# **Magnetotelluric Method**

1.1. Course Number: GE423

1.2. Contact Hours: 3-0-0 Credits: 9

1.3. Semester Offered: 4<sup>th</sup> Year-Even

1.4. Prerequisite: Electromagnetic Methods

1.5. Syllabus Committee Members: Dr. Satish Sinha and Dr. Piyush Sarkar

2. **Objective:** The objective of this course to familiarize the student to magnetotelluric methods in detail and its applications in geophysics through case studies.

3. **Course Content:** Unit-wise distribution of content and number of lectures

Unit	Topics	Sub-topics	Lectures
1	Introduction	Sources of MT signal, interaction with the earth-uniform earth, horizontal layers, anisotropy, inhomogeneity, impedance tensor and tipper, topographic and regional effects, static shift.	8
2	Theory of electromagnetic wave propagation	Theory of electromagnetic wave propagation in horizontally layered earth and response over multi layered earth	8
3	Data processing and analysis:	Auto and cross spectra, solution to the impedance and tipper equations, local and remote references, errors and noise. Robust and hybrid processing.	8
4	Interpretation of MT data	1-D and 2-D interpretation of MT data, strike, rotation swift strike, polar diagram, tipper, skew, ellipticity, TE and TM modes	5
5	Impedance Distortion	Groom Bailey Decomposition, Phase Tensor Analysis.	5
6	Audio magneto telluric	Audio magneto telluric methods and 1 D and 2D interpretation	3
7	Case study	Structural mapping for petroleum exploration, geothermal mapping, exploration for sulphides, gold, uranium. Detecting subsurface structures and water	3
Total			40

# 4. Readings:

### 4.1. Textbook:

• Simpson, F., and Bahr, K., 2005, Practical Magnetotellurics: Cambridge University Press

# 4.2. Reference books:

• Vozoff, K., 1996, The Magnetotelluric Method; in Nabighian, M. N., Ed., Electromagnetic Method in Applied Geophysics: 2, Soc. of Explor. Geophys., 641-711.

# 5. Outcome of the course:

Knowledge of magnetotelluirc methods, Data acquisition, processing, and interpretation.