

Unit I

Principles of elasticity: Normal strains, shearing strains, Hooks's law, Elastic moduli, Wave motion/Reflection, refraction, diffraction, attenuation and absorption of seismic waves, surface waves, Acoustic Impedence, Dispersion, Multiples. Reflection and transmission coefficients, elastic wave velocities of rocks: Laboratory and field determinations, factors affecting velocity. Different types of Velocity.

Unit II

Electromagnetic geophone and its performance, damping coefficient hydrophones, Detector arrays, array response, uniform arrays, amplitude weighted arrays, distance tapered arrays, streamer, analog data acquisition, amplifiers, filters, gain control and recording types. Digital data acquisition, digital field system, signal flow and recording. Constituent units and modules. Wireline and radio telemetry.

Dynamic range of signals, Noise: Shot generated, ambient and electrical noises, their nature and attenuation requirements.

(18 Hours)

Unit III

Geometry of ray paths, refraction and reflection. Horizontal layers and dipping layers, NMO and dip move out. Discrete and continuous velocity changes, low velocity layer, faults and contacts, Field layout and shooting procedures for land and marine surveys, split-spread and end-on-spreads, C.D.P. procedures for land marine surveys stacking chart. 3-D surveys. Vertical seismic profiling. Single channel and multichannel surveys.

Seismic energy sources for land and marine surveys. Dynamite, thumper, Dinoseis, vibroseis, land air gun, pinger, boomer, sparker, airgun, watergun, vaporchoc, etc. Controlled explosions, shot control, source arrays, Energy content, frequency, pulse length and resolution, penetration, signatures. Generation and recording of shear waves.

(20 Hours)

Unit IV

Static and dynamic corrections, velocity determination, Preparation of seismic sections, migration analysis of analogue records.

Refraction surveys, field procedures, reduction of data, interpretation, marine refraction, sonobuoy surveys, Analysis of refraction records. Interpretation of reversed and unreversed profiles, delay time methods. Masked layers and hidden layers.

Automatic processing of digital seismic data. Demultiplexing, TAR, velocity analysis, velocity spectra and velocity scan, automatic statics, picking, stacking, spiking deconvolution, dereverberation, whitening, time variant frequency filtering, apparent velocity filtering. Seismic section plotting, display types. Picking of events marking, Isochron maps, Isopach maps, Geologic interpretation, synthetic seismogram.

High Resolution Reflection Seismic soundings. Dispersion studies and amplitude analysis.

(22 Hours)

Unit V

Application of reflection and refraction methods: Exploration for minerals, oil and gas, groundwater engineering surveys.

Structural traps and stratigraphic traps: Identification of geologic structures like anticlines, faults, salt domes, etc. Pitfalls in interpretation.

Bright spot, seismic attributes, hydrocarbon indicators. Wavelet processing, automatic migration.

Seismic stratigraphy: Geologic sea level change model. Depositional patterns, seismic sequences, seismic facies, Reflection Character concepts.

Books:

1. Seismic prospecting instruments by B.A. Evenden et. al.
2. Introduction to geophysical prospecting by M.B. Dobrin.
3. Seismic prospecting for Oil by G.H. Dik.
4. Interpretation theory in applied geophysics of F. S. Grant and G.F. West.
5. Applied Geophysics by W.M. Telford et. al.
6. Seismic stratigraphy by Robert E. Sheriff.
7. An introduction to seismic interpretation by R. Mc Quillin et. al.
8. Seismic stratigraphy - application to hydrocarbon exploration by
9. Geotran and Geoquest - Three volumes.
10. Exploration Seismology - by Sheriff R.E. (1982) Cambridge University Press