

# GLOBAL INITIATIVE FOR ACADEMIC NETWORKS



National Coordinating Institute  
**INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR**

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## Advanced Remote Sensing Techniques for Mine Environmental and Safety Monitoring

(3<sup>rd</sup> December 2018 to 7<sup>th</sup> December 2018)

### Overview

In light of increasing awareness for environmental stewardship; it has become vital to closely and frequently monitor the impact of mining on surrounding environment. Remote sensing technology on other hand is evolving very rapidly and has a great potential to complement and enhance conventional monitoring systems. The remote sensing sensors are day by day getting better to capture unprecedented details of the targets. The platforms to carry such sensors; i.e. satellites, aircraft, terrestrial and more recently Unmanned Aerial Vehicles (UAV) are also getting more robust and reliable. Furthermore, software and algorithms to analyse this data is also developing at a very high pace. This course provides an opportunity for the participants to get broad overview of almost all the sensor technologies and their specific applications for mining and geo-resource researchers. The course includes hands-on tutorial exercises and real-world examples from mine sites.

This course provides a detailed understanding on various aspects of remote sensing involving multispectral, hyperspectral, thermal, microwave and LiDAR sensors. Emphasis is given to their specific applications for mining industry citing numerous mining examples and hands-on tutorials. A particular focus is on environmental monitoring including mapping re-vegetation, detecting land cover and land use changes; tracing soil contamination, slope monitoring etc. Mine safety aspects including subsidence monitoring is also included to provide complete set of applications.

<b>Modules with dates</b>	<p><b>Monday 3 December 2018 to Friday 7 December 2018 (5 days)</b></p> <p><b>Day # 1:</b>  <b>Lecture 1 &amp; 2:</b> Basics of passive remote sensing, Basics of active remote sensing  <b>Tutorial 1 &amp; 2:</b> Learning how to acquire satellite images and toposheets</p> <p><b>Day # 2:</b>  <b>Lecture 3 &amp; 4:</b> Multispectral remote sensing for monitoring mine environment  <b>Tutorial 3 &amp; 4:</b> Multispectral image analysis (including pre-processing, atmospheric corrections etc.) using standard software tools,  Case studies from mine environmental monitoring</p> <p><b>Day # 3:</b>  <b>Lecture 5 &amp; 6:</b> Hyperspectral remote sensing for finger printing of the ecosystem surrounding a mine site  <b>Tutorial 5 &amp; 6:</b> Hyperspectral image analysis (including pre-processing, atmospheric corrections etc.) using standard software tools</p> <p><b>Mid-course examination:</b> 1.5 hrs duration (50% weightage) involving multiple choice and short response questions</p> <p><b>Day # 4:</b>  <b>Lecture 7 &amp; 8:</b> Microwave and LiDAR for mine safety monitoring  <b>Lecture 9 &amp; 10:</b> Mobile laser scanning for underground structural mapping  <b>Tutorial 7 &amp; 8:</b> Demonstration of InSAR processing for mapping mine induced deformation, Demonstration of LiDAR point cloud processing</p> <p><b>Day # 5:</b>  <b>Lecture 11 &amp; 12:</b> Thermal remote sensing for mining  <b>Lecture 13 &amp; 14:</b> Application of UAVs / Terrestrial Vehicles for mine environmental and safety monitoring  <b>Tutorial 9 &amp; 10:</b>  Detection of thermal hotspots using Landsat data  Demonstration of a mining geo-database using GIS tools</p> <p><b>End of course Examination:</b> 1.5 hrs duration (50% weightage) involving multiple choice and short response questions</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>▪ you are an executive or engineer from mining industry or allied service sector</li> <li>▪ you are in a government organisation including R&amp;D laboratories dealing with mine environment and safety monitoring</li> <li>▪ you are a student (BTech/MSc/MTech/PhD) or a faculty in Mining Engineering or Environmental Engineering interested in learning how to incorporate advance remote sensing for mining applications.</li> </ul>
<b>Fees</b>	<p><b>Step 1: GIAN Registration</b>  A mandatory registration fee of Rs. 500/- to be paid through the GIAN website (<a href="http://www.gian.iitkgp.ac.in/GREGN">http://www.gian.iitkgp.ac.in/GREGN</a>). The registration on GIAN is a one-time affair, i.e., once you are registered on GIAN portal, you may apply for any GIAN course.</p> <p><b>Step 2: Course registration</b>  The participation fees for taking the course is as follows:  <b>Participants from abroad : US \$500</b>  <b>Industry/ Research Organizations: Rs.30000/-</b>  <b>Academic Institutions: Rs.10000/-</b>  <b>Students: Rs. 1000/-</b></p> <p>The above fee includes all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.</p>

# The Faculty



**Dr. Simit Raval** is a Deputy Director of undergraduate mining engineering programme at the University of New South Wales (UNSW) in Sydney, Australia. As the Co-director of the Laboratory for Imaging of the Mining Environment (LIME) at UNSW, he leads a group of researchers focused on using smart sensors to visualise, identify and monitor the environmental and safety aspects of mining.



**Professor Debashish Chakravarty** is with the department of Mining Engineering, IIT Kharagpur, India. His research interest includes use of advanced technologies, like sensor integration, remote sensing, GPS, GIS, VR, automated rescue robot for mineral and mining industries. He has interest in technical investigation of slope stability issues. He is the Professor-in-charge of Mine Surveying, Remote Sensing & GIS Laboratories. Additionally, he is the Professor for the institute flagship program on Autonomous Ground Vehicles (AGV) Research for different types of robots in open cast and underground conditions.

## Course Coordinator

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