सत्यमेव जयते
Department of Science & Technology
Govt. of India

Winter School In Geospatial Science and Technology (Level 1)

1 to 21 November, 2022

at

ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan, India

Organized by

ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan, India

Supported by

National Geospatial Program, Department of Science and Technology, Government of India, New Delhi

Principal Investigator

Dr. Priyabrata Santra,
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Co-Principal Investigators

- Dr. Mahesh Kumar , Principal Scientist, ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan
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- Dr. N.R. Panwar, Principal Scientist, ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan

ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan

ICAR-Central Arid Zone Research Institute (CAZRI) owes its origin to the Desert Afforestation Research Station, which was established in 1952 at Jodhpur and was upgraded to the Desert Afforestation and Soil Conservation Station later in 1957. In order to put appropriate emphasis on arid zone research and development, the Government of India in 1958 on the recommendation and advice of an UNESCO expert, Mr. C.S. Christian from Australia, the Institute came into existence on October 1, 1959 to promote.

The Institute is a constituent of the Indian Council of Agricultural Research (ICAR), New Delhi.The Institute conducts multi-disciplinary research to seek solutions to the problems in hot and cold arid zones of the country, covering about 39 million hectare area. The institute has distinction of being one of the first International Institutes of its kind in the world devoted to arid zone research and development. During last six decades the Central Arid Zone Research Institute has provided a better understanding of the arid ecosystem and its natural resources, and has developed disseminated several technologies that have influenced the land use and livelihood options improving overall productivity of this fragile agro climatic region. The Institute has focused its research and development activities on monitoring and assessment of natural resources of this fragile arid ecosystem with a holistic approach encompassing environment and livelihood issues of desert dwellers with greater emphasis on sustainable agriculture, horticulture and agro-forestry, livestock husbandry, range management and use of alternate sources of energy. CAZRI has been involved in evolving technologies and strategies to combat drought and desertification. CAZRI, Jodhpur with its five Regional Research Stations located at Pali, Bikaner and Jaisalmer (Rajasthan), Kukma-Bhuj (Gujarat) and at Leh (J&K) has been at the forefront of mobilizing scientific. Technical and policy related expertise to improve livelihood and living condition of desert dwellers with a focus on improved agriculture and environmental sustainability.

Fig 1. ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan

What is the Summer/Winter Schools (Level 1)Capacity Building Program in Geospatial Science and Technology

Recently knowledge has been identified as the most important driving factor for India's sustainable economic growth. India has adopted a new information regime for sustainable economic growth through its 'Digital India' program to support good governance, sustainable development goals and empowerment of its citizens. Over the last three decades, the widespread adoption of geospatial technologies into various sectors have proven to be an effective enabler to meet these challenges. The capacity building program initiatives of the National Geospatial Program (NGP) erstwhile Natural Resource Data Management System (NRDMS) Department of Science and Technology, Government of India to develop national capacity for geospatial science and technology development through diverse programs in collaboration with various partner organizations adaptation capacity of geospatial science and technology at across the country. The objective of the program is to build knowledge and various levels of governance in collaboration with academia and user agencies. The three week Summer/ Winter School in Geospatial technology is being conducted at two levels– Level 1 and Level 2. The 21-day summer/winter school in Geospatial Science and Technology (Level 1) supported by the National Geospatial Program (NGP) of the Department of Science and Technology, Government of India focuses on developing knowledge and capacity building in geospatial technologies through the use of open source geospatial software.

Who can apply?

Faculty members, scientists, technologists, researchers from academia, national institutions of research, smart city cells, municipal corporations and other government departments, personnel from non government organizations are eligible to apply. Only 2-3 seats are reserved for research scholars.

How to apply?

- Interested candidates should fill the online application form through the weblink available on http://dst-iget.in.
- Selected candidates will be informed by mail.
- For any further queries write to dst-iget@bvieer.edu.in or call on +91-20-24375684/24362155.
- Address all queries regarding the program to PI through email.

Important Information

Last date for registration : 30 September 2022
Dates of the program: 1 to 21 November, 2022
Mode of conduct: Offline Mode
(According to the situation of Pandemic the mode of conducting the program will be changed to ONLINE)
No. of seats: 25
Registration Fees: Nil

Principal Investigator:
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Co-Principal Investigators:

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- Dr. P.C. Moharana, Principal Scientist, ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan,
- Dr. N.R. Panwar, Principal Scientist, ICAR-Central Arid Zone Research Institute, Jodhpur, Rajasthan,

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Venue:
ICAR-Central Arid Zone Research Institute
CAZRI Road, Jodhpur - 342 003 (Rajasthan) - INDIA

Grading and Certification : Grading and Certification Participants will be assessed based on assignments completed during the course, a mini project that they are expected to complete, active participation during the training program as well as attendance.

Note: In case the program is conducted online due to COVID 19 restrictions, participants must ensure that they have a laptop and a strong internet connection.

Infrastructural facilities:

The Institute has following important infrastructure facilities: state-of-the-art auditorium, conference hall, small size auditorium, meeting rooms, video conferencing room etc. Apart from, these, the Institute has Agricultural Knowledge Management Unit (AKMU) having several number of computers, GIS laboratory, Agri-business incubation centre (ABI) etc. Licensed geospatial software e.g. ArcGIS and handheld navigation systems are also available in the Institute

Lab Facilities Available at ICAR– CAZRI

The Institute has several analytical laboratories in several research areas e.g. soil science, organic chemistry, tissue culture, biochemistry, plant pathology, post harvest processing, animal nutrition, solar energy yard etc. Few important facilities available in the Institute are CHNS analyser, FTIR, HPLC, Gas chromatography, AAS, Spectrophotometer, fame photometer, soil moisture sensors, agrivoltaic system etc.

Boarding & Lodging Facilities

The Institute has one guest house cum training hostel (20 AC/non-AC rooms) and one International guest house (2 Suites and 9 AC rooms) within the campus. The guest houses and hostel are operated to mainly support the research activity on the campus with a homely atmosphere.

Fig. 2: International guest house

Fig. 3: International guest house (inside

Fig. 4: Guest house

Fig. 5: GIS laboratory

Fig. 6: Soil physics laboratory

Fig. 7: Agricultural knowledge management unit (AKMU)

Program schedule for 21 Days Winter School (level 1) in Geospatial Science and Technology

(1 to 21 November 2022)

Day, Date	Session	Time	Topic
1st Nov 2022, Tuesday	**Morning Session (3 Hours)**	**10:00-11:00**	Theory 1: Introduction to the concept of geospatial science and technology
		11:00-12:00	Theory 2: Introduction to UNGGIM / geospatial SDG indicators
		12:00-12:15	**TEA BREAK**
		12:15-13:15	Theory 3: Application of geospatial science and technology in natural resource management (soil, water and vegetation)
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-17:00**	Field visit to GIS laboratory and CAZRI research farm
2nd Nov 2022, Wednesday	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 4:** Spatial and non-spatial data types (aerial photos, remote sensing, toposheets, databases, drones etc.)
		11:00-12:00	**Theory 5:** Acquisition of spatial and non-spatial data from different sources and their quality assessment
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 6:** Geographic co-ordinate system
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 1:** Acquisition of free satellite data from Bhuvan
		15:00-16:00	**Lab 2:** Acquisition of sentinel and Landsat satellite data from Earth Explorer portal
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 3:** Introduction of QGIS and functions
3/3rd Nov 2022 (Thursday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 7:** Map projections
		11:00-12:00	**Theory 8:** Geodetic datum-concept and types
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 9:** Sources and types of errors in geospatial data building
		13:15-14:00	**LUNCH BREAK**

	Evening Session (3 Hours)	**14:00-15:00**	**Lab 4:** Working with projections using QGIS using exiting projection
		15:00-16:00	**Lab 5:** Making and new project and importing a projection using QGIS
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 6:** Field exercise for collecting points using a handheld GPS
4/4th Nov 2022 (Friday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 10:** Elements of data quality and importance of metadata
		11:00-12:00	**Theory 11:** Digital cartography-Cartographical evolution
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 12:** Map classification and its elements
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 7:** Georeferencing in QGIS-1
		15:00-16:00	**Lab 8:** Georeferencing in QGIS-2
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 9:** Georeferencing in QGIS-3
5/5th Nov 2022 (Saturday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 13**: Introduction to database, database structure and database management systems
		11:00-12:00	**Theory 14:** Database data models
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 15:** Database creation linking spatial and attribute data
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 10:** Image registration using QGIS -1
		15:00-16:00	**Lab 11:** Image registration using QGIS-2
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 12:** Image registration using QGIS-3
6/6th Nov 2022 (Sunday)			**Holiday**
7/7th Nov 2022 (Monday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 16:** Spatial analysis using QGIS
		11:00-12:00	**Theory 17:** Multicriteria analysis in GIS environment
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 18:** Introduction to global navigation satellite systems (GNSS)
		13:15-14:00	**LUNCH BREAK**
		14:00-15:00	**Lab 13:** Data exploration using QGIS

	Evening Session (3 Hours)	**15:00-16:00**	**Lab 14:** Working with tables and queries
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 15: I**mporting GPS data in to QGIS
8/8th Nov 2022 (Tuesday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 19:** Basic principle and concept of remote sensing
		11:00-12:00	**Theory 20:** Applications of remote sensing technologies in agriculture
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 21:** Introduction to earth resource satellites for assessment and monitoring of natural resources
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Theory 22:** Introduction of electro radiation models and their basic principals
		15:00-16:00	**Theory 23:** Energy matter interactions in atmosphere and with terrain
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Theory 24**: Atmospheric windows and types of remote sensing systems;
9/9th Nov 2022 (Wednesday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 25**: Elements of visual interpretation of remote sensing images and factors governing the interpretability
		11:00-12:00	**Theory 26:** Image quality assessment
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 27:** Statistical evaluation of remote sensing images through univariate and multivariate image statistics
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 16:** Introduction to SAGA GIS
		15:00-16:00	**Lab 17:** Understanding remote sensing image using SAGA GIS
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 18:** Image interpretation using SAGA GIS
10/10th Nov 2022 (Thursday)	**Morning Session (3 Hours)**	**10:00-11:00**	Theory 28: Radiometric image rectification and restoration
		11:00-12:00	**Theory 29:** Geometric image correction and restoration
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 30**: Introduction and basics of image enhancement

		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 19:** Visual interpretation of remote sensing image using SAGA GIS
		15:00-16:00	**Lab 20:** Georeferencing a toposheet using SAGA GIS
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 21:** Image registration using SAGA GIS
11/11th Nov 2022 (Friday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 31:** Enhancement of remote sensing images
		11:00-12:00	**Theory 32:** Image classification
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 33:** Validation of image classification
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 22:** Subsetting and mosaicking of remote sensing image using SAGA GIS
		15:00-16:00	**Lab 23:** Enhancement of remote sensing images using SAGA GIS
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 24:** Preparation of vegetation indices using SAGA GIS
12/12th Nov 2022 (Saturday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 34:** Change detection algorithms
		11:00-12:00	**Lab 25:** Unsupervised classification of remote sensing images using SAGA GIS
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Lab 25:** Supervised classification of remote sensing images using SAGA GIS
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 26:** Accuracy assessment of classified images using SAGA GIS
		15:00-16:00	**Lab 27:** Change detection using SAGA GIS-1
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 28:** Change detection using SAGA GIS-2
13/13th Nov 2022 (Sunday)			**Holiday**

14/14th Nov 2022 (Monday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 35:** Introduction to Google earth engine
		11:00-12:00	**TEA BREAK**
		12:00-12:15	**Theory 36:** Accessing earth observation (EO) datasets through Google earth engine
		12:15-13:15	**Theory 37:** Visualization and analysis of remote sensing images using Google earth engine
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-16:00**	**Theory 38:** Understanding the basics of terrain data (DEM, DTM, DSM etc) and their importance
		16:00-16:15	**TEA BREAK**
		16:15-17:15	**Lab 29**: Terrain analysis using SAGA GIS
15/15th Nov 2022 (Tuesday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 39:** WebGIS application-technical basis
		11:00-12:00	**Theory 40:** Geospatial web services
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 41:** Introduction to NSDI and SDI
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 30:** Exercise on spatial data analysis-1
		15:00-16:00	**Lab 31:** Exercise on spatial data analysis-2
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 32:** Exercise on spatial data analysis
16/16th Nov 2022 (Wednesday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 42:** Application of geospatial technology for mapping soil resources Lab 33: Using QGIS to create a WebGIS-1
		11:00-12:00	**Theory 43:** Application of remote sensing for water resource monitoring
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 44:** Application of remote sensing for monitoring vegetation
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 33:** Using QGIS to create a WebGIS-1
		15:00-16:00	**Lab 34:** Using QGIS to create a WebGIS-2
		16:00-16:15	**TEA BREAK**

		16:15-15:15	**Lab 35:** Understanding Geoserver
17/17th Nov 2022 (Thursday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Theory 45:** Application of GIS for monitoring and assessment of climate change
		11:00-12:00	**Theory 46**: Use of remote sensing and GIS techniques for achieving SDG target on land degradation neutrality
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Theory 47:** Advances in RS/GIS in combination with machine learning tools
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-15:00**	**Lab 36:** *Project work
		15:00-16:00	**Lab 37:** *Project work
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 38:** *Project work
18/18th Nov 2022 (Friday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Lab 39:** *Project work
		11:00-12:00	**Lab 40:** *Project work
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Lab 41:** *Project work
		13:15-14:00	**LUNCH BREAK**
	Evening Session (3 Hours)	**14:00-16:00**	**Lab 42:** *Project work
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 43:** *Project work
19/19th Nov 2022 (Saturday)	**Morning Session (3 Hours)**	**10:00-11:00**	**Lab 44:** *Project work
		11:00-12:00	**Lab 45:** *Project work
		12:00-12:15	**TEA BREAK**
		12:15-13:15	**Lab 46:** *Project work
		13:15-14:00	**LUNCH BREAK**
		14:00-15:00	**Lab 47:** *Project work

	Evening Session (3 Hours)	**15:00-16:00**	**Lab 48:** *Project work
		16:00-16:15	**TEA BREAK**
		16:15-15:15	**Lab 49:** *Project work
20/20th Nov 2022 (Sunday)			**Holiday**
21/21st Nov 2022 (Monday)	**Morning Session (3 Hours)**	**10:00-10:45**	**Lab 50:** *Project work
		10:45-11:30	**Lab 51:** *Project work
		11:30-12:15	**Lab 52:** *Project work
		12:15-12:30	**TEA BREAK**
		12:30-13:15	Evaluation of project work
		13:15-14:00	**LUNCH BREAK**
		14:00-17:00	Feedback report and overall evaluation