Advance Seismic Methods

1.1. Course Number: GE322

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

1.3. Semester Offered: 3rd Year-Odd

1.4. Prerequisite: Seismic Methods

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

2. **Objective:** The primary objective of the course is to introduce fundamental and advanced aspects of seismic data processing, modelling and interpretation technique which is vital part for applied geophysics study of any kind sub-surface geological study. The underlying physics and mathematics of the various seismic analysis methods are presented through theory and computing classes, giving students an appreciation of their limitations and potential for creating models of the subsurface.

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

Unit	Topics	Sub-topics	Lectures
1	Seismic data processing	Introduction to seismic data processing. Processing sequences- preparation of processing geometry, quality checks, true amplitude recovery, deconvolution, filtering, velocity analysis, Statics Corrections, NMO corrections, Stacking; Complex-trace analysis; Hilbert transform (instantaneous frequency; instantaneous phase); noise elimination through multichannel filtering, parameter optimization for generation final stacked section. Discrete time sequence; Z-transform, Linear system; Filtering system, Frequency alias; Nyquist frequency; Interpolating; Low-pass, high-pass, band-pass filters; Notch, Moving average; Gibbs effect; Spectral analysis, Zero Phase; Linear phase shift, DMO and migration AVO and attribute analysis. Anisotropy processing: HTI, VTI Mode. Converted Wave Processing.	15
2	Advanced seismic data processing	3D seismic data processing techniques: Generation of time slice and stacked sections for both land and marine.3D Processing techniques- generation of time slice and stacked sections. Special seismic data processing technique: Pre-Stack Time Migration and Pre Stack Depth Migration, Introduction of Reverse Time Migration. Concepts of SRME, Radon. PSTM and PSDM.	12
3	Advanced	Introduction to seismic data interpretation: Overview of	13

	Seismic data Interpretation	Seismic Stratigraphy. Wavelet analysis for seismic stratigraphic interpretation. Seismic sequence analysis and seismic facies analysis. Overview of Seismic Stratigraphy. Study of seismic section and other geological aspects of prospecting, structural interpretation, construction of isochron and isopach maps, thin bed resolution and pitfalls, LRLC interpretation, AVO and attribute analysis, Prospect evaluation & Ranking, Basis of seismic interpretation in workstation environment using standard packages.	
		Total	**40**

4. Readings:

4.1. Textbook:

- Al Sadi, H. M., 1982, Seismic Exploration: Birkhauser Verlag.
- Claerbout, J. F., 1985, Imaging the interior of the earth, BlackWell Scientific Publications.

4.2. Reference Books:

- Dobrin, M. B., and Savit, C. H., 1988, Introduction to Geophysical Prospecting (Fourth Edition), Tata McGraw Hill.
- Lavergene, M., Seismic Methods.
- Lindseth, R. O., 1976, Digital processing of geophysical data - A review: Technical Publication
- O. Z, Yilmaz, Seismic data analysis.

5. Outcome of the course:

- Knowledge on fundamentals of seismic data processing.
- Knowledge on 2D and 3D seismic data processing techniques.
- Knowledge on 3D seismic data special processing techniques.
- Knowledge on seismic data modelling techniques and converted wave processing technique.
- Knowledge on processed seismic data interpretation.