WinterSchoolin Geospatial ScienceAnd Technology (Level 2)

Theme: Advanced geospatial techniques for coastal and marine applications

06 – 26 January 2025

Organized by

Department of Ocean Engineering,
Indian Institute of Technology Madras,
Chennai, Tamil Nadu, India

सत्यमेव जयते
Department of Science & Technology
Govt. of India

Supported by

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

Principal Investigator

Prof.P Shanmugam, Professor, Department of Ocean Engineering, Indian Institute of Technology Madras, Chennai,
Tamil Nadu, India

Summer/Winter School 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. The three week program is being conducted at three levels, Level 1 (Standard), Level 1 (Spatial thinking) and Level 2. In addition there is a three day Geo Innovation Challenge Program. The objective of the program is to build knowledge and various levels of governance in collaboration with academia and user agencies and foster innovation.

Level 2 Summer / Winter School In Geospatial Science and Technology

This three week program is a theme specific advanced training being implemented by eight institutions across the country. A one week online refresher session will be held prior to the commencement of the three week program. The 21-day summer/winter school in Geospatial Science and Technology (Level 2) 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 geospatial software.

About the National Geospatial Program of the Department of Science and Technology, Government of India

In the heart of India's technological advancement lies the National Geospatial Programme (NGP) of the Department of Science and Technology, Government of India. The Geospatial Capacity Building Program initiated in 2010 has over the years flourished, fostering capacities in geospatial science, technology, solutions, and entrepreneurship. Its transformative journey initiated with a modest ambition has evolved into a robust program, igniting minds and expanding horizons.

For a decade, the Geospatial Capacity Building Program under DST has been a cornerstone, conducting 166 comprehensive three-week programs conducted as Summer and Winter Schools in Geospatial Technologies at a basic (Level 1) and advanced level (Level 2). The 2024 cycle includes a 11 three week Level 1-(Standard) programs, 4 three week Level 1-(Spatial Thinking) programs, 8 Level 2-(Advanced) three week programs and 7 Geo Innovation Challenge Programs being conducted by various Universities across India selected through a stringent process by the DST.

The sessions at these programs comprise classroom, lab, fieldwork, and mini-projects. Central to this success is a structured curriculum and the advocacy of open-source software. The dedicated portal, https://dst-iget.in, is a reservoir of learning materials, connecting educators, professionals, and scientists, and catalyzing India's geospatial domain. The NGP-DST's geospatial capacity building program is coordinated nationally by the Bharati Vidyapeeth Deemed University, Department of Geoinformatics, Institute of Environment Education and Research, Pune.

The Department of Ocean Engineering, Indian Institute of Technology Madras, Chennai, Tamil Nadu, Bharat is one of the selected institutions for conducting the Level 2 Program.

Indian Institute of Technology Madras

IIT Madras is established in 1959. It is a residential institute with nearly 600 faculty, 8000 students and 1250 administrative & supporting staff and is a self-contained campus located in a beautiful wooded land of about 650 acres. The campus is located in the city of Chennai. The Institute has sixteen academic departments and a few advanced research centres in various disciplines of engineering and pure sciences, with nearly 100 laboratories organized in a unique pattern.

IIT Madras has been the top-ranked engineering institute in India for four consecutive years as well as the 'Best Educational Institution' in Overall Category in the NIRF Rankings of 2019 put out by the Ministry of Human Resource Development. Visit us on: https://www.iitm.ac.in/

Department of Civil Engineering

The Ministry of Education and Social Welfare, as per the decision of the Council of Indian Institute of Technology, established the Ocean Engineering Center of IIT Madras in 1977 based on the recommendation of the committee headed by Dr. Y. Nayudamma. The Department is to act as a Center of Excellence for advancing the frontiers of science and to provide Break-through Technology as well as to develop education and training programs in the field of Ocean Engineering. A national advisory committee consisting of representatives of the then Ministry of Education, CSIR, UGC, DST, ONGC, EIL, other IITs, and user industries with the Director, IIT Madras as the chairman monitored the progress of the Department over the years. A review committee headed by Prof. M.G.K. Menon also reviewed the progress of the Department in 1982 and its recommendation has since been implemented.

The last 26 years have seen a remarkable growth of the Department in terms of expertise and infrastructure facilities and there has been notable success in achieving the above-mentioned objectives. The Department vigorously pursues activities in line with its objectives and remains committed to excellence in its endeavor in education, research, and training programs as well as supporting developmental efforts of marine industries. The Department has a laboratory are of 3000m2 and a highly specialized faculty numbering 20 with adequate support from technical and administrative staff.

Indian Institute of Technology Madras, Administrative Block

Department of Ocean Engineering

Who can apply?

- Faculty members, scientists, technologists, researchers from academia, national institutions of research, smart city cells, municipal corporations and other government departments are eligible to apply.
- Personnel from non government organizations (NGO)
- School Teachers
- Only 2-3 seats are reserved for research scholars. Only candidates who have a high degree of experience with geospatial technologies should apply for these advanced programs.

No basics will be covered in the Level 2 program. Candidates who have no knowledge of geospatial technologies should apply for the Level 1 program.

How to apply?

- Interested candidates should fill the online application form through the web link available on http://dst-iget.in. Kindly keep a digital copy of your photograph, LinkedIn Id / ORCID Id / Researchgate Id / Google Scholar Id (atleast one is needed) and deputation letter (format available on http://dst-iget.in website) handy while filling in the form.
- For any further queries write to dst.iget@bharatividyapeeth.edu or call on 7559288803
- Address all queries regarding the program **once selected** to the PI, Prof.P Shanmugam, *pshanmugam@iitm.ac.in, 9884704395*

Important Information

Last date for registration: 24 December 2024
Date of intimation of selection: 24 Dec 2024
Date of online orientation: 25 December 2024
Dates of the program: 06 – 26 January 2025

Mode of conduct: Offline
No. of seats: 25
Registration Fees: Nil

Principal Investigator: Prof.P Shanmugam, Professor, Department of Ocean Engineering, Indian Institute of Technology Madras, Chennai, Tamil Nadu, India
Email: pshanmugam@iitm.ac.in
Phone Number: 9884704395

For any queries contact

Prof.P Shanmugam (PI), pshanmugam@iitm.ac.in, 9884704395

Address

Indian Institute of Technology Madras, IIT P.O., Chennai 600 036, India

Certificate

Certificate of participation will be awarded to each participant only after attending the full course.

Travel and Lodging

Each participant will be reimbursed with 3 AC train fare. Lodging and boarding on a double sharing basis will be provided by the host institution.

Infrastructure and Facilities

Laboratory

The department, which boasts a 3000-square-metre laboratory area, strives for excellence in the areas of education, research and training programs while supporting developmental efforts within various marine industries.

Lodging and Boarding

The Institute has a guest house with AC/non-AC rooms and a 24x7 Wi-Fi facility across the campus. The number of the rooms are sufficient to accommodate 30 participants and resource persons at a time.

Computer lab

Solar Panels 300 kVA Installed

Surveying Lab

Cafeteria

Deputation Letter (Format) for DST Summer/Winter School/ Geoinnovation Program 2024-25

This is to state that Dr./Mr./Ms._____working at _____(name of the institute) as _____ (Designation), since _____(year) is being deputed/nominated to_____(program name in detail) from ----------(date, month, year) to ---------- (date, month, year) . He/she will be relieved from his/her duties during this period.

Signature and Seal

Head of the Institute

Program Schedule for 21 Days Summer School in Geospatial Science and Technology (Level 2)

Conducted by: Department of Ocean Engineering, Indian Institute of Technology Madras, Chennai, Tamil Nadu, India

Theme: Advanced geospatial techniques for coastal and marine applications

January 06-26, 2025

Day	Session	Theme	Time	Topic
Day 1	FN	Inauguration	08.30-9.30	Registration
	FN		09.30-10.30	Inaugural
	FN		10.30-11.00	**Break**
	FN	Inauguration	11:00-11:30	Introduction of the Participants; Discussion on prospects and expectations from the training program
	FN	Research at OOIL	11:30-01:00	Introduction to OOIL
	AN		01:00 -02:00	**Lunch**
	AN	Marine and Coastal Environment	02:00-04:00	Marine and Coastal Environment
	AN		04:00-04:30	**Break**
	AN	Marine and Coastal Environment	04:30-06:00	Marine/Coastal Vulnerability and Hazards
Day 2	FN	Coastal zone management and ocean policies	09.30-10.30	Coastal Zone Management: CZIS, ICZM model concepts and case studies in India
	FN		10.30-11.00	**Break**
	FN	Coastal zone management and ocean policies	11:00-12:00	Coastal and ocean policy
	FN	Marine surveying	12:00-01:00	Fundamentals of Coastal and Marine Surveying: Introduction to geodesy, various co-ordinate systems and projection types
	AN		01:00 -02:00	**Lunch**
	AN	Marine surveying	02:00-04:00	Coastal control surveying and offshore fix techniques: Principles and measurements
	AN		04:00-04:30	**Break**

	AN	Marine surveying	04:30-06:00	Satellite systems – GPS, Differential GPS, GLONASS – static and Kinematics GPS surveys
Day 3	FN	Remote sensing	09.30-10.30	Remote sensing: Principles and governing laws, EMR interaction with atmosphere and earth materials, sensors and platforms
	FN		10.30-11.00	**Break**
	FN	Remote sensing	11:00-12:00	Physics of ocean color remote sensing - Theory and principles
	FN	Remote sensing	12:00-01:00	Physics of ocean color remote sensing - Theory and principles
	AN		01:00 -02:00	**Lunch**
	AN	Remote sensing	02:00-04:00	Physics of thermal remote sensing, algorithms and applications
	AN		04:00-04:30	**Break**
	AN	Practical session on advanced surveying instruments	04:30-06:00	Demonstration and Hands on training on GPS, RTK-DGPS
Day 4	FN	Remote sensing	09.30-10.30	Physics of microwave remote sensing, algorithms and applications
	FN		10.30-11.00	**Break**
	FN	Remote sensing	11:00-12:00	Satellite processing techniques for (coastal and marine) general remote sensing data
	FN	GIS principles and applications	12:00-01:00	GIS Concepts (Principles, components of GIS, data types, formats and projections)
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on GIS	02:00-04:00	Overview of QGIS
	AN		04:00-04:30	**Break**
	AN	Practical session on GIS	04:30-06:00	Practical session on QGIS
	FN	GIS principles and applications	09.30-10.30	GIS and its applications

Day 5	FN		10.30-11.00	**Break**
	FN	GIS principles and applications	11:00-12:00	Flood inundation modelling, mapping and assessment through remote sensing and GIS
	FN	Geodesy and GNSS	12:00-01:00	Geodesy theory/principles, Coordinate systems in space/ plane and projection systems
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on GIS	02:00-04:00	Demonstration of GIS applications with case studies
	AN		04:00-04:30	**Break**
	AN	Practical session on GIS	04:30-06:00	Demonstration of GIS applications with case studies
Day 6	FN	Optical remote sensing Advanced techniques	09.30-10.30	Rayleigh scattering correction algorithm applied to ocean optical remote sensing data
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	Aerosol scattering correction algorithm applied to ocean optical remote sensing data
	FN	Optical remote sensing Advanced techniques	12:00-01:00	Aerosol scattering correction algorithm applied to ocean optical remote sensing data
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on QGIS	02:00-04:00	Practical session on QGIS
	AN		04:00-04:30	**Break**
	AN	Practical session on QGIS	04:30-06:00	QGIS mini project discussion
Day 7	FN	Optical remote sensing Advanced techniques	09.30-10.30	Advanced optical techniques for surface and subsurface applications
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	Modelling of air-underwater communication channel
	FN	Optical remote sensing Advanced techniques	12:00-01:00	Estimation of underwater visibility using remote sensing data
	AN		01:00 -02:00	**Lunch**

	AN	Radiometric measurements	02:00-04:00	Radiometric measurements - Theory / measurement principles / Demonstration using Trios Radiometers
	AN		04:00-04:30	**Break**
	AN	Radiometric measurements	04:30-06:00	Practical session using RAMSES Trios Field Radiometers
Day 8	FN	Optical remote sensing Advanced techniques	09.30-10.30	Sediment settling velocity - Theory/principles/algorithms for its estimation using remote sensing data
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	Remote sensing assessment of thin layer dynamics in the subsea environment (case study in Bay of Bengal)
	FN	Optical remote sensing Advanced techniques	12:00-01:00	Remote sensing assessment of thin layer dynamics in the subsea environment (case study in Bay of Bengal)
	AN		01:00 -02:00	**Lunch**
	AN	Photometric measurements	02:00-04:00	Photometric theory and measurement methods
	AN		04:00-04:30	**Break**
	AN	Photometric measurements	04:30-06:00	Practical Session using Photometric instruments (ac-S, BB9, VSF, FLNTU)
Day 9	FN	Optical remote sensing Advanced techniques	09.30-10.30	Modelling of carbonate chemistry parameters and the assessment of ocean acidification using remote sensing data
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	New techniques and applications for assessing marine plastic pollution
	FN	Optical remote sensing Advanced techniques	12:00-01:00	New techniques and applications for assessing marine plastic pollution
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on UAV	02:00-04:00	UAV-based remote sensing – Introduction and guidelines, Flight path preparation
	AN		04:00-04:30	**Break**
	AN	Practical session on UAV	04:30-06:00	UAV-based remote sensing – Introduction and guidelines, Flight path

				preparation
Day 10	FN	Optical remote sensing Advanced techniques	09.30-10.30	Cyanobacteria bloom detection/quantification using remote sensing data
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	Modelling the optical properties of coral reefs for remote sensing applications
	FN	Optical remote sensing Advanced techniques	12:00-01:00	Modelling the optical properties of coral reefs for remote sensing applications
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on UAV	02:00-04:00	UAV-based Advanced Hyperspectral Data acquisition
	AN		04:00-04:30	**Break**
	AN	Practical session on UAV	04:30-06:00	UAV-based Advanced Hyperspectral Data acquisition
Day 11	FN	Optical remote sensing Advanced techniques	09.30-10.30	Remote sensing techniques for assessing/detecting Coastal hypoxia zones
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	Oil Spill trajectory modelling risk assessment and sensitivity mapping
	FN	Optical remote sensing Advanced techniques	12:00-01:00	Oil Spill trajectory modelling risk assessment and sensitivity mapping
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on UAV	02:00-04:00	UAV-Acquired Hyperspectral Data Processing Techniques
	AN		04:00-04:30	**Break**
	AN	Practical session on UAV	04:30-06:00	UAV-Acquired Hyperspectral Data Processing Techniques

Day 12	FN	Optical remote sensing Advanced techniques	09.30-10.30	New Approaches and Concepts for Monitoring and management of coastal water quality
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	Fuzzy logic approach for water quality assessment using remote sensing data
	FN	Optical remote sensing Advanced techniques	12:00-01:00	Fuzzy logic approach for water quality assessment using remote sensing data
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on Ferret	02:00-04:00	Practical session on Ferret software
	AN		04:00-04:30	**Break**
	AN	Practical session on Ferret	04:30-06:00	Practical session on Ferret software
Day 13	FN	Optical remote sensing Advanced techniques	09.30-10.30	Reconstruction of super spectral resolution image from multispectral ocean color remote sensing data
	FN		10.30-11.00	**Break**
	FN	Optical remote sensing Advanced techniques	11:00-12:00	Modelling of PAR and primary productivity using ocean color remote sensing data
	FN	Optical remote sensing Advanced techniques	12:00-01:00	Modelling of PAR and primary productivity using ocean color remote sensing data
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on SeaDAS	02:00-04:00	SeaDAS - An introduction
	AN		04:00-04:30	**Break**
	AN	Practical session on SeaDAS	04:30-06:00	Installation of SeaDAS
	FN	Microwave remote sensing Advanced techniques	09.30-10.30	Microwave remote sensing techniques for estimating the ocean physical properties, surface structures/ships, surface slicks
	FN		10.30-11.00	**Break**
	FN	Microwave remote sensing Advanced techniques	11:00-12:00	Synergy between microwave and optical RS data for specific ocean/coastal applications
	FN	Microwave remote sensing	12:00-01:00	Synergy between microwave and optical RS data for specific

Day 14		Advanced techniques		ocean/coastal applications
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on SeaDAS	02:00-04:00	Practical session on SeaDAS
	AN		04:00-04:30	**Break**
	AN	Practical session on SeaDAS	04:30-06:00	Practical session on SeaDAS
Day 15	FN	Microwave remote sensing Advanced techniques	09.30-10.30	Wind and wave data accumulation for microwave remote sensing applications
	FN		10.30-11.00	**Break**
	FN	Microwave remote sensing Advanced techniques	11:00-12:00	Machine-learning approach for ship detection and classification using SAR data
	FN	Microwave remote sensing Advanced techniques	12:00-01:00	Demonstration of machine-learning approach implementation and application for ship detection and classification using SAR data
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on SeaDAS	02:00-04:00	Practical session on SeaDAS
	AN		04:00-04:30	**Break**
	AN	Practical session on SeaDAS	04:30-06:00	SeaDAS mini project discussion
Day 16	FN	Thermal remote sensing Advanced techniques	09.30-10.30	Application of thermal remote sensing data for assessing thermal plume contamination in coastal waters
	FN		10.30-11.00	**Break**
	FN	Marine Hazards	11:00-12:00	Remote sensing techniques for Assessing Marine hazards
	FN	Marine Hazards	12:00-01:00	Remote sensing techniques for Assessing Marine hazards
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on Python	02:00-04:00	Demonstration of sea level anomaly mapping using python
	AN		04:00-04:30	**Break**
	AN	Practical session on Python	04:30-06:00	Practical session on sea level anomaly mapping

Day 17	FN	Marine Hazards	09.30-10.30	Marine hazards – Tsunami & Harmful algal blooms (HAB)
	FN		10.30-11.00	**Break**
	FN	Marine Hazards	11:00-12:00	Integration of RS data and Numerical models results related to the Storm surges and cyclones
	FN	Marine Hazards	12:00-01:00	Integration of RS data and Numerical models results related to the Storm surges and cyclones
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on radiative transfer models	02:00-04:00	Radiative transfer modelling in ocean optical remote sensing
	AN		04:00-04:30	**Break**
	AN	Practical session on radiative transfer models	04:30-06:00	Practical session on Radiative transfer modelling using Hydrolight software
Day 18	FN	Marine Hazards	09.30-10.30	Cyclone impact assessment using remote sensing data
	FN		10.30-11.00	**Break**
	FN	Marine Hazards	11:00-12:00	Numerical modelling of coastal hydrodynamics and its validation using in-situ and satellite data for very severe cyclones
	FN	Marine Hazards	12:00-01:00	Numerical modelling of coastal hydrodynamics and its validation using in-situ and satellite data for very severe cyclones
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on ENVI	02:00-04:00	ENVI software: An introduction - Understand basic tools in ENVI software · How to use ENVI software to process and analyze geospatial imagery?
	AN		04:00-04:30	**Break**
	AN	Practical session on ENVI	04:30-06:00	Introduction to IDL · Preprocessing and classification of satellite data using different techniques
	FN	Field Visit	09.30-10.30	Field Visit – Muttukadu lagoon and its surrounding coastal zones
	FN		10.30-11.00	**Break**
	FN	Field Visit	11:00-12:00	Field Visit – Muttukadu lagoon and its surrounding coastal zones

Day 19				
	FN	Field Visit	12:00-01:00	Field Visit – Muttukadu lagoon and its surrounding coastal zones
	AN		01:00 -02:00	**Lunch**
	AN	Field Visit	02:00-04:00	Field Visit – Muttukadu lagoon and its surrounding coastal zones
	AN		04:00-04:30	**Break**
	AN	Field Visit	04:30-06:00	Field Visit – Muttukadu lagoon and its surrounding coastal zones
Day 20	FN	Exam	09.30-10.30	Post assessment Exam
	FN		10.30-11.00	**Break**
	FN	Report presentation	11:00-12:00	Report presentation by individual groups
	FN	Report presentation	12:00-01:00	Report presentation by individual groups
	AN		01:00 -02:00	**Lunch**
	AN	Practical session on ENVI	02:00-04:00	Practical session on ENVI
	AN		04:00-04:30	**Break**
	AN	Practical session on ENVI	04:30-06:00	Practical session on ENVI
Day 21	FN	Advanced topics on Ocean and coastal vulnerabilities	09.30-10.30	Exposure to numerical modelling and simulation of coastal oceanographic processes
	FN		10.30-11.00	**Break**
	FN	Advanced topics on Ocean and coastal vulnerabilities	11:00-12:00	Ocean acidification and its effects: Assessment from space and in-situ observations
	FN	Advanced topics on Ocean and coastal vulnerabilities	12:00-01:00	Ocean acidification and its effects: Assessment from space and in-situ observations
	AN		01:00 -02:00	**Lunch**
	AN	Advanced topics on Ocean and coastal vulnerabilities	02:00-04:00	Integrated coastal vulnerability assessment: A methodology for coastal cities management, integrating socioeconomic, physical and environmental dimensions
	AN		04:00-04:30	**Break**

	AN		04:30-06:00	valediction function