

| Course Type | Course Code | Name of Course                                          | L | T | P | Credit |
|-------------|-------------|---------------------------------------------------------|---|---|---|--------|
| DP          | GPC204      | Self-Potential Method: Theory and Application Practical | 0 | 0 | 2 | 2      |

#### Course Objective

The course is designed to understand the concepts of Self-Potential method through their practical approach. Clear understanding of the data acquisition, processing and interpretation through various and how the inversion parameters can be further used to derive the structure of the sub-surface.

#### Learning Outcomes

Any student of modern seismology would be master of its fundamental knowledge and deepening his understanding with a coherent balance of theory, concepts and applications of the computer programs that are openly available for use.

| Unit No. | Description of Lectures                                                                                                                             | Lecture Hrs. | Learning Outcomes                                               |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------|
| 1.       | Field demonstration of Self-Potential data acquisition.                                                                                             | 2            | Field Setup and data acquisition                                |
| 2.       | Plot profile(s) for various geometrical shaped causative sources using given input values and interpret the anomaly curves qualitatively.           | 4            | Characteristic curves for different causative bodies            |
| 3.       | To determine Self-Potential parameters for given profiles obtained from the given contour map using nomogram                                        | 2            | Model parameter estimation using nomogram                       |
| 4.       | Plot the profile along all the given traverses; estimate strike direction; interpretation of the sub-surface geology based on estimation of strike. | 4            | Interpretation of self-potential data for sub-surface geology   |
| 5.       | Interpret the SP anomaly using the concept of PSO                                                                                                   | 4            | PSO algorithm and its application for inversion of SP data      |
| 6.       | Interpret the SP anomaly curve using the concept of Analytical Signal                                                                               | 4            | Inversion of Analytical Signal data using PSO                   |
| 7.       | Uncertainty estimation in the inverted model parameters                                                                                             | 2            | Uncertainty quantification in the estimated model parameters    |
| 8.       | Interpret the SP anomaly using the concept of Euler Deconvolution                                                                                   | 2            | Interpretation of self-potential data using Euler Deconvolution |
| 9.       | Design a sand box experiment for determination of temperature coefficient for the thermoelectric effect                                             | 4            | Design sand box experiment                                      |
|          | <b>Total</b>                                                                                                                                        | <b>28</b>    |                                                                 |

**Text Books:**

1. Bhattacharya, B. B., and Shalivahan, 2016, Geoelectric Methods: Theory and Applications: McGraw Hill Education (India) Private Limited
2. Telford, W. M., Geldart, L. P., Sheriff, R. E., and Keys, D. A., 1976, Applied Geophysics, Cambridge University Press

**Reference Books:**

1. Revil, A., and Jardani, A., 2013. The Self-Potential Method: Theory and Applications in Environmental Geosciences Applied Drilling Engineering: Cambridge University Press.
2. Eppelbaum, L. V., 2021. Review of Processing and Interpretation of Self-Potential Anomalies: Transfer of Methodologies Developed in Magnetic Prospecting, geosciences.
3. Jouniaux, L., Maineult, A., Naudet, V., Pessel, M. and Sailhac, P., 2009. Review of self-potential methods in hydrogeophysics, C. R. Geoscience, 341, 928-936
4. Pekşen, E., Yas, T., Kayman, A. Y. and OZkan, C., 2011. Application of particle swarm optimization on self-potential data, Journal of Applied Geophysics, 75, 305–318.
5. Bhattacharya, B. B. and Roy, N., 1981. A note on the use of a nomogram for self-potential anomalies, Geophysical Prospecting, 29, 102-107.