



# Seismic Anisotropy: Estimation, Imaging, & Reservoir Characterization

(May 28-June 1, 2018)

Venue: Indian Institute of Technology Roorkee, Roorkee-247667, Uttarakhand, India

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## Overview

It is well known that the earth is anisotropic; still, the convenience of data processing and subsurface characterization under the isotropic assumption has led us to ignore anisotropy. It is not surprising to note that the isotropy-approximation of the subsurface has resulted in hundreds of dry and misplaced boreholes and billions of dollars in lost revenue.

Over the last two decades, however, advances in computing, methodology, and algorithms coupled with improved seismic data acquisition have exposed us to the many pitfalls of ignoring anisotropy in imaging the subsurface and have shed new light on the immense potential of anisotropy in characterizing oil & gas reservoirs. Applied seismic anisotropy is a rapidly evolving field and has seen significant recent advancement in anisotropy parameter estimation and subsurface imaging. In fact, depth migration using anisotropic velocity models has become a routine data processing step in nearly all oil & gas firms within the United States and Europe. Undoubtedly, seismic anisotropy will play a vital role in the exploration, development, and exploitation of hydrocarbon resources in the coming decades. It is critical that all Indian entities involved in the oil & gas sector, public and private, realize the importance of seismic anisotropy in maximizing resource recovery and remain competitive with the worldwide oil & gas industry.

### Objective:

The primary objective of the course is to help participants understand and use seismic anisotropy to identify sweet spots in the subsurface and reduce drilling risk. The course goals include:

- i) educating participants about appropriate parameterization for TI (transversely isotropic) and orthorhombic media,
- ii) helping them in identifying the presence & influence of velocity anisotropy in pre-stack seismic data and depth-migrated images,
- iii) exposing them to various methodologies employed in anisotropy velocity estimation, and
- iv) making them aware of the use of seismic anisotropy in characterizing reservoirs.

<b>Course Information</b>	<b>Duration: May 28 - June 1, 2018</b>
<b>Modules</b>	<p>Module 1: Wave Propagation and Notation  Module 2: Data Acquisition &amp; Processing  Module 3: Estimation &amp; Imaging of anisotropy parameter  Module 4: Fracture &amp; Reservoir Characterization using AVO AVAz, Shear-Wave Splitting and Effective Medium Theory concepts  Module 5: Advanced Topics: FWI, Attenuation anisotropy, VSP processing</p> <p><b>Number of participants for the course will be limited to fifty.</b></p>
<b>You Should Attend If...</b>	<ul style="list-style-type: none"> <li>▪ Geophysicists, geologists, engineers, &amp; researchers from all private and public enterprises with an interest in subsurface characterization.</li> <li>▪ Student at all levels (BSc/BTech/MSc/MTech/PhD) and faculty from academic and technical institutions</li> </ul>
<b>Fees</b>	<p>The participation fees for attending the course is as follows:</p> <ul style="list-style-type: none"> <li>• Participants from abroad: US \$500</li> <li>• Industry/ Research Organizations: Rs. 12000.00</li> <li>• Academic Institutions (Faculty): Rs. 7000.00</li> <li>• Academic Institutions (Students): Rs. 3000.00</li> </ul> <p>➤ Students have to show the proof of their full time student enrollment in academic institute.</p> <p>The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility.</p> <p><b>Fee does not include accommodation and food. On request basis, participants may be provided with accommodation on payment basis.</b></p> <p>Note:  Accommodation:  1. The registration fee should be sent in advance through bank draft drawn in favor of "Dean SRIC, IIT Roorkee" and payable at Roorkee latest by April 30, 2018.  2. The Complete form along with payment may please be sent to:  Dr. Ravi Sharma, Department of Sciences, IIT Roorkee, Roorkee-247667, Uttarakhand  e-mail: ravisharmafes@iitr.ac.in, ravisharmafes@gmail.com</p>

# The Faculty



Dr. Jyoti Behura is the founder & CEO of Seismic Science LLC, a technology start-up offering advanced imaging and reservoir characterization solutions for addressing some of the most challenging problems facing the oil & gas industry. In addition, he also holds a Research Assistant Professor position in the Department of Geophysics at the Colorado School of Mines (CSM) where he collaborates with Prof.

Manika Prasad at the Center for Rock Abuse. He graduated from the Indian Institute of Technology (IIT), Kharagpur, with an Integrated Bachelor of Science and Master of Science degree in exploration geophysics (2003). He received his Ph.D. in geophysics from CSM in 2009 where he worked with Prof. Ilya Tsvankin and actively collaborated with Profs. Mike Batzle and Roel Snieder. After graduating from CSM, Jyoti worked as a research geophysicist at BP America Inc. in Houston. His primary research interests are in seismic anisotropy, attenuation, rock physics of unconventional hydrocarbons, seismic interferometry, imaging, and seismic processing. Jyoti is the recipient of the 2012 Society of Exploration Geophysicists (SEG) J. Clarence Karcher Award, which is given in recognition of significant contributions to the science and technology of exploration geophysics by a young geophysicist. He also received the 2009 SEG award for the Best Paper in Geophysics for his work with Prof. Tsvankin on attenuation anisotropy. IIT also recognized him with the Institute Silver Medal (2003), the P.K. Bhattacharya Memorial Award (2003), the G.B. Mitra Memorial Award (2003) and the J.C. Ghosh Memorial Award (2002). He serves as Co-Editor-in-Chief for the Journal of Applied Geophysics. Jyoti is a member of the SEG, EAGE and a special editor for Geophysics. Contact email id: jbehura@mines.edu



Dr. Ravi Sharma received his Masters' (M.Tech.) in Applied Geophysics from the University of Roorkee in the year 1999. He received his another Masters' and a PhD in Petroleum Engineering from Colorado School of Mines, Golden, USA in the year 2015. Dr. Sharma has a rich industry experience right from his days with ONGC from 2001 to 2007 and with other multinational oil and gas companies such as BP, MOC and COP from 2008 to 2015. He mostly worked in multidisciplinary teams performing validation and integration of geoscience data for predicting of rock and fluid properties using seismic/acoustic amplitudes acquired through experiments in laboratories and in fields. He has extensive research experience with experimentation and modelling for storage, flow and elastic property prediction in the reservoirs using Petrophysical and Rock Physics techniques and tools. His other interests include Flow Through Porous Media, Simulation, Hydraulic Fracturing, Unconventional Resources, Digital Rock Physics, Attenuation and Dispersion in seismic rock properties. He received many merit awards for his professional services and research activities and been the recipient of prestigious scholarships. He serves on the review and editorial board of reputed geoscience journals. He currently serves as Assistant Professor at the Department of Earth Sciences in IIT Roorkee. Contact email ID: ravisharmafes@iitr.ac.in

## Course Co-ordinator

**Dr. Ravi Sharma**

Phone: +91-1332-284867

E-mail: ravisharmafes@iitr.ac.in,  
ravisharmafes@gmail.com

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For registration visit:  
<http://www.gian.iitkgp.ac.in/GREGN>

Indian Institute of Technology Roorkee

Registration Form

**Induced Polarization of Rocks: From Petrophysics to Tomography  
and Their Applications to Reservoirs and Geothermal Systems**

(MHRD Scheme on Global Initiative on Academic Network (GIAN))

May 28 - June 1, 2018

- Name .....
- Designation .....
- Affiliation .....
- Address for Correspondence .....
- .....  
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- Email: .....
- Phone No: .....
- Accommodation required: **Yes / No**
- Type: Hotel/Hostel/Guest House (accommodation shared basis may be available @Rs. 500/  
per day)
- Cheque/DD No. ....
- Dated ..... for Rs. ....

Date

Signature of the participant

**Note:**

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**2. The Complete form along with payment may please be sent to:**

**Dr. Ravi Sharma, Department of Earth Sciences, IIT Roorkee, Roorkee-247667, Uttarakhand, India, Ph.No.: (+91)- (0)1332-284867, +91-9411067315, e-mail: ravisharmafes@gmail.com, ravisharmafes@iitr.ac.in**