



Accredited Africa Training Institute for Capacity Development

Unit FO409, Hatfield Plaza · 1122 Burnett St, Hatfield 0028 · Pretoria, Gauteng · South Africa

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COURSE BROCHURE

Active Sensor Image Analysis Techniques

Law, Military Science and Security / Sovereignty of the State

Unit Standard 244516 · NQF Level 5 · 12 Credits · 9 Days

COURSE OVERVIEW

This course equips participants with the skills to analyse images acquired by active sensors, such as radar and LiDAR. Learners will interpret sensor data, apply processing techniques, and extract meaningful information for applications in remote sensing, GIS, and environmental monitoring.

Category	Law, Military Science and Security
Subfield	Sovereignty of the State
Unit Standard	244516
Accreditation	SAQA Accredited · NQF Level 5 · 12 Credits
Duration	9 days
Training Method	Online, On-Campus, In-House
Certificate	Issued via AATICD LMS – verifiable online

LEARNING OUTCOMES

- Apply principles of active sensor imaging to interpret acquired data.
- Analyse image characteristics including resolution, noise, and geometric distortions.
- Evaluate different processing techniques for enhancing active sensor imagery.
- Extract thematic information from active sensor images using classification methods.
- Demonstrate proficiency in using software tools for active sensor image analysis.
- Validate analysis results through ground truthing and accuracy assessment.

WHO SHOULD ATTEND

- This course is designed for GIS technicians, remote sensing analysts, and environmental scientists who work with active sensor imagery and need to enhance their analytical capabilities.

COURSE OUTLINE

Day 1: Introduction to Active Sensors and Image Acquisition

- Overview of remote sensing: passive vs active sensors.
- Principles of LiDAR, radar, and sonar.
- Sensor components: transmitter, receiver, scanning mechanism.
- Imaging modes: strip mapping, spotlight, pushbroom.
- Factors affecting image quality: resolution, noise, geometry.
- Applications in environmental monitoring, defence, and engineering.

Day 2: Image Preprocessing and Calibration

- Radiometric calibration: gain, offset, atmospheric correction.
- Geometric correction: sensor model, ground control points, resampling.
- Speckle noise in SAR and LiDAR: causes and reduction.
- Image enhancement: contrast stretching, histogram equalization.
- Data formats and metadata extraction.

Day 3: Image Filtering and Feature Extraction

- Spatial filtering: mean, median, Gaussian filters.
- Edge detection: Sobel, Canny, Roberts operators.
- Texture analysis: GLCM, Gabor filters.
- Frequency domain: Fourier transform, high-pass/low-pass filtering.
- Morphological operations: dilation, erosion, opening, closing.

Day 4: Image Segmentation and Object Detection

- Thresholding: global, adaptive, Otsu's method.
- Clustering: K-means, mean shift.
- Region-based segmentation: region growing, watershed.
- Object detection: template matching, Hough transform for lines and circles.
- Segmentation evaluation: Jaccard index, Dice coefficient.

Day 5: Classification Techniques for Active Sensor Data

- Supervised classification: maximum likelihood, SVM, random forest.
- Unsupervised classification: K-means, ISODATA.
- Object-based image analysis: segmentation, rule-based classification.
- Accuracy assessment: confusion matrix, kappa coefficient.
- Handling mixed pixels and sub-pixel analysis.

Day 6: Advanced Techniques: Deep Learning for Active Sensor Imagery

- Introduction to neural networks and CNNs.
- Popular architectures: U-Net, ResNet, YOLO.
- Transfer learning and fine-tuning.
- Data augmentation for active sensor imagery.
- Training considerations: overfitting, batch normalization, dropout.

Day 7: 3D Point Cloud Processing from LiDAR and Radar

- Point cloud filtering: ground vs non-ground, noise removal.
- Segmentation: region growing, RANSAC for plane detection.
- DEM generation: interpolation, gridding.

- LiDAR classification: vegetation, buildings, ground.
- Radar interferometry (InSAR): phase unwrapping, deformation mapping.

Day 8: Time-Series Analysis and Change Detection

- Change detection methods: image differencing, ratioing, PCA.
- SAR coherence change detection.
- Time-series analysis: stack processing, temporal filtering.
- Applications: deforestation, urban expansion, crop monitoring.
- Accuracy assessment for change detection.

Day 9: Integration, Case Studies, and Future Trends

- Integration with GIS: raster-vector overlay, spatial analysis.
- Multi-sensor data fusion: combining LiDAR, SAR, and optical.
- Case studies: flood mapping, mining, defence.
- Future trends: AI, real-time processing, small satellites.
- Mini-project presentations and peer feedback.

ASSESSMENT & CERTIFICATION

Delegates are assessed through exercises and a final test. A mark of **50% or above** earns an **AATICD Certificate of Completion**, issued digitally with a unique verification code. This course carries **12 NQF credits** at **NQF Level 5**.

PRICING (PER DELEGATE, EX-VAT)

Delegates	Training Method	Price per Delegate	Total
1	Online	R 25,600.00	R 25,600.00
1	In-House	R 33,300.00	R 33,300.00
1	On-Campus (Pretoria)	R 38,400.00	R 38,400.00

UPCOMING SESSIONS

Start	End	Method	Venue
18 Aug 2026	28 Aug 2026	On-Campus	Durban, South Africa
19 Aug 2026	31 Aug 2026	On-Campus	Shenzhen, China
20 Aug 2026	01 Sep 2026	On-Campus	Harare, Zimbabwe
20 Aug 2026	01 Sep 2026	On-Campus	Dubai, UAE
21 Aug 2026	02 Sep 2026	On-Campus	Pretoria, South Africa
24 Aug 2026	03 Sep 2026	On-Campus	Durban, South Africa
25 Aug 2026	04 Sep 2026	On-Campus	Shenzhen, China
26 Aug 2026	07 Sep 2026	On-Campus	Harare, Zimbabwe

Contact us if no suitable date is listed – on-demand sessions can be arranged for groups.

HOW TO GET A QUOTE OR APPLY

1. **Get an instant quotation online:** visit www.aaticd.co.za, open the page for this course (Unit Standard 244516) and click **Get A Quote / Apply**. Select your training method and number of delegates – your quotation is generated immediately and emailed to you with the course brochure attached.
2. **Apply by email:** send the course title, your preferred training method (Online, In-House or On-Campus Pretoria), the number of delegates and your preferred dates to apply@aaticd.co.za – our team will reply with a formal quotation.
3. **Apply by phone or WhatsApp:** call +27 12 004 8389 or WhatsApp +27 65 077 6310 and we will prepare your quotation and reserve your seats.
4. **Confirm your booking:** accept the quotation and settle the invoice. As soon as payment is confirmed your delegates are enrolled and receive their AATICD LMS login details by email, along with joining instructions for their chosen training method.

Group discounts apply automatically – the more delegates you enrol, the lower the price per delegate. No payment is required to request a quotation.

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