpose of this course will be to understand and appreciate the symbiotic relationship that exists between mathematics and geophysics.
Learning Outcomes
Upon successful completion of this course, students will gain a mathematical background for the study of the Earth's dynamics and interactions

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Principle of Radioactivity, Half-life and decay equation, Types of Radioactive decay, Statistical nature of radioactive decay, Natural Radioactive Elements in Soil and Rocks; The U and Th Radioactive Decay Series and Potassium; Radioactive Equilibrium: Secular and Transient Equilibrium; Gamma Ray Energy Spectrum, Interaction of Gamma Rays with Geological Materials; Age determination using radioactive isotopes.	**12**	It emphasizes on various radiometric dating techniques and their applications to understand the complexities of mantle processes and magmatic evolution.
2.	Radiation detectors: Geiger-Muller counters, Scintillometers, Gamma ray spectrometers: The Measured Gamma Ray Energy Spectrum, Stripping factors; Source- Detector Geometry: Surface and Airborne measurement geometry, Borehole measurement geometry, Effective Sample Volume, Counting Statistics.	**6**	Helps to understand the principles of radiation detectors used in the laboratory measurements and field survey.
3.	Portable and Car-borne gamma-ray spectrometry: Field measurement, Instrument calibration, Data processing procedure; Airborne gamma-ray surveys: Survey methodology, Spectrometer calibration and Survey Monitoring procedures; Data processing: Dead-Time Corrections, Energy Calibration, Cosmic and Aircraft Background Removal, Radon Background Removal, Calculation of Effective Height, Spectral Stripping, Height Correction, Conversion to elemental Concentrations,	**8**	Basic survey practices and data processing techniques used in radiometric exploration.

	Levelling the data; Sources of noise and error propagation		
4.	Borehole Logging procedures: Borehole characteristics and effects; TC gamma ray and gamma ray spectral logging, Background radiation in borehole measurements, Calibration of natural gamma ray logging systems, Determination of borehole correction factors: Hole size/water correction, Casing correction, Moisture correction, Disequilibrium and Z-effect correction.	**7**	Different geophysical logs used in the radiometric exploration and its data interpretation procedures
6.	Interpretation of radiometric data: Disequilibrium in the geological environment; Interpretation pitfalls; Responses of mineralized environments, Kimberlite characteristics, and classification: diamond exploration; Regolith and soil mapping; Environmental Radiation Monitoring: Radon potential mapping, nuclear fallout and waste disposal, Radiometric prospecting for beach placers, titanium, zirconium, and rare-earths.	**6**	Case studies from different geological environments and pitfalls in the radiometric data Interpretation.
	Total:	**39**	

Text Books

1. E. Rutherford, Radioactivity, Dover Publishers, 2004.
2. C.G.Clayton, Nuclear Geophysics, Permagon, 1983.

Reference Books

1. W.M. Telford, L.P.Geldart, and R.E.Sheriff, Applied geophysics,Cambridge,1990.
2. Lowrie, W., Fundamentals of Geophysics, Cambridge Univ. Press, 2007.
3. Stanislav Mares, Introduction to applied geophysics, D.Reidel Publishing Co.,1984
4. U. Aswatha Narayana, Nuclear Geology, I.B.H. Publishing Co., 1984.
5. V.L.S.Bhimasankaram, N. Venkat Rao K. S. R. Murthy, and E.I. Savenko, Principles and Methods of Nuclear Geophysics, AEG Publication, 1985.
6. J.G. Morse, (Ed.) Nuclear Methods in Mineral