CONCEPT

Remote Sensing for Environmental Monitoring: Satellite Imagery, Land Cover and Change Detection

10 – 14 October 2027
Riyadh - KAFD district five-star



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Ref: 608_17940 **Date:** 10 – 14 October 2027 **Location:** Riyadh - KAFD district five-star **Fees:** 20000 SAR

Introduction:

Remote sensing gives environmental and planning teams repeatable evidence of how land, vegetation, water and urban surfaces change, yet many organisations still rely on occasional field visits and unchecked imagery. Without corrected images, consistent indices and tested classification accuracy, monitoring reports on desertification, shoreline change or urban heat cannot support planning or impact assessment decisions. This Core Concept course builds practitioner skill in selecting sensors, preprocessing imagery, calculating spectral indices, classifying land cover, detecting change and linking results to GIS planning layers. Participants produce a Remote Sensing Monitoring Plan and Change Map Report for a case area.

Course Objectives:

- Select optical, thermal, radar or drone imagery with the spatial, spectral, radiometric and temporal resolution a monitoring question requires
- Prepare analysis-ready imagery through radiometric, atmospheric, geometric and topographic correction, cloud masking and compositing
- Calculate and interpret vegetation and water indices to track vegetation condition, surface water extent and soil exposure
- Classify land use and land cover from satellite imagery and report map accuracy with a confusion matrix and area estimates
- Detect and quantify environmental change such as land degradation, shoreline retreat and urban heat using multi-date imagery
- Integrate classified and change layers into GIS planning and environmental impact assessment workflows

Target Audience:

- Environmental specialists who monitor land degradation, habitats, water bodies and pollution indicators
- Urban and regional planning staff who prepare land use evidence and track urban growth
- Agriculture, rangeland and natural resource staff who assess vegetation cover and land condition over large areas
- GIS analysts who process imagery and maintain raster and thematic map layers
- Environmental impact assessment practitioners who build baselines and follow-up monitoring for projects

Course Outline:

Day 1: Remote Sensing Principles, Sensors and Imagery Sources

- Electromagnetic Spectrum and Spectral Signatures of Soil, Vegetation and Water
- Passive Optical Multispectral and Thermal Infrared Sensors Compared
- Active Radar SAR and Lidar Sensing: Backscatter, All-Weather and Night Capture
- Drone Imagery Capture: Flight Planning, Ground Sample Distance and Orthomosaics
- Open Satellite Data Archives and Commercial Very High Resolution Imagery Selection Criteria

Day 2: Image Resolution, Preprocessing and Spectral Indices

- Spatial, Spectral, Radiometric and Temporal Resolution Trade-Offs for Monitoring Tasks
- Radiometric Calibration and Atmospheric Correction to Surface Reflectance
- Geometric and Topographic Correction, Georeferencing and Image Co-Registration
- Cloud and Shadow Masking, Mosaicking and Cloud-Free Composite Building
- Vegetation and Water Indices: NDVI, SAVI, EVI and Normalized Difference Water Index

Day 3: Land Cover Classification, Accuracy Assessment and Change Detection

- Land Use and Land Cover Class Scheme Design and Training Sample Collection
- Supervised and Unsupervised Classification: Maximum Likelihood, Random Forest and Clustering
- Accuracy Assessment: Confusion Matrix, Overall Accuracy, Kappa and Area Estimation
- Change Detection Methods: Post-Classification Comparison and Image Differencing
- Satellite Image Time Series: Trend, Seasonal and Abrupt Change Decomposition

Day 4: Environmental Monitoring Applications and Problem Cases

- Desertification and Land Degradation Indicators: Vegetation Loss, Sand Encroachment and Soil Exposure
- Coastal Shoreline Change, Mangrove Extent and Water Body Surface Area Monitoring
- Oil Spill and Turbidity Detection With Radar and Optical Imagery
- Urban Heat Island Mapping From Land Surface Temperature and Air Quality Proxy Overview
- Common Error Sources: Mixed Pixels, Seasonal Mismatch, Sensor Differences and Misregistration

Day 5: Planning Integration Lab and Monitoring Report

- Exporting Classified Rasters and Change Layers Into GIS Planning Databases
- Remote Sensing Evidence in Environmental Impact Assessment Baselines and Follow-Up Monitoring
- Case Area Data Pack: Multi-Date Imagery, Field Points and Planning Constraints
- Change Map Production: Legend, Area Statistics and Uncertainty Statement
- Remote Sensing Monitoring Plan and Change Map Report Drafting and Peer Review

Skills You Will Gain:

- Sensor and Imagery Selection
- Image Preprocessing
- Spectral Index Analysis
- Land Cover Classification
- Map Accuracy Assessment
- Multi-Date Change Detection
- Thermal and Heat Island Mapping
- Environmental Monitoring Planning

Why Attend This Course:

- Return with a Remote Sensing Monitoring Plan and Change Map Report built on a case area data pack
- Replace occasional site visits with repeatable image-based indicators for vegetation, water and land condition
- Defend change maps in planning and impact assessment reviews with stated accuracy and uncertainty
- Compare monitoring practice with environmental, planning, agriculture and GIS peers from several sectors

Conclusion:

Credible environmental monitoring from space depends on choosing the right sensor, correcting imagery consistently and proving map accuracy. The course moves from spectral principles, sensors and data sources, through resolution, preprocessing and indices, to land cover classification, accuracy assessment and change detection, then to desertification, coastal, water, oil spill and urban heat applications and their error sources. The final day links results to GIS planning and impact assessment and produces a Remote Sensing Monitoring Plan and Change Map Report ready for use at work.