SEISMIC FIELD TECHNIQUES GEP005

COURSE DESCRIPTION

The course covers the fundamental physical aspects of applied seismology, the science, the engineering and the operational details as they all relate to the exploration effort for hydrocarbons. It is an essential precursor to our course "Advanced Seismic Field Techniques - Theory and Practice." We recommend to take these two courses in sequence to achieve a full understanding and skillful application of seismic prospecting for hydrocarbons.

Please recall that field acquisition consumes about 90% of a seismic budget, data processing about 10% and interpretation, however important is only about 1%. However the current scientific effort on these is mostly the other way around. This course intends to reverse such trend by focusing upon both the science and the practical aspects of seismic field techniques.

COURSE GOAL

To enhance the participants' knowledge, skills and abilities necessary to a better understanding of applied seismic techniques, the pertinent physical aspects and the great variety of equipment, personnel and operational details that are currently in practice.

COURSE OBJECTIVES

By the end of this course, participant will be able to:

- The physical aspects of applied seismology such as the elastic constants pertinent to rocks, types of body and surface waves and their elastic propagation.
- The composition, the layout and the safe operation of a seismic crew both in land and in marine environments.
- The details of seismic data acquisition such as sources, receivers, multi-fold sub-surface coverage, the multiplexing process, digital terminology, recording formats and the like.
- Details of supportive activities such as topographic surveys, shallow refraction surveys, shot and uphole drilling techniques and the like.
- Limitations and the ever looming pitfalls that can jeopardise the results of seismic exploration.

WHO SHOULD ATTEND

Geologists and geophysicists who work with seismic data, data processing experts, experienced seismic data interpreters, exploration managers and team leaders including Human Resources experts who want to learn more about seismic field operations and techniques.

COURSE DURATION

5 Working Days

COURSE OUTLINES

1. Introduction
    - Elastic constants.
    - Uniform circular motion.
    - Simple harmonic motion.
    - Wave types and propagation.
    - Conversion modes and Zoeppritz relationships.
2. Composition of a Seismic Crew
    - The marine seismic crew.
    - The land seismic crew.
    - Hygiene, safety, personnel and camp layouts.
3. Seismic Refraction Methods.
    - Snell's Law and pertinent calculations of depths and vertical times.
    - Geology in seismic terms.
    - Reflection coefficients.
    - The seismic wavelet.
    - Fourier synthesis.
    - Multiple reflections.
    - Free surface ghosting.
    - Diffractions.
    - Sampling issues.
    - The aliasing phenomenon.
    - Seismic noise classification and pertinent analyses.
4. Seismic Surveys on Land
    - Topographic positioning.
    - Map projection systems.
    - Impulsive and vibratory sources.
    - Sensors.
    - Recorders.
    - A/D converters.
    - Multiplexing.
    - SEG formats and digital terminology.
    - Improved stack-array concept.
        - Source array directivity and beaming techniques.

5. Seismic Surveys at Sea

- Positioning systems.
- Energy sources.
- Marine vibroseis.
- Sensors.
- Recorders.
- Tow configurations.
- Dual sensor systems.
- Ocean bottom cables and nodes.

6. 3D Seismic Surveys

- Patterns and scripts.
- Types of geometry.
- Wide and narrow distributions of fold, azimuth and offsets.
- Receiver and source arrays.
- Bin size and fold.
- Bin analyses.
- Footprints.
- Common conversion point.

7. Textual, Pictorial and Video Coverage of Seismic Field Operations Including HSE Issues.

- Arctic in Summer.
- Arctic in Winter.
- Tropical rain forest.
- Rugged mountains.
- Trust-fold belts.
- Desert with sand dunes and sebkhas.
- Desert with rocky plateau and ravines.
- Savannah, grassland.
- Towns, cities, installations.