

# Advanced Image Processing in Earth and Environmental Sciences

23<sup>rd</sup> to 27<sup>th</sup> May, 2016

School of Geosciences, University of the Witwatersrand

Advances in sensor technology have necessitated the development of efficient image processing techniques for a wide variety of applications. As such, this course is designed to provide the theoretical and practical basis of digital image processing and their utility in specific remote sensing (RS) applications. Lectures will showcase a diverse array of topics showing how RS data derived from multispectral, hyperspectral and RADAR can provide value-added information in a variety of application areas. During the practical exercises, the participants will have the opportunity to:

- 1) Process, visualise and analyse multispectral, hyperspectral and RADAR data for resources mapping and exploration;
- 2) Learn advanced concepts and procedures for analysing imaging spectrometer data or hyperspectral images; and
- 3) Process, visualise and analyse recently acquired European SENTINEL 1 radar data for resources exploration and the mapping of Earth surface deformation and other environmental hazards.

## Course content

<b>Day 1</b>		
09:00-10:30	<b>Lecture.</b> Introduction to new and advanced sensors, techniques and programs	
11:00-12:30	<b>Lectures:</b>	
13:30-15:00		Optical Remote Sensing
15:30-17:00		Hyperspectral Remote Sensing
	Radar Remote Sensing	
<b>Day 2</b>		
09:00-17:00	<b>Optical Practical Exercise 1:</b> Image data processing & visualization of optical data using multispectral RS data, image sharpening, PCA and ratio images, MNF transformation, decorrelation stretch, filtering,	
<b>Day 3</b>		
09:00-10:30	<b>Hyperspectral Exercise 2:</b> Involves removing residual calibration errors; Spectral Angle Mapper Classification; Rule Classifier; Spectral Feature Fitting and Analysis; 2D Scatter Plots and evaluation of Spectral Feature Fitting Results	
11:00-12:30		
13:30-15:00		
15:30-17:00		Additional Exercise.: Hydrothermal alteration mapping for gold mineralization
<b>Day 4</b>		
09:00-10:30	<b>Lecture:</b> Interferometric and polarimetric SAR	
11:00-12:30	<b>Radar Exercise 3-A:</b> Involves data calibration, multilooking, speckle reduction, terrain correction	
13:30-17:00	<b>InSAR Exercise 3-B:</b> Data acquisition, image co-registration, spectral filtering, interferogram formation and coherence estimation, topographic phase removal, phase filtering; phase unwrapping, geocoding	
<b>Day 5</b>		
09:00-10:30	<b>InSAR Exercise 3-B:</b> Continuation	
11:00-12:30	<b>Polarimetric SAR Exercise 3-C:</b> Opening a Quad Pol Product, data calibration, , Polarimetric Matrix Generation, Polarimetric Speckle Filtering, Polarimetric Decompositions, Polarimetric Classification	
13:30-15:00		
15:30-17:00		

## About the Presenter

Prof. Tsehaie Woldai is an internationally-renowned Remote Sensing and GIS specialist who recently retired after more than 30 years at the International Institute for Geoinformation and Earth Sciences (ITC) in The Netherlands. He is currently a Visiting Professor at the University of the Witwatersrand. His research interests include geology, structural geology, remote sensing (Optical, Synthetic Aperture Radar (SAR), Interferometric SAR, Hyperspectral), image processing and interpretation, GIS and geo-environmental modelling and ranges across all continents except Antarctica. He has published more than 100 papers and has presented more than 50 short courses across the world.

## Who should attend?

The course is open to Earth Scientists employed in mining companies, Geological Survey organisations, Universities and other organisations, who are engaged in geological mapping or in mineral exploration, and can accommodate a maximum of 25 participants. In order to obtain the maximum benefit from this course, candidates should have a basic knowledge of Remote Sensing. Participants wishing to bring their own laptops and ENVI software are welcome to do so.

## Course fee

The fee of **R8,500.00 (+ 14% VAT)** includes all notes and morning and afternoon tea/coffee. A variety of lunch options are available on campus. Parking will be arranged.

## Application deadline:

Please complete the attached Registration Application Form before 15 April, 2016, and return it to Sharon Ellis ([Sharon.ellis@wits.ac.za](mailto:Sharon.ellis@wits.ac.za); 011-7176565; Fax 011-7176579). Approved candidates will be notified by 22 April.

## Venue

GIS Laboratory, Bernard Price Building, East Campus, University of the Witwatersrand, Johannesburg

## ***Registration Application Form***

### **Advanced Image Processing in Earth and Environmental Sciences**

**23<sup>rd</sup> to 27<sup>th</sup> November, 2015**

**University of the Witwatersrand, Johannesburg**

**Please return completed form by e-mail to [Sharon.ellis@wits.ac.za](mailto:Sharon.ellis@wits.ac.za), or fax to 011 717 6579**

<b>Title:</b>	
<b>First Name:</b>	
<b>Surname:</b>	
<b>Organisation:</b>	
<b>Position:</b>	
<b>Address:</b>	
<b>Invoice details (if different from above)</b>	
<b>Telephone Number:</b>	
<b>Cell Phone Number:</b>	
<b>Fax Number:</b>	
<b>E-Mail Address:</b>	
<b>I have attended the following Image Processing courses / I have the following relevant experience:</b>  (As this is an advanced course, please provide details that demonstrate your proficiency, such as course name, duration, venue, presenter/organisation. This information will be used for selection purposes)	

**Application Deadline is Monday 15 April 2016; approved candidates will be notified of acceptance by 22 April, and will receive payment details.**