PE6040 Advanced Seismic Data analysis and interpretation

Course Content:

Introduction to Elasticity theory Wave Equation, Plane and Spherical Wave Solutions, Seismic Waves, Marine 3-D Data acquisition Marine Shear Wave acquisition, 3-D Land acquisition, Normal-Moveout Calculations, Dip, Cross-Dip, and angle of approach, Depth and Dip Calculations Using Velocity Functions, Weathering Corrections and Dip/Depth Calculations, Field Techniques, Seismic Data Processing – Fourier Transforms, Convolution, and Correlation, Deconvolution and Frequency Filtering, automatic Statics Determination, Velocity analysis, Preservation of amplitude information, Migration Methods, DMO and Prestack Migration Maximum Porosity Versus Depth, Relation Between Lithology and Seismic Velocities, Porosities, Velocities, and Densities of Rocks Velocities in Limestone and Sandstone, Dependence of Velocity-Depth Curves on Geology, Determining Lithology from Well-Velocity Surveys, Reflectivity Versus Water Saturation, Effect of Overpressure, Effects of Weathered Layer (LVL) and Permafrost Stacking Velocity Versus Rms and average Velocities, Well-Velocity Survey, Effect of Timing Errors on Stacking Velocity, Depth, and Dip. Estimating Lithology from Stacking Velocity, Velocity Versus Depth from Sonobuoy Data, influence of Direction on Velocity analyses, Reflection Field Methods, Reflection-Point Smear for Dipping Reflectors, attenuation of air Waves, Maximum array Length for Given apparent Velocity, Noise Tests, Selecting Optimum Field Methods, Optimizing Field Layouts, Selecting Survey Parameters, interpreting Up hole Surveys, Weathering and Elevation (Near-Surface) Corrections, Determining Static Corrections from First Breaks Seismic Data Processing, Fourier Series, Fourier Transforms of the Unit Impulse and Boxcar, alias Filters, Calculating Cross correlation and autocorrelation, Convolution and Correlation Calculations, Deconvolution Methods, inverse Filter to Remove Ghosting; Recursive Filtering, Ghosting as a Notch Filter, autocorrelation, apparent-Velocity (F -K) Filtering, Kirchhoff Migration, Effects of Normal-Moveout (NMO) Removal Specialize Techniques, Exploration With S Waves, Channel Waves, Vertical Seismic Profiling, Seismic tomography, Borehole Studies, Passive Methods, Geostatistical Methods

Text Books:

1. **Sheriff R.E. and Geldart L.P., Tulsa, Oklahoma,** Exploration Seismology, 2nd Edition, Cambridge University Press, Cambridge, 1995. Payton C.E., Seismic Stratigraphy – applications to Hydrocarbon Exploration, Memoir of the American association of Petroleum Geologists 26, Tulsa, Oklahoma, 1977. Yilmaz O., Seismic Data analysis: Processing inversion and interpretation of Seismic Data (Vols. 1&2), Society of Exploration Geophysicists, 2001.

Reference Books:

1. **Hardage B.A., Seismic Stratigraphy,** Elsevier, amsterdam, 1987. Bullen K.E. and Bolt B.A., an introduction to the theory of Seismology, Cambridge University Press, 1985. Bath M., introduction to Seismology, Birkhauser Verlag, Basel, 1973. Coffeen J.A., interpreting Seismic Data, Penn Well, 1984.

Prerequisite:

NIL