

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGPC101	Geo-electromagnetism	3	0	0	3

**Course Objective**

The primary objective of the course is to describe the physical and mathematical principles of electromagnetism as observed and prevalent in the domain of geophysics, specifically in the context of global electrical, and magnetic fields.

**Learning Outcomes**

Upon successful completion of this course, students will have:

- In-depth knowledge of the physical and mathematical principles of electromagnetism as observed and prevalent in the domain of geophysics.
- In-depth information about the usage of electromagnetic fields in all areas of geophysics, including a study of the Earth's atmospheric, near surface and deep layers.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1.	Introduction: Development of Electromagnetism, in Geophysics, Historical Perspective: National Scene against Global Backdrop, Fundamental Similarity between Electricity and Magnetism	4	Understanding the Historical Perspective
2.	Internal Magnetic Field: Interior of the Earth and Physical Properties, Electromagnetism in Matter and Magnetic Properties, Electromagnetic Materials, Domain States and Grain Sizes, Palaeomagnetism: An Indirect Measurement of Past Geomagnetic Field, Magnetic Banding	8	Understanding Interior of the Earth
3.	Magnetic Field that Extends into Space: Structure of the Earth's Atmosphere and the Sun, Structure of Magnetosphere, Sources of Electric Fields	8	Understanding the Structure of the Earth's Atmosphere
4.	Technique of Magnetic Measurements: Geomagnetic Observatories, Fluxgate and Induction Magnetometers.	6	Understanding the Magnetic Measurements
5.	Magnetic Observatories and Data Analysis: Geomagnetism and Secular Variation, Equatorial Enhancement and Geomagnetic Field Variations, Geomagnetic Storms	8	Understanding the Data Analysis in Geomagnetism
6.	Geophysical Applications: Physics of the Earth's Space Environment, Satellite Damage and Tracking, Induction in Long Pipelines, Induction in Electric Power Grids, Communication Systems, Disruption of GPS, Structure of the Earth's Crust and Mantle, Ocean Bottom Studies	8	Understanding the Geophysical Applications
	<b>Total</b>	<b>42</b>	

**Text books**

1. Nathani Basavaiah, Geomagnetism: Solid Earth and Upper Atmosphere Perspectives. Springer, 2011.
2. W. H. Campbell Introduction to Geomagnetic Fields , Second Edition, Cambridge university press, 2003.

**Reference books**

1. Zhdanov, M.S., 2009. Geophysical electromagnetic theory and methods. Elsevier.
2. Lowrie, William, and Andreas Fichtner. Fundamentals of geophysics. Cambridge university press, 2020.
3. Fowler, Christine Mary Rutherford, Clarence Mary R. Fowler, and Mary Fowler. The solid earth: an introduction to global geophysics. Cambridge University Press, 1990.
4. Kono, Masaru, ed. Treatise on Geophysics, Volume 5: Geomagnetism. Elsevier, 2010.
5. Manda, Mioara, and Monika Korte (eds.) Geomagnetic observations and models. Vol. 5. Springer Science & Business Media, 2010.