Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGPC536	**Geoelectromagnetic Methods**	3	0	0	3

Course Objective
To facilitate the understanding and use of electromagnetics in solving exploration problems
Learning Outcomes
Upon successful completion of this course, students will: • have a broad understanding of Electromagnetic method: theory, acquisition and interpretation. • understand the advantages of TEM over FDEM. • Understand the effect of conducting overburden and host rock

Unit No.	Details of Lectures	Lecture Hrs.	Outcome
1.	Introduction: Principle of electromagnetic induction, Magnetic field due to a current carrying loop, Elliptical polarization, plane of polarization, dip and tilt angles	**6**	Helps in understanding the basic concept of EM method and mathematical expressions for generation of magnetic field due to current carrying loop of different shapes. Further, the unit also helps in understanding that the EM waves are elliptically polarized.
2.	Interpretation: Nomograms for quantitative determination of parameters by dip angle method, VLF and AFMAG methods, TURAM method	**5**	This unit helps in understanding qualitative interpretation of EM data acquired using nomograms through various coil arrangements.
3.	Maxwell's equations, propagation of electrical and magnetic field as a dissipative wave, diffusion equation, propagation constant, Hertz vector, Lorentz condition, boundary conditions	**4**	This contains a summary and background about the formative laws that are the basis for Maxwell's equations as well as an introduction to general topics that and not survey specific.
4.	Response of a single closed conducting circuit by using a fixed horizontal transmitter-receiver system. Analysis of response functions with frequency and different ranges of conductivities, amplitude and phase relations, vector diagrams and their significance.	**3**	This unit helps in understanding the analysis of response function and qualitative interpretation of EM data using vector and phasor diagrams.
5.	Electromagnetic scale modeling	**6**	This section pertains to simulating field situation

			at laboratory scale.
6.	Response of a thin conducting sheet in half-space, phasor diagrams, effect of a conducting host medium to the response of a thin conducting vein embedded in a conducting host, concept of current channeling	7	This section helps in understanding the behavior of conductor embedded in conducting overburden rock and conducting host rock.
7.	Transient electromagnetic Method: Basic principles, Transient emf and magnetic field behavior due to various, behavior of current density in half space by rectangular loop with time, conductors concept of smoke ring, Concepts of toroidal and poloidal induction in a conductive zone	7	This section pertains to understanding Maxwell's equations in the time domain.
8.	Brief account of various time domain systems frequency sounding and geometric sounding, merits of time domain methods over frequency domain methods	2	Various TEM systems and the advantages of TEM over FDEM
9.	Airborne EM	2	Basics of Airborne EM
	Total Classes	**42**	

Text Books:

1. Nabighian, M. N., 1988, Electromagnetic Methods in Geophysics, Volume 1, SEG Publication.
2. Nabighian, M. N., 1991, Electromagnetic Methods in Geophysics, Volume 2, Parts A and B, SEG, Publication.
3. Telford, W. M., Geldart, L. P., Sheriff, R. E., and Keys, D. A., 1988, Applied Geophysics.

Reference Books:

1. Grant, F. S., and West, G. F., 1965, Interpretation Theory in Applied Geophysics.
2. Gupta Sarma, D., and Maru, V. M., 1981, A study of some effects of a conducting host rock with a new modelling approaches: Geophysics, 36, 166-183.
3. Mining Geophysics, 1967, Volume II, SEG Publication.