GERMI has established three research wings. The **Petroleum Research Wing** concentrates on research and development of increasingly efficient, well adapted technologies to extract, upgrade, manage, commercialize the oil and gas resources and economic impact of their production. The results generated will directly support GERMI’s mission of protecting and responsibly managing the country’s hydrocarbon resources by advancing scientific understanding for a balanced and secured energy future.

The **Solar Energy Research Wing** supports fundamental and applied research ranging from solar cell material and device designs to plant performance analysis. The Wing also provides technical and advisory services to government as well as industries for deploying solar and related renewable energy initiatives. The Wing has a successful track record in setting up rooftop and megawatt-scale photovoltaic power plants, smart and micro-grids, social projects such as solar streetlights, as well as structuring public-private transactions to ensure sustainability. This rich experience also culminates into very successful and comprehensive professional and vocational training programmes.

The **Environment and Energy Efficiency Research Wing** of GERMI conducts research on issues of National and International importance related to science, technology and management pertaining to environmental pollution, energy efficiency, bio-energy and optimization of conversions of waste to energy. This Research Wing primarily focuses on Research & Services to help solve the practical problems faced by the industries & enable the integration of innovative need-based technologies and other holistic interventions.

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**ABOUT GERMI**

Gujarat Energy Research and Management Institute (GERMI), an ISO 9001:2008 certified institute, is a Centre of Excellence in industry learning, research and development and education. It was set up to develop human resource assets to cater to both renewable and non-renewable energy sectors, improve knowledge base of policy makers, technologists, and provide a competitive edge to compete in the global arena.

GERMI is promoted by Gujarat State Petroleum Corporation Limited (GSPC), a Government of Gujarat Undertaking. GERMI is an established specialized research, education, management and training institute, and is continually expanding its horizons to cater to allied energy sectors. GERMI is a registered Society and a Trust under the Societies Registration Act, 1860 and the Bombay Public Trust Act, 1950. GERMI is a recognized Scientific and Industrial Research Organization (SIRO) by the Department of Scientific and Industrial Research (DSIR), Government of India.

**GERMI - R & D ACTIVITY**

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**COURSE DATE**
4 - 7 February, 2015

**COURSE VENUE**
Gujarat Energy Research and Management Institute
Pandit Deendayal Petroleum University Campus,
Raisan, Gandhinagar - 382 007, Gujarat.

**COURSE FEE**
INR 25,000/- per participant
(plus 12.36% service tax)
WHO SHOULD ATTEND?
The course is designed for young industry professionals - Geologists, Geophysicists, Petrophysicists, Reservoir and Production engineers.

COURSE OUTLINE

DAY 1
Reservoir Seismic - Evaluation of high resolution 3D Seismic
- Introduction to 3D data - benefits over 2D
- 3D capabilities and utilities
- Horizontal - view seismic interpretation - attribute slices
- Reservoir delineation & characterisation for modeling and simulation
- Volumetric and reserve estimates
- Offshore drilling hazards - shallow gas chimneys, high pressure prediction
- Seismic sequence stratigraphy - SSSI Framework: Horizon cube, Wheeler domain
- Limitations

Production Seismic - Evaluation of 4D (time lapse 3D) Seismic
- 4D preambles
- Introduction to geomechanics, hard and soft reservoirs
- Dynamic reservoir characterisation
- Seismic Reservoir Monitoring (SRM) - fluid flow surveillance drive mechanisms, reservoir heterogeneity, permeability barriers, by-passed hydrocarbon, high permeable paths, EOR sweep monitoring
- 4D in unconventional reservoirs (shale gas exploration - fracturing)
- 4D limitations and summary

DAY 2
Shear wave Seismic
- Basic shear wave properties - polarization, birefringence
- Introduction to shear seismic API, constraints, Horizontal and mode converted waves, Multi component surveys
- Application and utility of shear waves: DHI validation, AVO, Vp/Vs, anisotropy, fracture detection and mapping

AVO & Vp/Vs Analysis
- AVO, types and attributes - intercept, gradient & product (AxB)
- Limitations
- Poisson's ratio and Vp/Vs for rock-fluid properties
- AVO and Vp/Vs analysis for seismic rock physics - An offshore case study, conclusions

Analyzing Seismic Attributes
- Primary attributes - Complex Trace Analysis, Spectral Decomposition
- Geometric attributes - Dip-azimuth, Curvature & Coherency
- Composite Multi attributes color display
- Limitations: data quality, conditioning & feasibility for object specific
- Summary

Seismic Forward & Inverse Modeling
- Preface
- Forward modeling – structural & stratigraphic (1D/2D/3D)
- Applications
- Limitations

Seismic Inversion
- Preface
- Types of seismic inversion - Operator based, Recursive, Model based & Stochastic
- Inversion solutions – Interval Velocity (Vp), Acoustic (AI) & Elastic Impedance (EI), AVO, Poisson’s Ratio, and Bulk density
- Applications - Reservoir Characterization and Reservoir Management
- Limitations

Seismic Technology Limitations
- Technology and technique limitations. Pitfalls in: Geophysical - Seismic API; Geological-Tectono-stratigraphic complexities; Technological-System intrinsic; Technical-hardware, software & humanware
- Some real case seismic images illustrating pitfalls

Wrap up Session
- Open to discussions

DAY 3

DAY 4

COURSE PREMISE
Development Geophysics is about evaluation of 3D and 4D seismic data, required to help optimize reservoir management through better reservoir characterization and fluid monitoring during field development and production stage. An integrated multidisciplinary approach to data analysis, Development Geophysics studies necessitate, in addition to seismic and well logs, elementary knowledge of reservoir geology, reservoir engineering and field production concerns including enhanced and secondary hydrocarbon recovery.

INSTRUCTORS’ PROFILE
Shri Niranjan Chandra Nanda post graduated in Geophysics from Benaras Hindu University. He was associated with Oil & Natural Gas Commission for more than 37 years and has made outstanding contributions in exploration and development of hydrocarbon resources in onshore & offshore basins of India.

His involvement in the Petroleum upstream industry continues even to date, building more than five decades of varied experience in diversified geological basins, both in India and abroad. Especially, his conceptual understanding of Reservoir Models from Seismic data has brought him recognition. He has several awards to his credit. In 1987, he was honoured with the National Mineral Award by the Government of India and lifetime achievement award at an SPG annual function, recently held at Kochi. Currently, he is a freelance Petroleum Geophysicist, and consultant to several E&P companies in India. He was a visiting faculty to Universities wherein he taught seismic data interpretation and evaluation. He also conducts training courses and workshops in seismic interpretation for geoscientists in E&P companies.

TECHNICAL COURSE COORDINATOR
Shri P. H. Rao is presently heading Data Interpretation Centre of Petroleum Research Wing of GERMI. He is Ex General Manager (Geophysics), ONGC. He has thirty-three years of rich experience in oil industry as a seismic data acquisition manager, exploration and development geoscientist with strong multidisciplinary integration skills and proven record of oil and gas discoveries. He has vast experience as an effective and successful project and team leader as well as team member involving complex geological studies. He possesses excellent communication skills, and has great knowledge on the latest state-of-art technologies. He has sound knowledge of G&G data interpretation on workstations using LandMark, Hampson Russel softwares and lead G&G teams at various levels for interpretation of 3D and 2D Seismic data for prospect delineation and evaluation. Shri Rao is well versed with all other types of Seismic interpretation softwares.

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