IGIS
INSTITUTE OF GEOGRAPHICAL INFORMATION SYSTEMS



INTERNATIONAL TRAINING WORKSHOP

Remote Sensing *for Disaster Management*

From satellite constellations to UAV systems: an integrated observation chain for emergency response and loss assessment

18–20 November 2026
IGIS, SCEE, NUST · Islamabad

Programme booklet

Two scales. One observation chain.

During a monsoon flood, responders need two answers at once: *how far has the water spread, and who is affected?* Then: *which embankments breached, which bridges failed, how many homes are lost?*

> No single sensing platform can address both. Used in a deliberate sequence, satellites and UAVs create an observation chain far more effective than either alone.

Over two and a half days you will work through that chain, using openly licensed satellite data, browser-based cloud computing and standard commercial UAVs, all reproducible with equipment ordinarily available to a Pakistani institution.

BY THE CLOSE OF DAY 3 YOU WILL HAVE PRODUCED

1. **A flood extent map** from Sentinel-1 SAR
2. **An exposure table** of population, cropland and roads
3. **A UAV orthomosaic and DSM** from imagery you helped fly
4. **A damage assessment** quantified from that model
5. **A rapid situation brief** for an emergency operations centre

PROGRAMME AT A GLANCE

From the wide view to the close-up.

01

WEDNESDAY 18 NOVEMBER · 08:30–17:00

Foundations, wide-area assessment & mission design

Modules 1–3 · Lab 0 · Lab 1A/1B flood mapping and exposure · Lab 2 flight planning

02

THURSDAY 19 NOVEMBER · 08:30–17:00

Field operations & UAV data processing

Field flights at the NUST field site · Lab 3A photogrammetry · Lab 3B 3D modelling and damage quantification

03

FRIDAY 20 NOVEMBER · 09:00–12:15

Integration, case studies & rapid-response simulation

Module 4 · three Pakistani case studies · capstone simulation · closing and certificates

2½	15	30	4
days	contact hours	participants	expert lecturers

DAY 1 · WEDNESDAY 18 NOVEMBER

Foundations & wide-area assessment

MORNING

08:30	**Registration and tea** Badge collection, laptop check and Earth Engine login verification.
09:00	**Opening ceremony** Welcome address, inauguration and course objectives.
09:20	**Module 1 · Foundations of remote sensing across scales** Passive and active sensing; the resolution quartet; swath versus resolution; what “large-scale” changes; the observation continuum from satellites to ground surveys; Earth observation across the disaster management cycle.
10:10	**Module 2 · Data access and international emergency mapping** Sentinel, Landsat, MODIS, VIIRS, GPM IMERG and global DEMs; Analysis-Ready Data; Copernicus Data Space and the Earth Engine catalogue; the International Charter, Copernicus EMS, Sentinel Asia and UN-SPIDER, and how a Pakistani agency requests activation.
10:55	Tea break
11:10	**Module 3 · UAV systems, regulation and payloads** UAV system composition; fixed-wing, multirotor and VTOL platforms; optical, multispectral, thermal and LiDAR payloads; regulations, authorities and operating procedures in Pakistan.
12:00	Lunch and prayers

DAY 1 · WEDNESDAY 18 NOVEMBER

Mapping the flood & planning the flight

AFTERNOON

13:30	**Lab 0 · Environment check** Earth Engine Code Editor orientation, shared scripts, a first run and login troubleshooting. Offline data package for anyone without access.
14:00	**Lab 1A · Rapid flood mapping from Sentinel-1 SAR** Pre- and post-event VV imagery, speckle filtering, change-detection ratio and thresholding, terrain masking with slope and HAND. Output: flood extent for the 2022 Sindh floods.
15:30	Tea break
15:45	**Lab 1B · Exposure and impact quantification** Flood extent against WorldPop, ESA WorldCover and OpenStreetMap to build a district-wise exposure table; error sources and where they justify an aerial survey.
16:20	**Lab 2 · Flight planning and mission design** Area, sensor, overlap, ground sample distance and safety; avoiding restricted airspace; altitude, speed and route generation. Each group plans the mission it flies on Day 2.
17:00	Close of Day 1 Field safety and pre-flight briefing issued.

DAY 2 · THURSDAY 19 NOVEMBER

Field operations & UAV data processing

08:30	**Transfer and pre-flight briefing**	To the NUST field site. Airspace, weather and safety limits, crew roles and go/no-go; aircraft checks and ground control layout.
09:00	**Field practical · UAV flight operations**	Supervised stations: manual handling, emergency take-off and landing, return-to-home; the planned mission; orthophoto, oblique and thermal acquisition; GCP survey.
11:30	**Data offload and quality check**	Coverage, overlap and image quality; flight log; transfer to workstations.
12:00	Lunch and prayers	Return to IGIS.
13:30	**Lab 3A · Photogrammetric processing**	POS data, pre-processing, alignment, dense reconstruction, DSM and orthomosaic, georeferencing and accuracy.
15:15	Tea break	
15:30	**Lab 3B · 3D modelling and damage quantification**	Oblique modelling; change detection between epochs; landslide displacement; building damage and road length, reconciled with the Lab 1 exposure table.

If weather or airspace prevents flying, a pre-flown reference dataset keeps the labs on schedule.

DAY 3 · FRIDAY 20 NOVEMBER · HALF DAY

Integration, case studies & rapid response

09:00 **Module 4 · Integrating the observation chain**
Nested assessment from satellite screening to UAV tasking and ground validation; handover points, authority and latency; uncertainty and defensible figures.

09:35 **Applied case studies**
Attabad Lake flood risk · Shisper Lake GLOF with HEC-RAS 2D · Jhang riverine flooding, ENSO and the monsoon.

10:15 Tea break
Scenario cards and data packages distributed.

10:30 **Capstone · Rapid-response simulation**
Six groups, 45 minutes, a four-slide brief: event footprint, exposure table, UAV tasking plan and confidence statement. Scenarios include Dera Ghazi Khan floods, a Hunza GLOF, a Muzaffarabad earthquake, Tharparkar drought, Karachi urban flooding and Sindh reconstruction.

11:45 **Communication, summary and closing**
Pak-NSDI and data sharing; self-study packages and online clinic; remarks by dignitaries, certificates and group photograph.

12:15 Close
Ahead of Friday congregational prayers.

LEARNING OUTCOMES

What you'll be able to do.

01 Choose platform, sensor and resolution for a hazard and reporting scale.

02 Access free satellite archives and request international emergency mapping.

03 Map flood extent from Sentinel-1 SAR and quantify exposure.

04 Select a UAV platform and payload against mission requirements.

05 Follow Pakistan's UAV regulations, permissions and flight-safety procedures.

06 Plan and fly a survey mission for orthophoto, oblique and thermal data.

07 Process imagery to an orthomosaic, a DSM and an oblique 3D model.

08 Quantify damage and reconcile it with satellite exposure estimates.

09 Design a nested multi-scale workflow with stated uncertainty.

10 Deliver a rapid situation brief under time pressure.

EXPERT LECTURERS

Your lecturers.



Dr. NIE Yong

Professor · Institute of Mountain Hazards and Environment (IMHE), CAS

Director, Mountain Science Data Center. Glacier and glacial lake hazards and remote sensing; 50+ papers including ESI highly cited work; risk assessment for the China–Pakistan Economic Corridor.



Engr. WANG Wen

Assistant Engineer · Mountain Science Data Center, IMHE, CAS

Remote sensing for mountain hazards and the cryosphere; extensive UAV fieldwork and processing, from flight planning to orthomosaics, DEMs and 3D models.



Dr. Javed Iqbal

Professor · SCEE – IGIS, NUST

Three decades in GIS, remote sensing and hazard mapping of landslides, glacier avalanches and flash floods; 200+ scholarly contributions.



Dr. Shahid Nawaz Khan

Assistant Professor · SCEE – IGIS, NUST

Explainable machine learning for Earth observation, SAR–optical fusion, Earth Engine and UAV remote sensing; FAA Part 107 remote pilot.

BEFORE YOU ARRIVE

Come ready to work.

The schedule is compressed, so there is no slack to recover from a failed login on the day.

- [ ] **Google Earth Engine access** registered and verified with a linked Cloud project. Allow 7–10 days.
- [ ] **Laptop with Google Chrome.**
- [ ] **QGIS 3.34 LTR** installed, with 5 GB free disk space.
- [ ] **UAV ground-station app** on a charged phone or tablet, with a cable.
- [ ] **Field clothing for Day 2:** closed-toe shoes, sun protection and a hat.
- [ ] **Pre-reading pack**, circulated two weeks ahead.
- [ ] **Signed field-safety acknowledgement**, handed in at registration.

VENUE & CONTACT

Where to find us.

LECTURES & LABS · ALL THREE DAYS

Institute of Geographical Information Systems

SCEE, NUST Sector H-12, Islamabad 44000

UAV FLIGHTS · DAY 2 MORNING

NUST Field Site

Near the Saddle Club, NUST H-12 · transfer from IGIS at 08:30

NUST_CPJRC_WRKSHP@igis.nust.edu.pk
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NOTES

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IGIS
INSTITUTE OF GEOGRAPHICAL INFORMATION SYSTEMS



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Institute of Geographical Information Systems, School of Civil and Environmental Engineering, NUST
Geological Survey of Pakistan

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