| Course Type | Course Code | Name of Course | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DC | NGPC522 | **Geoelectrical Methods** | **3** | **0** | **0** | **3** |

| **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:<br><br>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 |

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|---|---|---|---|
| **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.