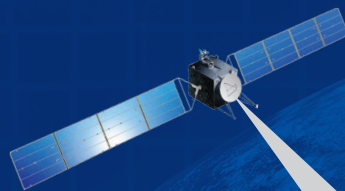


CSSTEAP NEWSLETTER

AUGUST, 2023 | VOLUME 26 | ISSUE 01



Centre for Space Science &
Technology Education in
Asia & the Pacific

(CSSTEAP)

(Affiliated to the United Nations)



*On a mission of capacity
building, the initiative of the
United Nations, for Asia and
the Pacific Region in
Space Science and
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Excellence in Education,
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**Governing Board Members and Special Invitees during 27th Governing Board Meeting
December 14, 2022**

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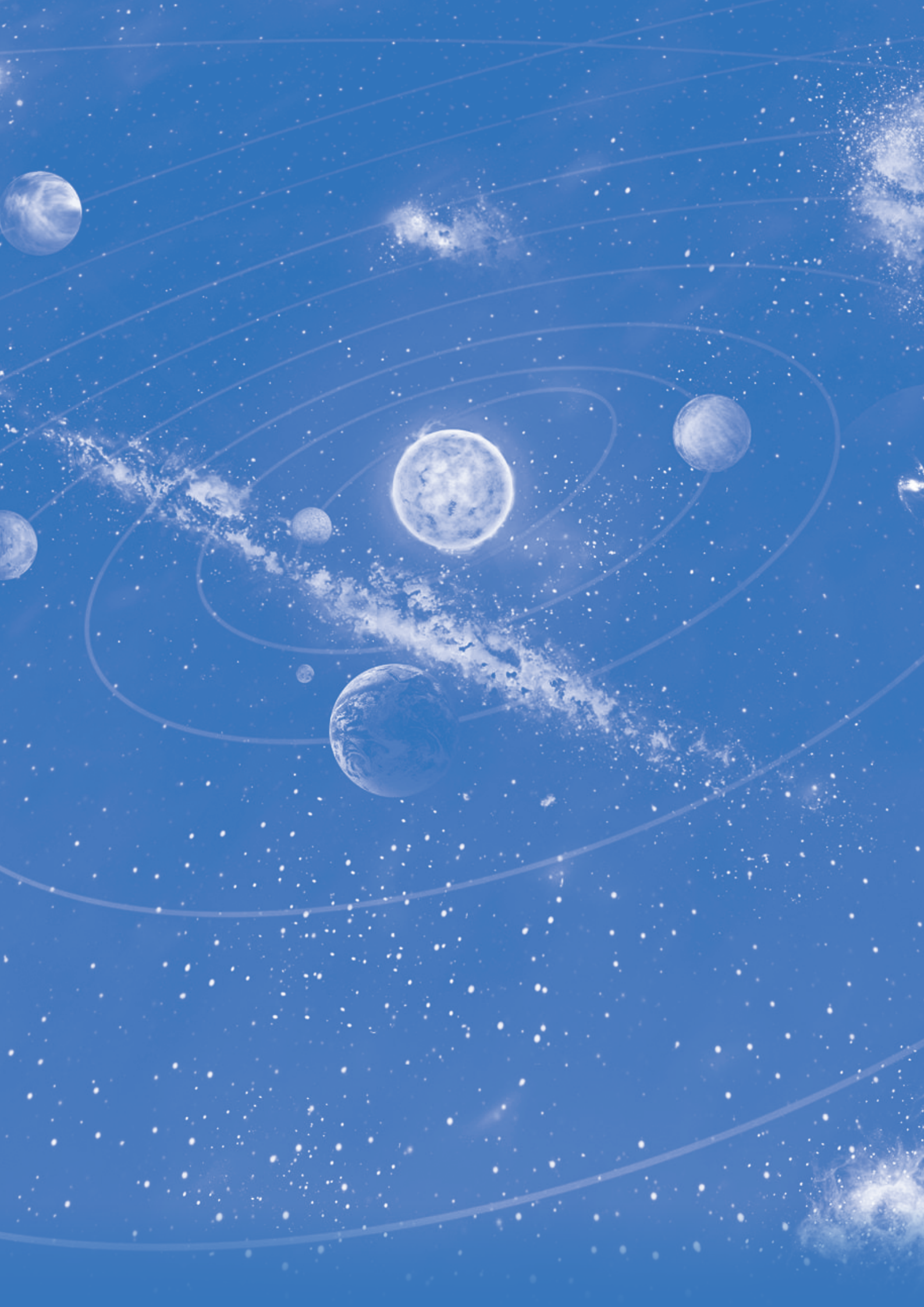
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DIRECTOR'S MESSAGE



The Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) has glorious 27 years of capacity building education in space science and technology in Asia and the Pacific region since its inception in 1995. The Centre offers a variety of courses catering to all level of technologist, academicians and students of the region. The prime focus of the Centre has been on long-term and short-term capacity programmes for mid-career professionals for in-person training. However, the advancement of web-based training and capacity building tools has provided a complete new opportunity to Centre to reach out to all region of Asia and the Pacific for the participants, who are not able to travel due to their professional commitments. The prime focus of the Centre has been on long-term and short-term programmes for mid-career professionals by inviting them to its 9-month long Post Graduate (PG) courses and short courses spanning for about 2-4 weeks. The flagship programme of CSSTEAP is the Post Graduate (PG) diploma programme offered five applications viz., Remote Sensing and Geographic Information Systems (RS&GIS), Satellite Communications, Satellite Meteorology & Global Climate, Space & Atmospheric Science and Global Navigation Satellite System. These courses have been approved by UN-OOSA for their potential benefits, scientific advancement, and societal applications in Asia and the Pacific. The short courses, which are also quite popular, cover different themes of Remote Sensing and GIS applications, DRR, Small Satellite Missions, Numerical Weather Prediction models and Navigation and Satellite Positioning System on regular basis etc. The Centre also organises short courses & awareness programmes from time to time based on specific request by the country of Asia and the Pacific. CSSTEAP has been involved in supporting efforts by UN-OOSA for various capacity building initiatives and support by UN-SPIDER for various international activities on Geospatial applications.

In 2022, the Centre after a break of two years resume the in-campus training for various long-term and short-term courses after the challenging period due to COVID-19 pandemic. However, the online mode of training which was adopted during the COVID-19 pandemic was continued which increases total number of courses offered by Centre significantly. There has been overwhelming response of these courses globally with significant number of participants from countries outside Asia and the Pacific region. In the year 2022, total 199 participants were trained through online courses of CSSTEAP. CSSTEAP has partnered with UN-OOSA and the Indian Space Research Organisation (ISRO) to provide various capacity building and academic inputs in space sciences and technology. A post symposium tutorial on "Space based data for climate monitoring and climate change impact" was conducted as part of UN-Austria symposium 2022 by CSSTEAP, ISRO and UN-OOSA. CSSTEAP and ISRO involved in curriculum development in "Access to Space for All", which focuses on hypergravity, microgravity and satellite development. CSSTEAP contributed in technical advisory mission for Philippines as part of UN-

SPIDER programme on “Use of Space Technology for DRR”. CSSTEAP signed an MoU with GISTDA, Thailand for collaboration in capacity building and training on various aspects of space technology and their applications in the ASEAN region.

CSSTEAP has updated its syllabus for different course to incorporate the advance technologies in space sciences and technology and has made significant improvement in training experiences of the participants.

I look forward to continued growth of CSSTEAP in fulfilling of its objectives as well as keeping in pace with developments in space technology and applications for national development through meeting the capacity building needs of countries in Asia and the Pacific region.

Dr. Prakash Chauhan
Director



ABOUT CSSTEAP

Peaceful utilization of the outer space has great potential for benefiting mankind. Considering the importance of space science, technology and its applications in promoting socioeconomic development, the United Nations, through its Office for Outer Space Affairs (UN-OOSA), facilitated the establishment and operationalization of the Centres for Space Science and Technology Education in different parts of the globe. In its resolution 45/72 of 11 December, 1990, the United Nations General Assembly (UNGA) endorsed the recommendation of the Committee on the Peaceful Uses of Outer Space (COPUOS) to establish Regional Centres for Space Science and Technology in developing countries. Under the auspices of the United Nations, through its Office for Outer Space Affairs (UN-OOSA), six Regional Centres for Space Science and Technology Education have been established in the regions that correspond to the United Nations Economic Commissions for Asia and the Pacific (India and China), Africa (Morocco, Nigeria) and Latin America and the Caribbean (with offices in Brazil and Mexico) and Jordan for the West Asia region. The Centres are affiliated to the United Nations through UN-OOSA. Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP) is the first Centre to be established on November 1, 1995 in India and has been imparting education/training in the areas of RS&GIS, Satellite Communications, Satellite Meteorology and Global Climate, Space and Atmospheric Science, Navigation and Satellite Positioning System and Small Satellite Missions using modern infrastructure, technology and training tools and practices for the Asia and the Pacific region.

The Centre's headquarter is located in Dehradun, India, and its programmes are executed by faculty of the Department of Space (DOS) at campuses in Dehradun, Ahmedabad and Bengaluru. The Centre is supported by Indian Institute of Remote Sensing (IIRS), Dehradun for RS & GIS course; by Space Applications Centre (SAC), Ahmedabad for Satellite Communication (SATCOM), Satellite Meteorology and Global Climate (SATMET) and Global Navigation Satellite System (GNSS) and Navigation and Satellite Positioning Systems (NAVSAT) short courses; by Physical Research Laboratory (PRL), Ahmedabad for Space & Atmospheric Science (SAS) course and UR Rao Satellite Centre (URSC), Bengaluru for short course on Small Satellite Missions. The Centre also has agreement with the Government of India by which it has been accorded specific privileges and international status to the centre, similar to the privileges enjoyed by UN specialized agencies. Under the agreement the Centre also has access to facilities, infrastructure and expertise of DOS/ISRO institutions, including IIRS, SAC, PRL, and URSC. The Centre has a Governing Board consisting of members from 17 countries from Asia-Pacific region and two observers, (UN-OOSA & ITC, The Netherlands). The Centre has formal UN affiliation with UN-OOSA for developing the CSSTEAP model and extending support in terms of expert advice, technical assistance, relevant documentation and future directions. The countries have agreed to the goals and objectives of the Centre by endorsing a cooperation agreement through which the Centre was established. The technical activities of the Centre are guided by an International Advisory Committee (AC) consisting of subject experts

that critically reviews the curricula, technical facilities, expertise in terms of faculty, etc.

The course curricula are developed by the Centre and endorsed by the United Nations for the various educational programmes run by the Centre. The educational programmes of the Centre are oriented towards the dissemination of knowledge in relevant aspects of space science and technology. The Centre offers Post Graduate courses in five areas. The model of the PG courses is designed to emphasize university educators, researchers and application scientists on the development and enhancement of knowledge and skills in the domains of space technology and the highlight of the course is an application project which greatly enhances the learning of the participants.

The successful completion of the 9-month PG-Phase of the programme leads to the award of a Post Graduate diploma by the Centre. The Centre has a collaboration with Andhra University, Vishakhapatnam, Andhra Pradesh, India for awarding Masters of Technology to eligible successful participants of the PG Diploma course. For those eligible students who successfully finish their PG course and whose academic qualifications satisfy Andhra University norms and are interested in continuing for a Master of Technology (M.Tech) degree, the Centre offers the opportunity to do so. This gives an opportunity to the scholar to apply their knowledge and training received to deal with a 'real life' problem, where inputs from space technology can be used.

In addition to providing facilities, infrastructure and skilled manpower, the Government of India, through the Department of Space provides most of the funding. Funding grants for international travel of participants,

subject experts, tuition fees and scholarships of students and the management of the Centre are mainly provided by Department of Space on behalf of Host country. UN-OOSA also provides funding for travel of some participants. Other agencies which financially contribute to the Centre include UN Agencies like UN-SPIDER, Beijing, China; UN-ESCAP in Bangkok, Thailand, UNESCO and UNDP.

Educational Programmes

The Centre offers post-graduate (PG) level training in five areas of specialization namely:

- Remote Sensing and Geographic Information Systems (RS & GIS),
- Satellite Communication (SATCOM),
- Satellite Meteorology and Global Climate (SATMET)
- Space and Atmospheric Science (SAS), and
- Global Navigation Satellite Systems (GNSS).

Besides the Post Graduate level courses, the Centre also conducts

short courses, workshops, awareness programmes, Webinar and MOOC on specific themes in the above areas, highlighting how space-based information can be used for national development. These educational programmes have benefited many scientists/engineers who will be the future policy & decision makers in several countries.

CSSTEAP has conducted 64 PG Courses (25 in RS&GIS, 12 in SATCOM, 12 in each SATMET and SAS and 03 in GNSS) and 79 short courses and workshops including 15 online short courses in last 27 years. These programmes have benefitted 3216 participants (PG-1054, Short courses-1490 and online short courses-672) from 38 countries in the Asia-Pacific region including 61 participants from 24 countries, outside Asia Pacific region.

Till date, 189 PG students (85 in RS&GIS; 51 in SATCOM; 22 in SATMET; 27 in SAS and 04 in GNSS) from 17 different countries have been awarded M. Tech. degree.



CSSTEAP Headquarters, Dehradun (India)



HIGHLIGHTS

RS & GIS: 26th PG Course on RS& GIS at IIRS, Dehradun during September 15, 2022 - June 15, 2023 (15 participants from 07 countries)

SATCOM: 13th Post Graduate Diploma in Satellite Communication at SAC, Ahmedabad during September 15, 2022 - June 15, 2023 (14 participants from 05 countries)

GNSS: 04th Post Graduate Course on Global Navigation Satellite System at SAC, Ahmedabad during September 15, 2022 - June 15, 2023 (10 participants from 4 countries)

PG COURSES ONGOING

ONLINE SHORT COURSES COMPLETED

Online Short Training course on “Open Source GIS Technology & Geo-web service” during April 25 - May 06, 2022 (53 participants from 08 countries)

Online Short Training course on “Hyperspectral Remote Sensing and its Applications” during May 16 - June 03, 2022 (43 participants from 09 countries)

Online Short Training Course on “Techniques and Application of Synthetic Aperture Radar (SAR) Remote Sensing” during October 10 -21, 2022 (36 participants from 16 countries)

Online Short Course on “Space based innovative solutions to improve water resources management in Asia-Pacific Region” during December 12 -16, 2022 (33 participants from 09 countries)

Online short course on “Advances in Remote Sensing Techniques for Geological Applications” during December 19 - 23, 2022 (34 participants from 09 countries)

Short Training course on 11th Small Satellite Mission” during November 07 - 18, 2022 (25 participants from 12 countries)

Short course on “Weather Forecasting using Numerical Weather Prediction models” during November 14 - 25, 2022 (24 participants from 09 countries)

Short Training course on “Application of Space Technology for Disaster Risk Management with Emphasis on Floods and Landslides for Asia Pacific Region” during November 21 to December 02, 2022 (13 participants from 08 countries)

Short Training course on Space Weather” during December 20 -30, 2022 (33 participants from 09 countries)

OFFLINE SHORT COURSES COMPLETED

26th POST GRADUATE COURSE ON REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM (RS&GIS)



The 26th PG Diploma RS&GIS batch was the first batch to start formally on campus after the Covid-19 pandemic. The previous 25th RS&GIS batch was conducted in a hybrid mode. Due to international travel restrictions, the 26th RS & GIS formally started on September 15, 2022. The course was inaugurated in the presence of Director CSSTEAP, Dr. Prakash Chauhan, Director IIRS, Dr. R.P. Singh, Dean (Academics) Dr. Pramod Kumar, Program Coordinator, CSSTEAP Dr. Arit Roy along with the Group Directors, Group Heads, Heads, Course Director, Course Coordinator, faculty members and course participants. The 26th RS&GIS batch had participation of fifteen participants from seven countries of Asia-Pacific Region (one participant from Sri Lanka and Kazakhstan, two participants each from Bangladesh, Myanmar, three each from Mongolia, Nepal and India). These participants were from various departments

working broadly in the field of meteorology, geology, hydrology, rice research, disaster management, Geoinformatics, agricultural sciences and information technology in various capacities in their respective organizations. The course started with an induction programme giving and overview of the course, briefing about the CSSTEAP campus and various other facilities. From the 26th RS&GIS batch the syllabus was revised as per the recommendations of the 12th Board of Studies (BOS).

Induction and orientation program was followed with commencement of Semester-I consisting of principles of remote sensing, photogrammetry, image interpretation and analysis, Geoinformatics, natural resource & environmental management. Semester-I laid emphasis on building the fundamentals. During Semester-II the course participants had to study two compulsory papers which included advanced remote sensing

and Geoinformatics focusing on topics like hyperspectral & microwave remote sensing principles and processing techniques, spatial database design, storage and retrieval, basics of programming language and data structures, Web GIS and open platforms for geoprocessing, AI/ML and Spatial Sampling and Variogram Modeling.

In Semester-II apart from two compulsory papers the participants also had to opt for two elective papers based on his/her academic qualification, professional experience and requirement of his/her parent organization. The thematic optional streams in Elective-I cover (i) Agricultural & Soil Resource Management (ii) Forest Resource & Ecosystem Analysis, (iii) Urban & Regional Studies, (iv) Advances in Image Analysis & Geoinformatics for Elective-II covers (v) Satellite Hydrology & Water Resource Management (vi) Geological

Remote Sensing, (vii) Marine and Atmospheric Remote Sensing and (viii) Natural hazards and Disaster Risk Management. In the present batch for Elective-I, 9 participants opted for Advances in Image Analysis & Geoinformatics, 03 for Agricultural & Soil Resource Management and 3 for Forest Resource & Ecosystem Analysis whereas in Elective-II, 9 participants opted for Natural hazards and Disaster Risk Management, 4 for Satellite Hydrology & Water Resource Management and 2 for Marine & Atmospheric Science. The participants were assessed through internal assessment followed by semester end assessment and practical examinations. The core components of course syllabus were covered by the faculty of IIRS and additional lectures by guest faculty on specialized topics were also arranged for the academic benefit of the course participants. The participants had

several field excursions for ground truth collection and for interpretation and analysis of remote sensing satellite data.

Participants worked on a pilot project work approved by a panel of committee during pilot project synopsis presentation under the supervision of their supervisors. The topics varied from agricultural drought, desertification, soil carbon stock, modelling of litter mass, flood hazard, soil erosion, irrigation water requirement, ship detection, web GIS application, coastal landforms, characterization of forest structure and fuzzy machine learning.

In addition to the academic activities special efforts were also put for improving the level of competency of spoken English, understanding and writing skills in English of the participants to help the participants in to help in writing the project report and

improving presentation skills. Special English language classes after office hours were conducted in campus for the three months.

In addition to above, the participants also had an opportunity to listen and interact with several renowned academicians and researchers. Prominent among them are Padma Vibhushan Dr. Kasturirangan, Hon. Distinguished Advisor, ISRO, Dr. George Joseph, Former Director, SAC (ISRO), Dr. S Somanath, Secretary Department of Space, Chairman ISRO, Dr. Prasad Srinivasa Thenkabail, Senior Scientist, USGS, Dr. P.S. Roy, Senior Fellow, Sustainable Landscapes and Restoration, WRI India and Former Director, IIRS and Dr. Andrew Joseph Kruczkiewicz, Senior Researcher, Columbia University, USA. The participants also had an opportunity to meet and interact with the Saudi Space Agency delegation during their visit to IIRS, Campus.



Valedictory function of 26th RS&GIS PG course



Dr. Sanjeev Kumar Singh
Course Coordinator,
RS & GIS



Sh. C.M. Bhatt
Course Director,
RS & GIS

13th SATELLITE COMMUNICATION (SATCOM) & 4th GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)



Introduction

Under the aegis of the Centre for Space Science and Technology Education for Asia and the Pacific (CSSTEAP), the thirteenth Post Graduate course on Satellite Communications (SATCOM-13) and Fourth Post Graduate course on Global Navigation Satellite Systems (GNSS-04) are being conducted by Space Applications Centre (SAC), ISRO, Ahmedabad.

The courses were announced in March, 2022 and the details of the courses were put up in CSSTEAP website. Amongst the interested applicants, 14 candidates from 5 countries were chosen for SATCOM-13 course while 10 candidates were chosen for GNSS-04 from 4 different countries.

The courses formally started from 15 September, 2022, unlike the previous courses, which usually starts from August. The formal joint inauguration

was held at Vikram Hall in the Main Campus of Space Applications Centre (SAC), Ahmedabad. The courses were inaugurated by Shri. Nilesh Desai, Director, SAC, in presence of Dr. Prakash Chauhan, Director CSSTEAP, who joined virtually from NRSC, Hyderabad and Program Co-ordinator, Dr. Arijit Roy, who joined from CSSTEAP, HQ at Dehradun. Shri. Kaushik Parikh, Associate Director, SAC, and other distinguished members of SAC including SMC members, Focal Points etc. were present in person in addition to the participants of GNSS-04 and SATCOM-13 courses.

Academic Sessions

The Semester-I of the academic course started from the day of inauguration. It continued for more than 15 weeks. This portion of the course consisted of 5 modules sessions with theoretical and

practical classes encompassing the fundamentals and the technological aspects of the respective subjects. Over this tenure, the approved updated syllabi, recommended by the Board of Studies, were followed. Salient features of this academic sessions include extensive foundation course and increased interactive sessions like tutorials and group seminars, including quizzes, visits and demonstrations. The paper titles for the two courses and their respective focal persons and credit points are given in the table below. There were internal exams conducted at the end of each module and a weeklong semester examination at the end of the semester. This was followed by educational tour to South India, which was 10 days long. Following this, the second semesters started on 16th January, 2023. The academic calendar for this semester of the course is provided below.

Academic Module List for GNSS-04

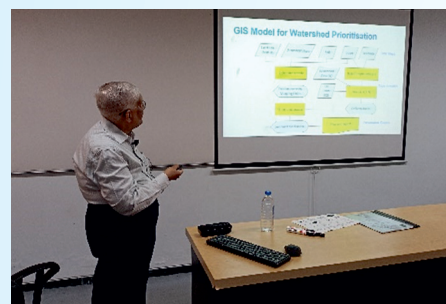
Paper No.	Topics	Focal Persons
MGNSS.I.1	Foundation Course	Smt. Leena Kohli Kapoor
MGNSS.I.2	Fundamentals of NAVCOM	Smt. Saumi S.
MGNSS.I.3	GNSS Signals and Systems	Smt. Durga Digdarshini
MGNSS.I.4	GNSS Signals and Systems	Mr. Saurabh Bhalla
MGNSS.I.5	Position Determination Techniques	Smt. Bhanu Panjwani

Academic Module List for SATCOM-13

Paper No.	Topics	Focal Persons
MSAT.I.1	Foundation Course	Mrs. Leena Kohli Kapoor
MSAT.I.2	Communication Systems	Mr. Dhaval Upadhyaya
MSAT.I.3	Modn, Multiplexing and Multiple Access	Smt. Neha Mehra
MSAT.I.4	Satellite Technology	Dr. Subhash Bera
MSAT.I.5	Digital Signal Processing	Dr. Deepak Mishra

It is worth mentioning that the faculties for the SATCOM – 13 and GNSS-04 courses were pooled either from well-known academic institutions across

India or from the most experienced Scientists and Engineers working at different ISRO Centers or other similar governmental organizations.



Lecture in SATCOM-13 class



Interactive classes in GNSS-04 course

In the mentioned Semester-I of the two courses combined, more than 100 lecturers/demonstrators were involved. Out of them majority were from SAC and other ISRO centers. Few experts were also identified from other organizations. Considering the importance of the industries in these two areas of SATCOM and GNSS, participation from industries were also encouraged and lectures from some well-known telecom and electronics industries like the tecom giant, Hughes etc. were arranged as a part of the curriculum. Visits to local industries like MCBS Pvt. Ltd. BISAG etc. were also included in schedule.

To evaluate the progress of participants, 5 examinations for internal assessments after each module and 5 semester-end exams were held, both theoretical and practical. This is in addition to other assignments, quizzes etc. held in each these courses. The focal points for each paper did the evaluations for all these papers. The performances of the participants were tabulated and announced in due time.

Educational Tour

An educational tour was organized for the participants of the courses for visiting various ISRO Centers in South of India. The tour was conducted from 02 January 2023 till 10 January, 2023. The tour was aimed at providing the participants a glimpse of existing facilities in SATCOM & GNSS areas. A total of 25 participants and three Coordinators proceeded from Ahmedabad to Bangalore-Hassan-Shri Harikota-Chennai and back to SAC, Ahmedabad.

The tour started from Bangalore where the travel from Ahmedabad to Bangalore and back was made by flight. All the intermediate road transport and stay at appropriate hotel/guest house were ensured. The visits during this tour were made to the following facilities of ISRO:

- Master Control Facility (ISRO), Hassan
- ISRO Telemetry Tracking and Command Network (ISTRAC),

ISRO, Byalalu and Peenya

- ISRO Satellite Integration and Test Establishment (ISITE), Bangalore
- ISRO Satellite Launching Centre at SDSC, SHAR

In Master Control Facility (MCF) at Hassan, the students were explained regarding various earth stations. On visit to ISTRAC, the data collection facilities for Space Sciences and Deep Space mission were explained. Students also visited

IRNSS Navigation Control Centre. The group visited ISITE of ISRO Satellite Centre (ISAC) at Bangalore. The group was apprised of various on-going missions and forthcoming missions. The integration of different satellite sub-systems was explained to the students. The testing of the satellites and large sub-systems under different thermal and vacuum environment was also explained. The state-of-the-art launching facilities at the SDSC, SHAR were witnessed by all the participants and they were particularly impressed by these visits.

The accommodation of the students, during the tour were arranged in semi-luxury hotels or ISRO guest houses, as available, in twin sharing mode. All intra city commutations over short distances were made in chartered buses.



CSSTEAP SATCOM-13 and GNSS-04 Students at ISTRAC and at SDSC, SHAR

Visit to Places of Interest

An exposure of the diverse Indian culture can go a long way in getting the shades of life worth remembering and emulating. Going with these established principles of learning and exploring, visits to different places of interest in Ahmedabad as well as during the South India educational tour, were organized. These visits, provided an opportunity to the participants to know & realize the diverse culture, tradition and rich heritage of India. The visits to local places of cultural and

traditional interest were conducted during the South India tour. All the participants have enjoyed places near Bangalore. At Hassan, the group visited Hoysaleswara temples at Belur and Halebidu. The group also visited Shravanabelagola temple dating back to 980 AD en-route from Hassan to Bengaluru.

The participants from both the courses were taken for a local sightseeing at Ahmedabad and Gandhinagar.

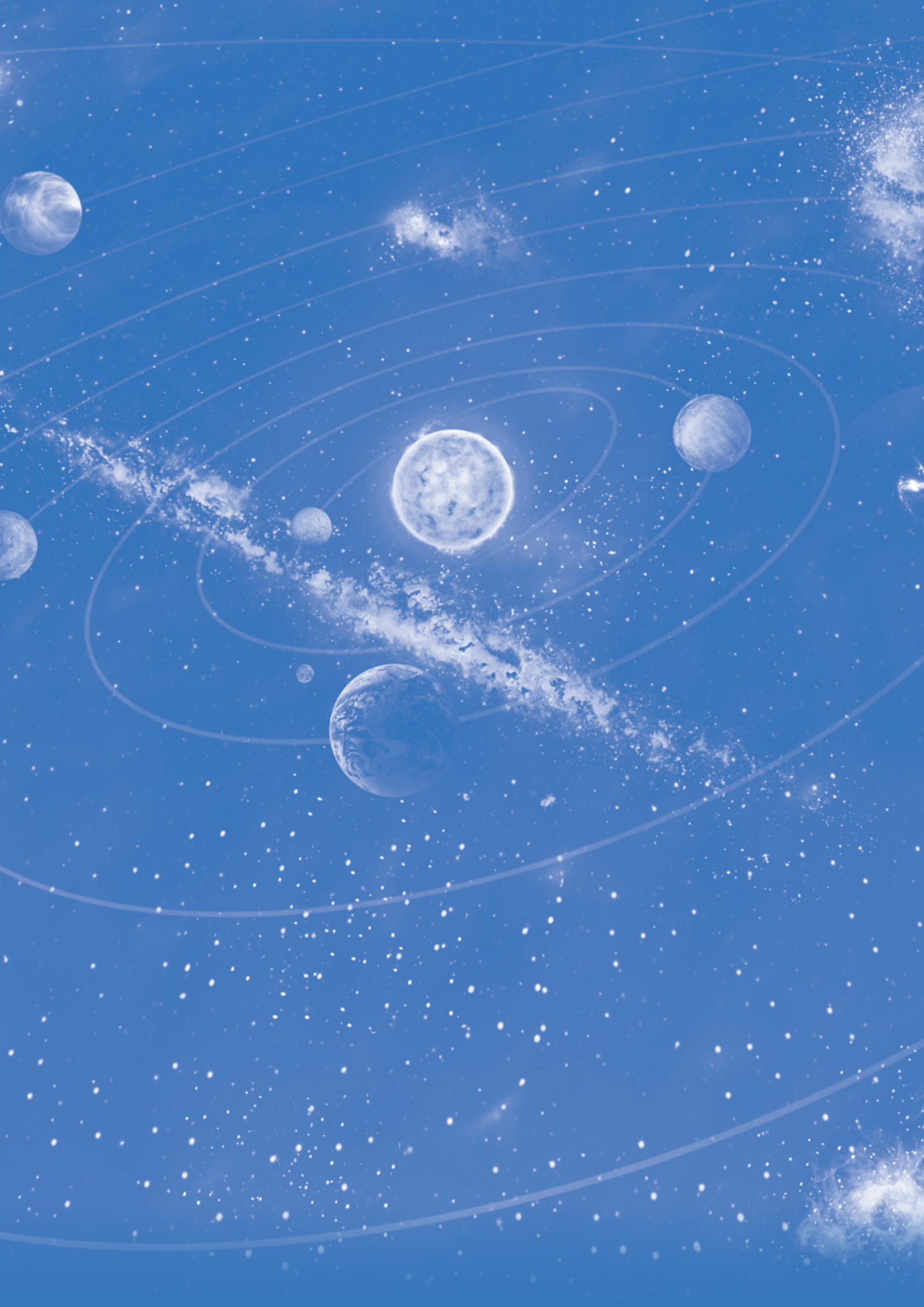
Their visit included, amongst the other places, the Gandhi Ashram, the heritage site of Adalaj step well and Akshardham, the temple of the Swaminarayan sect. This visit was very much appreciated by all the students. The students, during their stay in Ahmedabad, also participated and enjoyed the Indian festival of light, Deepavali. They also witnessed and participated in the Dandiya dance at NID, Ahmedabad during the Navaratri festival.



CSSTEAP SATCOM-13 and GNSS-04 Students celebrating Navaratri and during the tour

The background is a deep blue space-themed image. On the left, a large, detailed view of the Earth's surface with swirling cloud patterns is visible. In the upper right, a satellite with two large solar panel arrays is shown, with a bright beam of light directed towards the Earth. In the lower right, a white rocket with orange and black accents is depicted ascending, leaving a white plume of smoke. The entire scene is overlaid with a subtle grid pattern and some faint geometric lines. A large, light blue, rounded rectangular shape is positioned in the bottom right corner, containing the text.

ONLINE SHORT TRAINING COURSE



ONLINE SHORT TRAINING COURSE ON

“OPEN SOURCE GIS TECHNOLOGY & GEO-WEB SERVICE”

DURING APRIL 25 - MAY 06, 2022



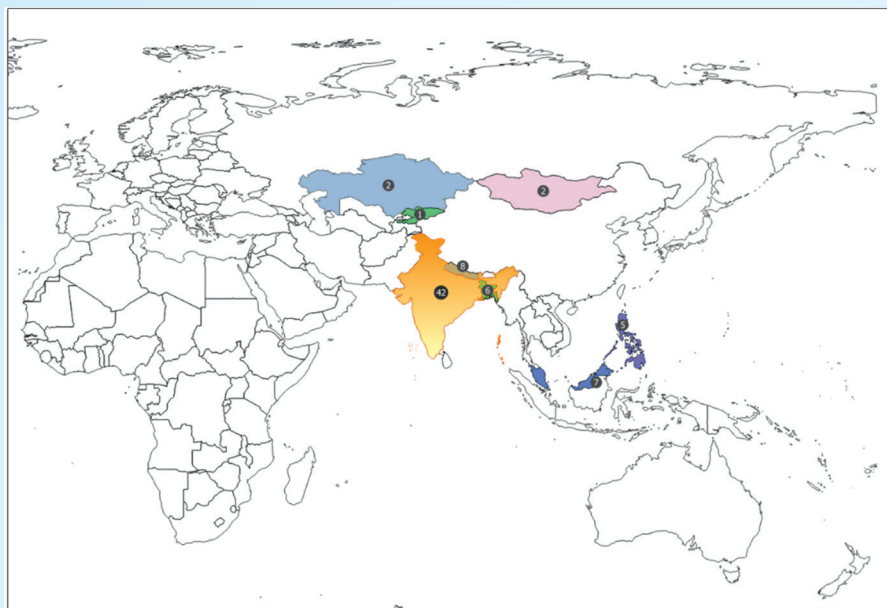
Open-source GIS has received substantial attention in last few years due to its free to use licensing policy and support for indigenous technological development by having access to the source code and flexibility to change it and redistribute. Apart from this, in geospatial domain web services are very important to achieve interoperability in data and information available with different data providers. Today, the geospatial services available in internet through various geo-portals are increasing rapidly

The online course of CSSTEAP on “Open source GIS and Geoweb service” was conducted by Indian Institute of Remote Sensing, ISRO Dehradun during April 25, 2022 to May 06, 2022. Total 53 participants from 8 countries i.e. Bangladesh-4, India-32, Kazakhstan-1, Kyrgyzstan-1, Malaysia-3, Mongolia-2, Myanmar-5, and Philippines-5 have joined the course.

The overall objective of this two weeks training programme is to generate awareness among users / researchers / professionals / decision-makers / academicians on geospatial technology in open source GIS and web GIS environment. The participants will be familiarized with the various geo-spatial data processing (Vector/Raster) using open source GIS software, Geo-RDBMS concepts, open geodata repositories and concepts of geo web services for developing any generic geo web portal. The course will help the participants to explore GIS customization in open source environment through programming concepts. The course will include theory and hands on sessions to facilitate in-depth learning.

During the course total 20 live lecture sessions and 10 practical experiments were conducted. The course was conducted in online mode through Microsoft Team (MS

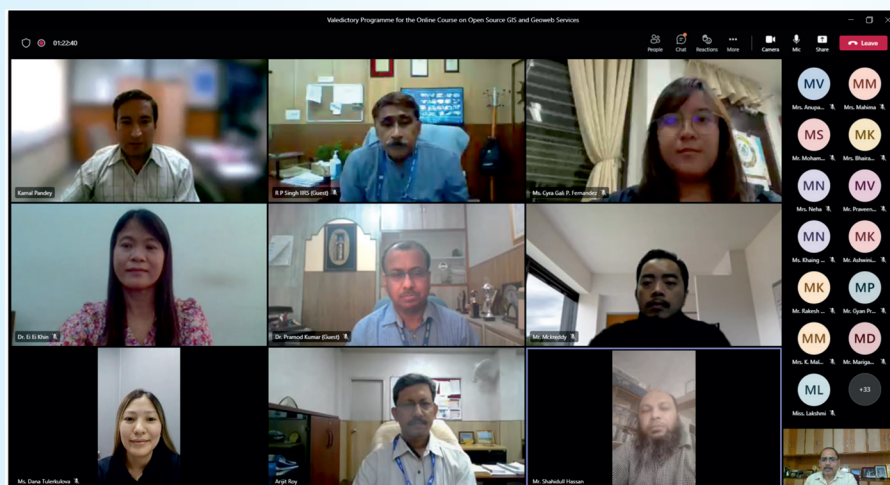
team) and IIRS E-CLASS Learning Management System (LMS). Two live lecture sessions and one practical demonstration was conducted on daily basis. Daily quiz assessment was also conducted through E-CLASS LMS. All the recorded video sessions, learning contents, presentation material etc., were upload in E-CLASS LMS and MS Team for offline access by the participants. It has greatly helped to the participants to access these contents as per their convenient time zone. In few technical sessions the student assignment was also given for self-practice by the participants. Discussion forum was also made available to the participants for collaborative learning in LMS. The major topics covered in theory are- Overview of GIS Technology, Open Source GIS and its applications, GIS Data structure and Data models, Projection Systems in GIS, Vector and Raster based GIS data analysis, Multi Criteria Decision analysis, Satellite Image Processing, GIS modelling



Participation from various countries

with GRASS software, Image processing of Microwave and optical data using SNAP and ILWIS, Field data collection using crowdsourcing and mobile GIS, Open GIS data repositories, Web GIS technology, Concept of Geoweb services and API, OGC web services and Geoserver, Open source Web Mapping libraries (Leaflet/Openlayers), GIS data handling in GeoRDBMS, PostgreSQL and PortGIS, Satellite Image Processing in Cloud Environment and Geoprocessing using Python and Jupyter notebook.

In practical sessions, hands-on experiments on QGIS, GRASS, SNAP, ILWIS, ODK and Geo-ODK, OGC web Services and APIs, Geoserver, OpenLayer API and Leaflet, GIS mashup applications and cloud computation using Google Earth Engine were conducted.



Group photo of the course participants and resource scientists



Dr. Kamal Pandey
Course Coordinator



**Dr. Harish Chandra
Karnatak**
Course Director

ONLINE SHORT TRAINING COURSE ON “HYPERSENSPECTRAL REMOTE SENSING AND ITS APPLICATIONS” DURING MAY 16 - JUNE 03, 2022



Hyperspectral remote sensing with a narrow bandwidth emerged as a promising technology for detection and identification of minerals, terrestrial vegetation, man-made materials and backgrounds. In this context, it has become essential to train the workforce in use of hyperspectral data. The CSSTEAP short course was of three weeks duration from 16-May-2022 to 03-June-2022. The course was designed for professionals/research scholars/students from Govt./Private Organizations engaged in remote sensing technology and its application in various fields. Total participants were around 43 from 09 countries i.e., Bangladesh-02, Colombia-03, India-26, Kazakhstan-01, Malaysia-03, Mongolia-01, Myanmar-02, Philippines-02, Sri Lanka-03. The participants were from different government and private organizations.

This course was designed to make the participants aware about hyperspectral remote sensing,



Group photo of the CSSTEAP short course on Hyperspectral Remote Sensing and its applications

hyperspectral data processing and its applications. The course included theoretical lectures on topics related to hyperspectral remote sensing & its processing techniques and their application areas such as forestry, agriculture & soils, geology, urban, water resources, atmosphere and planetary explorations. The topics covered in the course were Introduction to hyperspectral remote sensing, Hyperspectral sensors, data quality

and its pre-processing, Atmospheric correction of hyperspectral data, Data Dimensionality reduction and endmember selection, Advance techniques for hyperspectral image enhancement and endmember extraction, Classification algorithms for hyperspectral data classification, Advance classifiers for hyperspectral data classification, Hyperspectral remote sensing for agriculture and soil studies, Hyperspectral remote sensing

for forestry applications, Hyperspectral remote sensing for water and snow cover studies, Hyperspectral remote Sensing for Geological Applications, Hyperspectral Remote sensing applications in Planetary exploration, Hyperspectral remote sensing for urban studies, Hyperspectral Remote sensing applications for atmospheric studies. Demonstration of practical exercises on hyperspectral data processing were included as part of the curriculum. Demonstration

for spectral data collection using ground spectro-radiometer was also conducted. At the end of all the lectures and practical, A small case study was also carried out by the participants in groups on utilization of hyperspectral data for soils studies, forestry applications, urban studies, mineral exploration, atmospheric studies and water quality analysis.

A formal feedback was taken at the end of the training. Participants have

expressed that the course is well organised and the material provided is relevant. They have also appreciated the faculty and have mentioned that theoretical concepts were dealt very effectively and thoroughly. They have expressed that they enjoyed a lot learning data processing simultaneously while learning theoretical concepts. However many participants want the course should be conducted offline, as they wanted to do hands on exercise.



Mr. Vinay Kumar
Course Coordinator



Dr. Anil Kumar
Course Director

ONLINE SHORT TRAINING COURSE ON “TECHNIQUES AND APPLICATION OF SYNTHETIC APERTURE RADAR (SAR) REMOTE SENSING” DURING OCTOBER 10-21, 2022



The advancement of earth observation has opened new avenues of research in the field of earth sciences. With the technological advancements in geo-information sciences, remote sensing has become an effective method for the detection and investigation of various factors. Because of the increasing demand for SAR data, many space agencies have developed and launched advanced SAR sensors and provide tools and software for data processing for the convenience of students and researchers. Several state-of-the-art SAR sensors are planned for future missions, taking into account user and scientific objectives as well as the data requirements of a variety of thematic applications. The international online training programme on “Techniques and Applications of Synthetic Aperture Radar (SAR) Remote Sensing” was conducted from 10 October-2022 to 21 October-2022. To make awareness among users/ researchers/ professionals/decision-



Valedictory Function of the Course

makers/ academicians about the concept of SAR Remote Sensing and disseminate knowledge and practical applications on the use of SAR data this two weeks training course was conducted.

A total of 36 participants joined training from 16 countries (Bangladesh, Bahrain, Ethiopia, India, Indonesia, Kazakhstan, Lao PDR, Malaysia, Mongolia, Myanmar, Nepal,

Philippines, Sri Lanka, Tajikistan, Thailand, and Uzbekistan). The training included theoretical lectures on topics related to SAR remote sensing & its processing techniques and their application areas such as forestry, soil moisture, geology, land subsidence detection, and water resources. In this training programme, subject expert faculty members of IIRS delivered lectures and three guest faculty from other institutes/centres

were also invited. Dr. Vishnu Nandan, University of Calgary delivered a lecture and conducted a practical session on Sea ice Monitoring from Multi-Frequency SAR Remote Sensing. Mr. David Mengen, Institute of Bio-and Geosciences: Agrosphere (IBG-3), Jülich, Germany delivered a talk on SAR and Soil Moisture. Dr. Anup Kumar Das, Space Applications Centre (SAC), Ahmedabad delivered a talk on Current and Future SAR Missions.

The topics covered in the course were Overview of SAR Remote Sensing, SAR data Processing, Polarimetric and interferometric SAR, Forestry Applications of SAR Data, SAR and Soil Moisture, Geological Applications of SAR data, SAR data applications in Hydrology, Time Series Interferometric SAR (PSInSAR/SBAS), Sea ice Monitoring from Multi-Frequency SAR Remote Sensing, Current and Future SAR Missions

Formal feedback was taken at the end of the training. Participants have expressed that the workshop was well organised and the material provided is relevant. They have also appreciated the faculty and have mentioned that theoretical concepts were dealt with effectively and thoroughly.



Dr. Shashi Kumar
Course Coordinator



Ms. Shefali Agrawal
Course Director

**ONLINE SHORT TRAINING COURSE ON
“SPACE BASED INNOVATIVE
SOLUTIONS TO IMPROVE
WATER RESOURCES
MANAGEMENT IN
ASIA-PACIFIC REGION”
DURING DECEMBER 12-16, 2022**



Indian Institute of Remote Sensing (IIRS), Dehradun, conducted one-week online short-term course on Space based Innovative Solutions to Improve Water Resources Management in Asia-Pacific Region during December 12-16, 2022 for the participants from Asia Pacific Countries. 33 participants from 9 countries of Asia Pacific attended the course.

The course consists of lectures on Recent advances in geospatial techniques for water resources management, Innovations & progress in remote sensing for surface water resources assessment, Remote sensing based hydrological parameter retrieval and model parameterization, Monitoring & modelling of hydro-meteorological extremes, and Water

availability and consumption dynamics assessment using remote sensing inputs and modeling techniques. The lectures were supported by videos & demos. Course Director, Dr. Praveen K Thakur and experienced faculty from WRD, IIRS delivered the lectures.



Dr. Arpit Chouksey
Course Coordinator



Dr. Praveen K. Thakur
Course Director

**ONLINE SHORT TRAINING COURSE ON
“ADVANCES IN REMOTE
SENSING DATA ANALYSIS
TECHNIQUES FOR
GEOLOGICAL
APPLICATIONS”
DURING DECEMBER 19-23, 2022**



The CSSTEAP One-week online Short course on “Advances in Remote Sensing Data Analysis Techniques for Geological Applications” has been conducted at IIRS Dehradun during December 19 - 23, 2022. A total 86 applications from 13 countries of Asia-Pacific region have been received. Out of 86

applicants, 34 from 9 countries have been selected for the course based on the selection criteria. Lectures have been delivered on various topics related to applications of remote sensing techniques for geological applications such as advances in thermal and microwave remote sensing, mineral exploration,

geophysical investigation, geology of planetary bodies and geological hazards such as landslide and glacial hazards. The valedictory of the course was conducted on 23 December, 2022. Certificates have been provided to the participants fulfilling the attendance criteria.



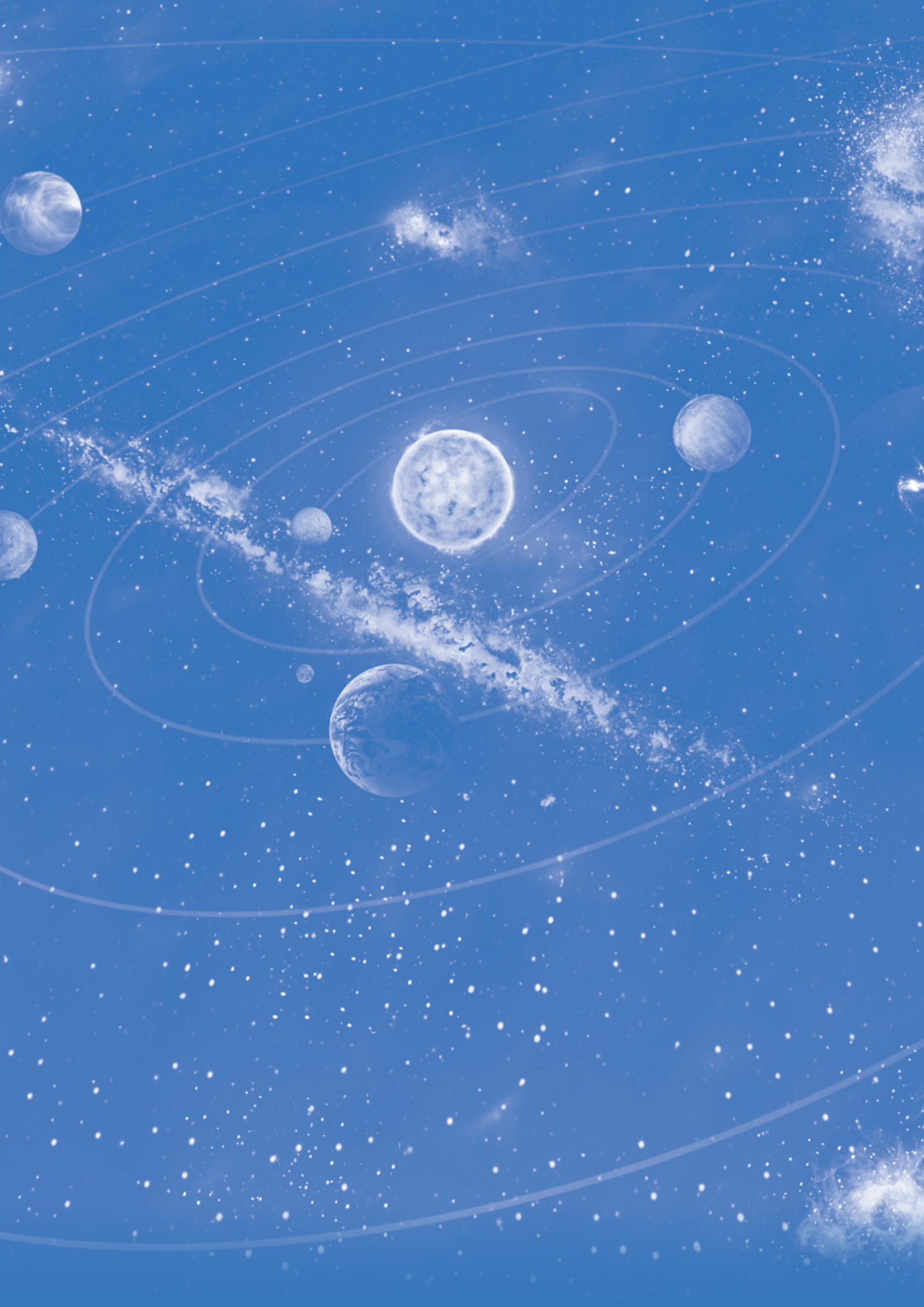
Dr. Pratima Pandey
Course Coordinator



Dr. R. S. Chatterjee
Course Director

The background is a deep blue space-themed image. On the left, a large, detailed view of the Earth's surface with swirling cloud patterns is visible. In the upper right, a satellite with two large solar panel arrays is shown, with a bright beam of light directed towards the Earth. In the lower right, a white rocket with orange and black accents is depicted ascending. A semi-transparent blue circular graphic with a grid pattern is positioned in the bottom right, partially overlapping the text.

OFFLINE SHORT TRAINING COURSE



OFFLINE SHORT TRAINING COURSE ON “11th SMALL SATELLITE MISSION” DURING NOVEMBER 07 - 18, 2022



U.R. Rao Satellite Centre (URSC), Bengaluru and Indian Institute of Remote Sensing (IIRS), Dehradun, jointly conducted two-week online short term course on small Satellite Mission for the participants from Asia Pacific Countries.

Centre for Space Science & Technology Education for Asia Pacific (CSSTEAP), IIRS Dehradun is hosting this course from 2012. This course commenced on 7th November 2022 and 25 participants from 12 countries of Asia Pacific attended the course.

The course was inaugurated by Shri. M. Sankaran, Director, U R Rao Satellite centre. Dr. Prakash Chauhan, Director, CSSTEAP and Dr. R. P. Singh, Director IIRS. Dr. Arijit Roy, Programme Coordinator, briefed about the CSSTEAP Programmes. Dr. P. Murugan, Course Director SSM-2022 briefed the participant about the course.

The course consists of lectures on satellite orbits, mission planning, system engineering, project management, satellite subsystems, Assembly Integration & Testing,

facilities required for satellite fabrication and testing, launch vehicle interface and on-orbit operations. The lectures were supported by videos & demos. Course Director, Dr. P. Murugan and experienced engineers from URSC, IIRS and ISTRAC delivered the lectures. Participants submitted assignments online and online test conducted for evaluating the participants.

The course concluded on 18th December 2022 with address by Dr. Prakash Chauhan, Director CSSTEAP and Dr. R. P. Singh, Director, IIRS.



OFFLINE SHORT TRAINING COURSE ON “WEATHER FORECASTING USING NUMERICAL WEATHER PREDICTION MODELS”

DURING NOVEMBER 14 - 25, 2022



The Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), affiliated to the United Nations is imparting training in various disciplines including a Short course on weather prediction using NWP models, which commenced on 14th November at SAC (Bopal Campus), and ended on 25th November 2022.

Twenty-four participants from nine countries in Asia-Pacific region have been trained in this course. They are mostly operational forecasters, meteorologist, and researchers in their own country, especially working in NWP. The participants are from the countries like Bangladesh, India, Kazakhstan, Kyrgyzstan, Mongolia, Myanmar, Nepal, Tajikistan and Vietnam.

This NWP course was for two weeks, and the course is well structured in such a way to get maximum benefit to the students. The 1st week started with history of NWP, model resolution etc., familiarization of Linux OS, Spaced base observation for NWP, solving NWP equations, forecasting processes, Data assimilation, setting of WRF model, WRF assimilation system. And 2nd week started with physical processes & parametrization, Assimilation of observational data in WRF, assimilation of land surface data, super ensembles, rainfall assimilation, radiance assimilation, assimilation system for tropical cyclones, AOS assimilation and dust storm forecasting.

In addition to class room lectures during the morning hours, practical

using Weather Research Forecasting (WRF) model, were conducted in the afternoon sessions. Most important highlight during this practical's, was the students were taught to how to install the WRF model in their computer. They were also taught how to assimilate the local observation/ satellite data of their country in the model. This was well appreciated by all the students.



Dr. Sanjib K Deb
Associate Course Director

OFFLINE SHORT TRAINING COURSE ON “APPLICATION OF SPACE TECHNOLOGY FOR DISASTER RISK MANAGEMENT WITH EMPHASIS ON FLOODS AND LANDSLIDES FOR ASIA PACIFIC REGION”

DURING NOVEMBER 21 - DECEMBER 02, 2022



Natural disasters are becoming more frequent and intense across the globe. Asia-Pacific nations experience more natural disasters than any other region. The region faces major disaster problems in the form of environmental hazards, geological hazards and hydro-meteorological hazards causing massive damage to environment, infrastructure, economy and society. Floods and associated landslides account for the largest number of natural disasters and affect more people than any other type of natural disaster in this region. The space based inputs can become an important tool in building resilience and addressing the priorities outlined by Sendai framework for disaster risk reduction (DRR). Space technology can be useful particularly in the risk assessment, monitoring, response, mitigation and preparedness phases of disaster management, including

early warning. A short course of two weeks on “Application of Space Technology for Disaster Risk Management with Emphasis on Floods and Landslides for Asia-Pacific region” was conducted at CSSTEAP, IIRS during November 21- December 02, 2022.

The course was attended by 13 participants from 08 countries (Bangladesh, Kazakhstan, Mongolia, Nepal, Sri Lanka, Tajikistan and Uzbekistan) of Asia Pacific region. The overall objective of the course was towards familiarizing the participants with disaster risk reduction concepts, institutional mechanisms, application of geospatial information technologies for pre- and post-disaster monitoring and mitigation such as early warning, hazard, vulnerability and risk assessment, damage assessment and disaster risk reduction measures and involve them to carry out a mini project

which will help in implementing DRR in their country.

The course designed was modular in structure and provided a balanced treatment of classroom lectures, practical/hands on session and field visits. The course covered topics such as RS & GIS concepts, satellite based communication and navigation, monitoring global targets using climate models and geospatial visualization, AI for flood hit spot risk analysis, optical and microwave remote sensing of flood inundation, mapping of flood hazard, depth and damage assessment, flood frequency and peak discharge estimation, application of altimetry for flood hazard studies, satellite data for extreme rainfall events analysis, overview of debris & GLOF hazards, urban flood hazard, overview of landslide studies using space data, snow and related mass movement hazards,

landslide mapping, monitoring and hazard zonation, SAR data for surface deformation and land subsidence, simulation and modeling of landslides, geophysical methods in landslide studies.

There were 22 Lectures and 06 practical's and 01 field visit during the training program. For field visit participants were taken to Irrigation Research Institute, Bahadarabad station which is a premier institute in the field of Hydraulic Modeling, Civil Engineering, Material Testing & Ground Water studies. The hydraulic

model facilities at Bahadarabad station of Institute are one of the best in India. Lectures from guest faculties from Space Application Section, United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP), Bangkok and from Central Building Research Institute (CBRI), India were also arranged. The course provided the participants with theoretical and practical knowledge on the disaster risk reduction (DRR) which would be useful and enable them to use this knowledge in their country for monitoring and mitigation

measures of the impacts due to floods and landslides using latest geospatial technologies.

A formal feedback was taken at the end of the course. In general, all the participants rated the course as very good to excellent in terms of objective, course program design and implementation. During the valedictory session the participants were addressed by Dean (A) Dr. Pramod Kumar, Director, IIRS Dr. R.P.Singh and Director, CSSTEAP Dr. Prakash Chauhan.



Course participants of short course and CSSTEAP/IIRS officials



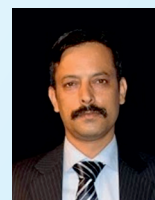
Attending lectures from Guest Faculty, UN-ESCAP



Participant receiving certificate



Jappji Mehar
Course Coordinator



C.M.Bhatt
Course Director

OFFLINE SHORT TRAINING COURSE ON “SPACE WEATHER” DURING DECEMBER 20 -30, 2022



A short course on “Space Weather” was conducted during December 20-30, 2022 by Physical Research Laboratory (PRL), Ahmedabad under the auspices of Center for Space Science and Technology Education in Asia and the Pacific (CSSTEAP), affiliated to the United Nations.

The inaugural ceremony was held at PRL on 20th December. There were 21 participants from 11 countries (Bangladesh, Ethiopia, India, Kazakhstan, Kyrgyzstan, Mongolia, Myanmar, Nepal, Sri Lanka, Tajikistan and Uzbekistan). Classes were held at Nano-SIMS hall. A total of 25 lectures were delivered by PRL's expert faculty on Solar sources of space weather, Propagation of the electromagnetic and charged particles through the heliosphere, The response of Earth's magnetosphere, ionosphere and thermosphere to Space Weather, Solar influence on middle atmospheric processes, and Effect of Space Weather on electronic and communications systems. For a



Inaugural session at Physical Research Laboratory

better understanding of the theory, there were practical sessions on (1) Measurement of the speed of coronal mass ejection, (2) Measurements of sunspots, (3) Measurement of the geomagnetic field, (4) Radio sounding of the ionosphere, (5) Measurements of TEC and scintillation using GPS, and (6) Study of optical signatures of space weather events.

As a part of the programme, the participants were taken to Udaipur

Solar Observatory (USO) and Mount Abu Observatory for a very short scientific tour. The trip to USO started with a visit to MAST, the Multi-Application Solar Telescope installed on the island in Lake Fatehsagar. They also visited the GONG (Global Oscillation Network Group) and e-Callisto facilities in the main campus. At Mt Abu Observatory, the students observed Jupiter through the telescope. Feedback from the participants was very positive.

MEETING OF CSSTEAP GOVERNING BOARD



The 27th meeting of the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) Governing Board (GB) was held at Department of Space Branch Secretariat, Sadiq Nagar, New Delhi on 14th December, 2022.

The meeting was chaired by Shri S. Somanath, Chairman, CSSTEAP GB, welcomed all the distinguished GB Members and Special invitees of 27th GB Meeting of CSSTEAP. The Chairman expressed his appreciation that the Centre has completed 27 years of its establishment successfully. The Centre has done a commendable job of capacity building in Asia Pacific region under the guidance of learned GB. The Chairman was pleased to note its appreciable growth in all the domains of its activities related to the capacity building in Asia and the Pacific region.

Chairman, CSSTEAP GB also mentioned that many significant changes are being undertaken in

CSSTEAP programmes. CSSTEAP has conducted important courses in climate change and disaster management. Chairman appreciated the online courses conducted by CSSTEAP during last one year. The Chairman also appreciated the support of UN-OOSA and UN-ESCAP in the form financial assistance for the CSSTEAP activities. Chairman, CSSTEAP GB also informed the GB Members that CSSTEAP has supported to UN activities in Technical Advisory Mission in Application of Space Technology for Disaster Risk Reduction during 26-30 September 2022 at Philippines.

Chairman, CSSTEAP GB reiterated that even during the Pandemic the space sector was very active with many innovative space mission. He apprised the members about the recent launches of ISRO in Earth Observations i.e. RISAT-1A and Oceansat-3. He also highlighted future missions of ISRO were also highlighted. The new adopted model

on commercialization of space missions is very important which will invite partnership of private sector in space sector. The activities of IN-SPACe and NSIL was also discussed. The importance of small satellite mission was highlighted. International cooperation in outer space and space technology will be one of the important agenda of G-20 initiatives from India for the next two years.

The Chairman especially mentioned that UN-ESCAP, Bangkok has been supporting Centre's RS&GIS programme by providing financial support for international travel to a few of participants. He sincerely thanked for this generous gesture and wish their continued support in future as well. The Chairman apprised CSSTEAP GB members on some of the significant achievements of ISRO during the last one year.

This was followed by a brief report on Centre's programmes, activities, host country support, etc. in the past

one year and planned academic activities for 2023 by Dr Prakash Chauhan, Director, CSSTEAP. He also informed successful completion of MOOC, online course on "Space-Based Data for Climate Monitoring and Climate Change Impacts" jointly conducted with UN-OOSA & ISRO on September 19, 2022 (73 participants from 18 countries). He also informed that during the year 2022, the Centre has conducted 04 short offline courses and 05 online short courses on different themes. He also informed that an MoU has been signed between CSSTEAP and GISTDA on August 3, 2022. He informed GB that the Centre has been conducting Post Graduate Courses in five disciplines and short courses in various themes. Till date the Centre has conducted 64 PG courses, 24 in Remote Sensing & Geographic Information System (RS & GIS), 12 each in Satellite Communications (SATCOM), Satellite Meteorology & Global Climate (SATMET), Space & Atmospheric Science (SAS) and

03 in Global Navigation Satellite Systems. The Centre has also conducted several short courses and workshops in past 27 years. These programmes have benefitted around 3149 participants from 37 countries in the Asia-Pacific region. In addition to this, 57 participants from 24 countries outside Asia-Pacific regions have also been benefitted. PG Courses have benefitted 1054 participants while Short Courses have benefitted 2095 participants. He also informed about new short course on Data acquisition and Data Processing of Earth Observation Satellites is proposed to be conducted at NRSC, Hyderabad in the year 2023.

Md. Azizur Rahman, Bangladesh thanked CSSTEAP and Govt. of India in helping Bangladesh for capacity building in various aspects of space technology. He appreciated the efforts of CSSTEAP and DOS and discussed about participants from Bangladesh benefitted by CSSTEAP. Ms. Erna Sri Adiningsih,

Indonesia, thanked CSSTEAP GB Chairman and Director, CSSTEAP for successfully holding the 27th GB meeting. She underlined the changes in the Indonesian Space Sector and integration of LAPAN with BRIN. She suggested that Space Policy and Law should be included in CSSTEAP courses. Prof. Abdykalykov Akymbek Abdykalykovich from Kyrgyz Republic thanked the Chairman and Director, CSSTEAP and appreciated CSSTEAP for conducting successfully its academic programs. Mr. Amizal Fadzli Rajali, Charge D' affaires, High Commission of Malaysia thanked Chairman CSSTEAP, GB and congratulated ISRO for its achievements. On behalf of Malaysia, he assured all cooperation and support. Mr. Ananda Mohan Sharma, Nepal Congratulated the Chairman, CSSTEAP GB and acknowledged the great work being carried by CSSTEAP. Dr. Marc Caesar Talampas, representing the Philippines and the Philippine



Governing Board Members and Special Invitees during 27th Governing Board Meeting

Space Agency (PhilSA), expressed gratitude to CSSTEAP. He emphasized the importance of capacity building for PhilSA in order to promote and sustain a robust Philippine space ecosystem. He also expressed PhilSA's keen interest in contributing to CSSTEAP's activities in the future. Eng. Mr. S. Panawennage, Sri Lanka congratulated India on space sector achievements. He further suggested that CSSTEAP should focus on "Guiding government and developing space ecosystem

in other countries". Mr. Tatiya Chuentragun, Thailand thanked CSSTEAP and appreciated that the Centre is a leading organization in Capacity building.

As per the recommendations of the Coordination Committee of ISRO/DOS/CSSTEAP, it was recommended to increase the living allowance to the CSSTEAP Course participants from INR 16,000/- to INR 31,000 per month. The GB endorsed the recommendations of CC and advised to revise the budget of 2023 considering the allowances.

The living allowance will be effective from January 2023.

The meeting was closed by Chairman, CSSTEAP GB, thanked all the GB members for their active participation and involvement in improving the overall activities of CSSTEAP. Complementing CSSTEAP for serving tirelessly towards the capacity building in the Asia-Pacific region and given the rapid pace of space technology advancements indicated that CSSTEAP need to brace for the challenging tasks ahead.

GLIMPSES OF STUDENTS' ACTIVITIES AT CSSTEAP











FUTURE COURSES

PG COURSES

27 th Remote Sensing and Geographic Information System (RS&GIS)	September 01, 2023 – May 31, 2024
13 th Satellite Meteorology & Global Climate (SATMET)	September 01, 2023 – May 31, 2024
13 th Space and Atmospheric Science (SAS)	September 01, 2023 – May 31, 2024

SHORT COURSES

Remote Sensing Data acquisition	August 21- September 01, 2023
Open Source GIS Technology & Geo-web service	September 04-15, 2023
Remote Sensing Data Processing	October 09-20, 2023
Overview of Web GIS Technology (Online)	November 18-29, 2023
Introduction to GNSS	November, 2023
Fuzzy Machine Learning and Deep Learning for Remote Sensing Data Classification (Online)	November 20-24, 2023
SAR Data Processing and its applications (Online)	December 04-08, 2023
Small Satellite Mission	December 04-15, 2023

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