

**17MPE116 : Hydrocarbon Exploration Techniques**

Teaching Scheme					Exam Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	1	0	4	4	25	50	25	--	--	100

**Unit 1:**

**Hours: 10**

**Gravity and Magnetic Survey**

Description of various types of gravimeter. Borehole gravimeter. Air borne gravimeter. Zero Spring length. Various types of Magnetometer. Bore hole and Air borne magnetometer. Unipolar gravity and Bipolar Magnetic. Poisson relation in relating to gravity and magnetic. Data Acquisition and Processing of gravity and magnetic data. Corrections applied to gravity and magnetic data. Paleomagnetic analysis. Field generated by magnetic forces. Monopole and dipole. Analysis of quadrapole. Derivation to understand Earth's magnetic field acting as a dipole field. Potential and simple surface distribution. Potential due to horizontal ribbon. Potential at an Exterior point for an arbitrary 3D body. Vertical and Gravity Anomaly due to fault. Gravity anomaly for a sphere, horizontal and vertical cylinder. Contouring of Bouguer Gravity Data and Separation of regional and residual. First order and second order gravity data. Zero contour of a second order gravity data. Downward and upward continuation of gravity data. Layered stripping of gravity and magnetic data. Sediment and Basement analysis using integrated gravity and magnetic data.

**Unit 2:**

**Hours:10**

**Electrical, Electromagnetic and Magnetotelluric method**

Various configuration of acquiring data for apparent resistivity calculation. Derivation for Schlumberger Array, Werner Array, Pole Dipole Array, Dipole-Dipole Array. Evaluating anisotropy using two layer, three layer and multilayer base curve. Type curve analysis: A Type, Q Type, K Type, H Type. Understanding isotropic and anisotropic layers using transverse resistance and longitudinal conductance. Use of principle of equivalence. Self-potential methods. Self-potential equipment. Interpretation of self-potential data. Telluric and Magnetotelluric methods, origin and characteristics of Magnetotelluric fields and electric currents. Field equipment and operations. Mapping 3D anomalies. Measuring overburden depth and resistivity.

**Unit 3:**

**Hours: 10**

**Seismic Acquisition and Processing**

Refraction, Reflection, Field methods and equipment. Fluid crew organization. Field Layouts and Equipments. Marine Equipments and methods. Measurement of velocity and density. Field processing of the raw data along with broute strap preparation. Software for initial processing and velocity estimation, average velocity, interval velocity, instantaneous velocity, stacking velocity, route mean square velocity, time-distance curve for refraction and refraction (two layers, three layers and multi layers). Acoustic impedance contrast. Stickogram preparation. SEG-D and SEG-Y sections, various seismic processing steps. Static and Residual static correction. Automatic Gain control (AGC). Muting. Horizontal velocity analysis.

Tomogram preparation. Normal and Dip Move out. Final Stack. Migration.

**Unit 4:**

**Hours:9**

**Structural and Stratigraphic Seismic Interpretation**

2D and 3D interpretation. Understanding time-lapse interpretation. Loop time and two way time map preparation. Advance velocity analysis. Gridding methodology and placement of faults. Depth – Map preparation. Isochron preparation. Isochrone-pach preparation. 2D interpretation and preparation of 3D volumes from 2D data (pseudo 3D preparation). Amplitude variation with Offset. Amplitude variation with Angle. Classes of Sand. Bright Spot, Dim Spot and Flat Spot. Understanding sequence stratigraphy from seismic interpretation. Mapping of transgressive sequences. Canyons. Dumps. Unconformity. Barrier Parts. Cheniers. Wedge-Out and Pinch out interpretation. 2D and 3D seismic attributes. Analysis of amplitude, frequency and sweetness, derived attributes. Use of attributes in understanding tuning thickness and Fresnel zone (vertical and horizontal resolution).

**Total Hours: 39**

**Text Books and References:**

1. Bhattacharya, P. *Direct current geoelectric sounding: Principles and interpretation*. Vol. 9. Elsevier, 2012.
2. Telford, William Murray, Lloyd P. Geldart, and Robert E. Sheriff. *Applied geophysics*. Vol. 1. Cambridge university press, 1990.
3. Dobrin, Milton B. *Introduction to geophysical prospecting*. International student edition, (McGraw-Hill Book Company, Inc.).
4. Telford, William Murray, Lloyd P. Geldart, and Robert E. Sheriff. *Applied geophysics*. Vol. 1. Cambridge university press, 1990.
5. Paul Weimer and Thomas L. Davis. *Application of 3D Seismic Data to Exploration and Production*, SEG Geophysical Developments, Series, No. 5.
6. Alsadi, Hamid N. "Seismic Hydrocarbon Exploration."