Course Type	Course Code	Name of Course	L	T	P	Credit
DC	GPC 509	**Geoelectrical Methods**	**3**	**0**	**0**	**9**

Course Objective
Understanding the physics of the current flow in the earth and its manifestation. Intricacies of data acquisition, interpretation and modelling for the entire gamut of geoelectrical methods. Understanding the phenomenon of Induced Polarization (IP) in identifying the electrical chargeability of subsurface materials
Learning Outcomes
Upon successful completion of this course, students will: The purpose of this course is to familiarise students with the resistivity and induced polarization methods which is extensively used in hydrogeological, environmental, geotechnical aspects of civil engineering, engineering geology and in mining engineering problems. The ultimate goal of the course is to solve geological problems by understanding the concepts of physics using electrical signature.

Sl. No.	Details of Lectures	Lecture Hrs.	Learning Outcomes
1.	Electrical Properties of rocks	**2**	Basic Principles
2.	Potentials in homogenous media. Equipotential surface generated by single and two electrodes. Effects of inhomogenous ground. Analogy between optical and electrical images	**3**	Knowledge on media
3.	Fundamental relation between potential, apparent resistivity, resistivity transform and layer distribution of a stratified earth (multiplayer).	**3**	Laws of resistivity
4.	Electrode Configuration, Geometrical constant, definition of apparent resistivity.	**3**	Field arrangement
5.	Application of linear filter theory analogy. Frequency characteristics of Schlumberger filter. Sampling interval, Shanon's Sampling theorem. Nyquist Rule. Determination of Sampling Interval.	**4**	Filter theory analogy
6.	Determination of Schlumberger filters coefficients. Sinc response of the Schlumberger filter. Filter coefficients, length of filter.	**4**	Designing of filter
7.	Recurrence relation, Flathe and Pekris Recurrence relations. Determination of resistivity transform by using Pekris Recurrence Relation.	**3**	Empirical relations and resistivity transformation
8.	Potential due to a point source in an anisotropic medium. Triangle of anisotropy, Paradox of Anisotropy, Principle of equivalence and suppression	**3**	Analysis in anisotropy media
9.	Self-Potential Method: Causes of Self-Potential, Interpretation of SP Data	**3**	Principle of SP
10.	Introduction, Sources of IP, Membrane polarization, Electrode polarization, Time and Frequency Domain measurements. Chargeability, Frequency effect and metal factor. Apparent Chargeability over layered earth, Application in Hydrocarbon Exploration	**7**	Measurement of SP and application
11.	Electrical resistivity tomography: Principle and Acquisition, Frechet Derivative for homogenous half-space, 1-D view of the sensitivity function- depth of investigation, 2-D view of the sensitivity function lateral and vertical resolution of the different arrays	**5**	Electrical Resistivity Tomography
12.	**Mise-a-la-masse Method**	**2**	Mise-a-la-masse Method
	Total Classes	**42**	

Text Books

1. Dobrin, M. B., and Savit, C. H., 1988, Introduction to Geophysical Prospecting (Fourth Edition), Tata McGraw Hill.
2. Telford, W. M., Geldart, L. P., Sheriff, R. E., and Keys, D. A., 1988, Applied Geophysics.

Reference Books

1. Parasnis, D. S., 1997, Principles of Applied Geophysics (Fifth Edition), Chapman and Hall.
2. Bhattacharya, B. K., and Patra, H. P., 1968, Direct Current Electric Sounding (Methods in Geochemistry and Geophysics) Elsevier Publishing Co.

Course Type	Course Code	Name of Course	L	T	P	Credit
DP	GPC 513	**Geoelectrical Methods Practical**	0	0	2	2

Sl. No.	Details of Lectures	Lecture Hrs.	Learning Outcomes
01	Acquisition of Vertical Electrical Sounding data		
02	Acquisition of Electrical Resistivity Tomography Data		
03	Generation of Vertical Electrical Sounding data using filter theory.		
04	Interpretation of Vertical Electrical Sounding data using partial curve matching technique		
05	Interpretation of Vertical Electrical Sounding data for resolution, sensitivity and uncertainty		
06	Interpretation of Dipole Dipole data using pseudo section		
07	Interpretation of SP data		
08	Computation of Frechet Derivative for different arrays and its utility in field planning		
09	Generation of triangle of anisotropy for the given data set		
10	Generation of second derivative of apparent resistivity curves for tackling equivalence problem.		