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CSSTEAP Newsletter

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Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP)
(Affiliated to the United Nations)

..... on a mission of capacity building, under the initiative of the United Nations, for Asia and the Pacific Region in Space Science and Technology, through Excellence in Education, Training, and Research.

INDIAN REGIONAL NAVIGATION SATELLITE SYSTEM LAUNCHED

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India earned laurels by successfully launching its first satellite (IRNSS-1A) in the series of Indian Regional Navigation Satellite Systems (IRNSS) by ISRO's Polar Satellite Launch Vehicle, PSLV-C22 from Satish Dhawan Space Centre, Sriharikota, India on July 2, 2013. This was the 23rd consecutively successful mission of PSLV. The 'XL' configuration of PSLV was used for the mission. This is the fourth time such a configuration is being flown, earlier three being PSLV-C11/ Chandrayaan-1, PSLV-C17/ GSAT-12 and PSLV-C 19/ RISAT-1 missions.

The IRNSS-1A satellite, weighing 1425 kg, was injected to the intended elliptical orbit of 282.46 km X 20,625.37 km. IRNSS-1A was launched into a Geosynchronous Transfer Orbit (sub GTO) with a 284 km perigee (nearest point to Earth) and 20,650 km apogee (farthest point from the Earth) with an inclination of 17.86 degree with respect to equatorial plane. ISRO's Master Control Facility (at Hassan, Karnataka) has assumed the control of the satellite.

IRNSS-1A has a mission life of 10 years and it carries two types of payloads- navigation payload and ranging payload. The navigation payload of IRNSS-1A will transmit navigation services signals to the users. This payload will be operating in L5 band (1176.45 MHz) and S-band (2492.028 MHz). A highly accurate Rubidium atomic clock is part of the navigation payload of the satellite. The ranging payload consists of a C-band transponder which facilities accurate determination of the range of the satellite. IRNSS-1A also carries Corner Cube Retro Reflectors for laser ranging.

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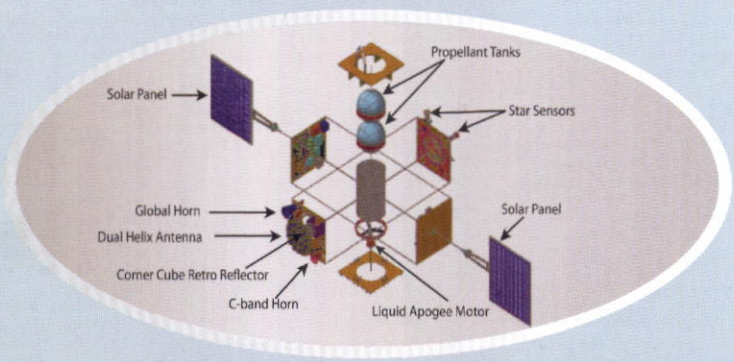


IRNSS-1A Disassembled View

IRNSS-1A undergoing tests in clean room

IRNSS-1A is the first of the seven satellites with three satellites in geostationary while four satellites in the inclined geostationary orbit constituting the space segment of the IRNSS. IRNSS is an independent regional navigation satellite system designed to provide position information in the Indian region and 1500 km around the Indian mainland and area enclosing from 30 to 130 degree East with a position accuracy of better than 20m in the primary service area. IRNSS would provide two types of services, namely, Standard Positioning Services (SPS) - provided to all users - and Restricted Services (RS) provided only to authorized users. A number of ground stations responsible for the generation and transmission of navigation parameters, satellite control, satellite ranging and monitoring, etc., have been established in as many as 15 locations across the country. The entire IRNSS constellation of seven satellites is planned to be completed by 2015.

The Salient features of IRNSS-1A are:

Orbit	:	Geosunchronous, at 55 deg East longitude with 29 deg inclination
Lift off Mass	:	1425 kg
Dry Mass	:	614 Kg
Physical Dimensions	:	1.58 x 1.5 x 1.5 meter
Power	:	Two solar panels generating 1660 W, one Lithium-ion battery of 90 Ah capacity 440 Newten Liquid Apogee Motor, twelve 22 Newton Thrusters
Control System	:	Zero momentum system, orientation input from sun & star Sensors and Gyroscopes; Reaction wheels, Magnetic Torquers and 22 Newton Thrusters as actuators.
Mission life	:	Ten years

Source: www.isro.gov.in

SEVENTEENTH POST GRADUATE COURSE ON REMOTE SENSING & GIS

The Seventeenth Post-Graduate Course on "Remote Sensing and Geographic Information System (RS&GIS)" of CSSTEAP was conducted at Indian Institute of Remote Sensing (IIRS), Dehradun, during July 1, 2012 to March 31, 2013. Total 21 participants from 12 countries of Asia-Pacific Region viz. three each from Mongolia, Uzbekistan and Vietnam; two each from Bangladesh, India and Tajikstan and one each from Kazakhstan, Kyrgyzstan, Myanmar, Nepal, Sri Lanka and Thailand.

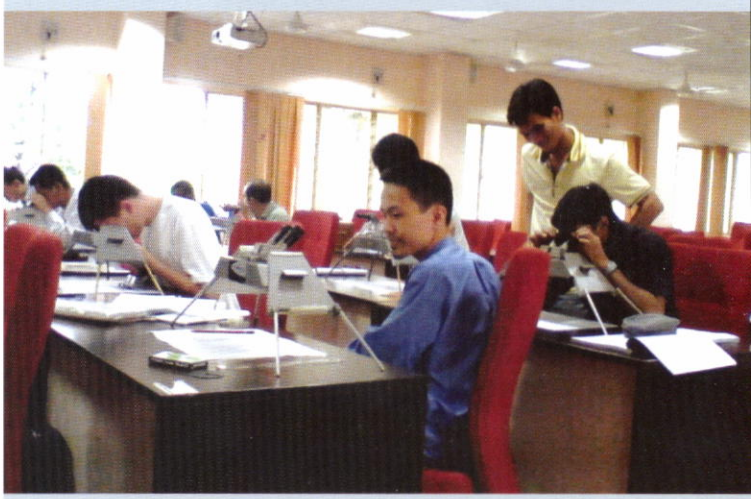
The entire course was divided into two semesters. Semester-I and Semester-II were of four and five months, respectively. Semester-I consisted of basics of remote sensing, Geographic Information System, Global Positioning System, image processing, image analysis, recent trends in RS & GIS technology and environmental analysis, monitoring and management. The faculty for the course were mainly drawn

from IIRS apart from invited guest faculty on specialized topics. The guest lecturers were from various Indian Organizations such as Wildlife Institute of India, Dehradun; Indira Gandhi National Forest Academy, Dehradun; Forest Survey of India, Dehradun; National Institute of Hydrology, Roorkee; Centre Soil and Water Conservation Research and Training Institute, Dehradun; Survey of India, Dehradun; Delhi Development Authority, New Delhi; Indian Institute of Technology, Roorkee; National Informatics Centre, New Delhi; Space Applications Centre, Ahmedabad; Department of Science and Technology, New Delhi; Indian Agriculture Statistical Research Institute, New Delhi; ESRI, New Delhi, etc.

In semester-II, the course participants chose one of the eight electives. Out of 21 participants, 4 each opteded for 'Agriculture & Soils' and Geo-informatics', 3 participants for 'Water Resources' while 2 each for 'Geosciences & Geohazard', 'Forest Ecosystem Assessment & Management', Marine & Atmospheric science', 'Satellite Image Analysis & Photogrammetry' and 'Urban & Regional Planning' disciplines. They opted the disciplines by considering his/her academic qualification, professional experience, and technical requirement of their parent organization.

The academic activities like theory, guest lectures, practical, etc. were organized in smart-class rooms. Multi-media self-learning packages, field excursion, seminars, etc. were also organized. All the participants learnt operationalization of software for digital satellite image processing for mapping natural resources for management and planning during computer-based practical exercises. Local field-visits were very effective in understanding different ecosystems, phenomenon, and earth surface features using RS data. They were also taught GIS using latest software, concept of datum, projections, database creation, analysis and modeling for understanding earth processes and natural resources management. Lecture notes in the form of printed books and supplementary reading materials were distributed well in advance to all the course participants to help easy assimilation of the subject in the class and also for future reading. Academic performance of the course participants was evaluated in each semester through periodic internal and external examinations in the form of written and practical examinations; class test, tutorials, seminar etc.

For interested participants English language classes after office hours were organized during the first three months for improving communication, understanding and writing skills in English. Technical visit of about two weeks to Andhra University, Visakhapatnam, an East coast of India and National Remote Sensing Centre (NRSC), Hyderabad an premier ISRO organization engaged in Satellite data reception, dissemination and applications in natural resources, management were organized during October, 2012. At Andhra University the eligibility for pursuing M.Tech. by the participants was formalized after completing the diploma. At Andhra University the participations attended basic as well as



Participants during the practical excercises

Participants during the field measurements

Course participants with dignitaries at Andhra University, Visakhapatnam

Participants during ISRS National Sympsoium at New Delhi

specialized lectures on application of RS & GIS on Coastal studies, Oceanographic applications, Tsunami, Weather forecasting and digital image processing. A field visit for urban & rural landscape of East coast seascape and Eastern Ghats was also organized for the benefit of the participants.

In order to provide a wider exposure in the field of Geoinformatics Technology & Applications, nine participants were given opportunity to attend ISRS National symposium on Space Technology for Food and Environmental security held in New Delhi during December 5-7, 2012. Thirteen participants of the PG course & one participant of M.Tech. participated in the National symposium on 'Frontiers of Meteorology with special reference to the Himalayas' for TROPMET 2012 held during November 20-22, 2012 at IIRS Dehradun. Two participants participated in seminar on 'Geo-enabling Uttarakhand: Opportunities and the way forward' at IIRS Dehradun on November 30, 2012. During technical visits the course participants explored Indian rich heritage and cultural diversity. On the social front, the participants had glimpses of Indian festivities by their active participation in various festivals such as Dussehra, Holi, Diwali, Id-ul-Fitr, Christmas, New year, etc.

The course participants learnt a great deal with respect to practical and technical aspects of RS & GIS technologies and their applications during the three months of pilot project carried out in Module-III. This module is basically designed to carry out pilot project work by the course participants. Course participants developed and finalized pilot project in consultation with organization in their home country and supervisors of IIRS.

The broad topics of the pilot projects under taken by the course participants during Module-III were:

- Water requirement estimation of piantation crops using temporal satellite data;
- Geospatial approach of Agro-Ecological characterization;
- Cropping Pattern Inventory & Suitability Analysis using RS&GIS;
- Soil qualiy index (SQI) based approach in assessing soil degradation for land use planning;
- Evaluation of EO-1 hyperion data for forest species discrimination & classification;
- Mapping above ground woody biomass using field inventory data and RS based model;
- Landslide assessment and debris flow modelling;
- Mineral mapping using spaceborne techniques and field investigation;
- Comparative study of Knowledge Based Algorithms for Automated Road Network Generalization;
- Forest fire likelihood modelling using multi-criteria decisions analysis and web-based data dissemination into OGC WMS services;
- Web based geo-information services for land use planning;
- Design the database of land information system (LIS) for land management;
- Studies of Spectral properties of aerosol and black carbon;
- Mapping the coverage of sea grass meadows of Gulf of Mannar biosphere reserve using RS data;

- Hyperspectral resolution enhancement using high resolution data;
- Fusion of multispectral & fully polarmetric data for land cover feature extraction;
- Relation between land surface temperature & land use/ land cover;
- Analysis of urban green space in Dehradun and surrounding using RS & GIS
- Snowmelt runoff modeling : a case study of Pinder valley
- Hydrological and environmental impact assessment analysis of hydro-power project
- Infrastructure mapping performance assessment of irrigation project using RS & GIS

The valedictory function of 17th RS & GIS course was organized on March 25, 2013. Dr. K. Radhakrishnan, Chairman, ISRO, Secretary Dept of Space and Chairman, GB CSSTEAP was the Chief Guest of the Valedictory function. On the occasion, Memoirs comprising of messages from GB, AC members, eminent persons, course report and pilot project abstracts of students was released by the Chief Guest. Dr. K. Radhakrishnan delivered the valedictory address and awarded the Post Graduate Diploma certificates to all the successful participants.

Seven participants passed with Distinction, five in First class and nine passed out as Pass. The first three rank holders received CSSTEAP excellence medals & certificates from the Chief Guest.

CSSTEAP Excellence Awards
Mr. Rajee George from India - Gold Medal
Ms. Satya Sahithi from India - Silver Medal
Mr. Md. Ashraful Islam from Bangladesh - Bronze Medal

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EIGHTH POST GRADUATE COURSE ON SATELLITE METEOROLOGY AND GLOBAL CLIMATE

The Eighth Post Graduate Course on Satellite Meteorology and Global Climate, under the aegis of the UN affiliated CSSTEAP, was conducted at Space Applications Centre (SAC), Ahmedabad during August 1, 2012 to April 30, 2013. A total of fourteen participants from eight different countries in Asia-Pacific region viz., three from India, two each from Kazakhstan, Mongolia, Sri Lanka and Tajikistan while one each from Malaysia, Thailand and Vietnam attended the course. The participants were mostly operational forecasters, meteorologist, and researchers in their own country.

Dr. K. Radhakrishnan, Chairman ISRO & Chairman, CSSTEAP GB distributing diploma certificates to the RS & GIS participants

Course participants with dignitaries during the valedictory function

SATMET course participants carrying out analysis of satellite data

Dr. Ad Stoffelen, KNMI, Netherlands, delivering lecture to course participants

The SATMET course consisted of two semesters spread in three modules. The first module covered the fundamentals of Satellite Meteorology and Global climate, and second module dealt with Advance Concept of Satellite Meteorology, e.g., Geophysical Parameter Retrieval and Satellite Products and their application in NWP etc. The third module was the Pilot project module (3 months duration) wherein the participants had to execute pilot project on a topic relevant to their own country under the guidance of an expert scientists from SAC.

Detailed lecture notes and supplementary materials were distributed to the participants. Library, laboratories and computing facilities were provided to the participants. During the course, there were periodical tutorials, weather discussions, climate seminar and the performance of the participants were assessed through written, interactive sessions and practical examinations.

In addition to class room lectures during both the modules, practicals using satellite data were conducted regualrly. There were nine sets of practicals in the Module-1 and ten practical in the module-2. The main work-horse for the practicals was data from INSAT and NOAA satellites, Microwave data sets Mega Trophques SAPHIR, SSM/I, TRMM and its applications. During the first module the emphasis was on data / image interpretation with many case studies on clouds, tropical cyclones etc. The second module consisted of basic of geophysical parameter retrieval, validations, assimilation in NWP and their applications. From this year onwards, the participants were exposed to meteorological data processing, meteorological Image Analysis System (MIAS) and related practicals, which was highly appreciated. Versatile software packages "ERDAS, MEAS, IDL, Matlab" on each computer terminal were provided for data processing.

During the course every participant was given opportunity to give seminars related to climate and meteorological problems affecting their region which improved the participants awareness and also improved their presentation skills. All the participants took interest on the weekly map discussion on weather over Indian and the Asia-Pacific region which is predicted using satellite images, weather charts and model forecasts available from various sources. This gave them a good exposure to various web sites and portals providing operational satellite data, forecasts and also helped them to keep track of various important meteorological events over their own region.

Technical visits were made to important Institutions in the country to have a first hand experience of the utilization of satellite data in an operational environment. The participants had opportunity to visit India Meteorological Department (IMD), New Delhi (Satellite Meteorology Division, NHAC); Indian Institute of Remote Sensing / CSSTEAP, Dehradun; Andhra University, Visakhapatnam; Satish Dhawan Space Centre, Sriharikota; National Remote Sensing Centre, Hyderabad; Indian National Centre for Ocean Information Services

(INCOIS) and Tsunami warning Centre, Hyderabad which proved to be very useful. The participants not only had an opportunity to visit excellent facilities of ISRO and other national organizations, but also got familiarized with the cultural heritage, different historical monuments, and rich cultural diversity in various parts of India. They also had a chance to participate festivals like Deepawali, Holi, Garba etc.

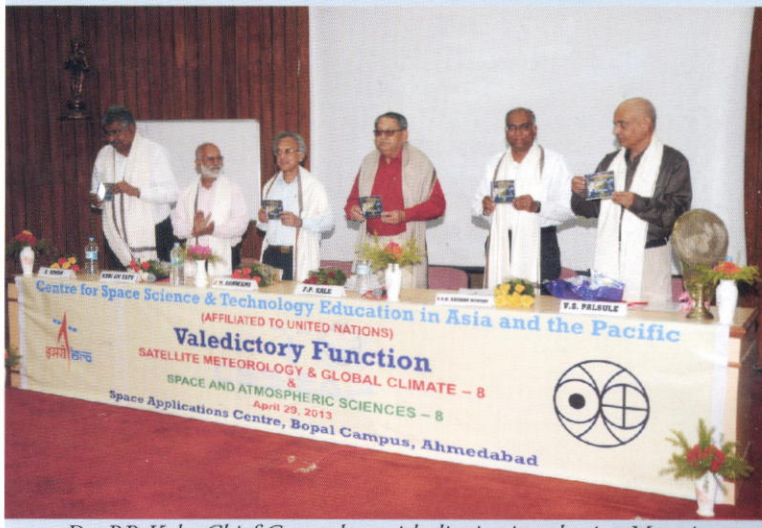
As a part of the 9 months PG course each participant is required to work on a pilot project. This pilot project is oriented towards the twelve months home country project work after the PGD course. The topics for the pilot project were identified after several sessions of discussions with the participants. Major topics of pilot projects identified were:

- Assimilation of satellite data in ocean circulation model
- Applications of AIRS sounding products over Indian region
- Validation of operational retrieval of atmospheric temperature and humidity profile from MODIS infrared radiance over Kazakhstan.
- Analysis of mesoscale convective system using satellite data
- Validation of LARH from SAPHIR (Megha Tropiques) with in-situ observations
- Nowcasting of mesoscale convective systems using satellite data
- A comparative study on cloud radiative forcing over Sri Lanka with Asian monsoon region
- Examination of cosmic ray-cloud cover association using long term ISCCP cloud data.
- Validation of Kalpana-SST and study of thermal features around Sri Lanka
- Estimation of spatial and diurnal variability of precipitation over Mongolia using TRMM 3B41 observations
- Assimilation of multi satellite data in WRF model for track & intensity prediction of tropical cyclone
- Assessment of the change (2000-01 & 2011-12) in ice surface melting pattern over Himalayan region from scatterometer data
- Soil moisture indexing based on thermal inertia from Kalpana-1 observations
- Modeling Long term change in net primary productivity using satellite data

The valedictory function was organized on April 29, 2013. Prof. P P Kale (former Director, SAC) was the Chief Guest for the function. On this occasion, Director DECU released the CD containing the syllabus and course materials and Memoirs were released by the Chief Guest. Prof. Kale distributed the P.G diploma certificates to all the participants and also delivered the valedictory address. In his address, Prof. Kale advised the students to be the ambassadors for promoting CSSTEAP activities in imparting the skills and knowledge to the fellow colleagues so that more people get benefited out of it.

Five students secured distinction, four passed in first class, and remaining five declared as pass. The first three rank

SATMET participants celebrating festival of lights - Diwali



Dr. P.P. Kale, Chief Guest alongwith dignitaries releasing Memoirs

Course participants and dignitaries in the Valedictory procession

Prof. P.P. Kale, distributing diploma certificates to the SATMET course participants

holders received CSSTEAP excellence medals and certificates from the Chief Guest.

CSSTEAP Excellence Awards

Lt. Cdr Biswarup Das from India - Gold Medal
Sqn Ldr Prabodh Shukla from India - Silver Medal
Ms. Pooja Jindal from India - Bronze Medal

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Dr. B. Simon
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EIGHTH POST GRADUATE COURSE ON SPACE AND ATMOSPHERIC SCIENCE

The seventh PG Course in Space and Atmospheric Sciences of CSSTEAP, was conducted by, Physical Research Laboratory (PRL), Ahmedabad, the host institution, during August 1, 2012 to April 30, 2013.

Fourteen participants from seven different Asia Pacific countries joined the course viz., four from India, three from Kazakhstan, two each from Mongolia, Myanmar and one each from Sri Lanka, Tajikistan, Uzbekistan.

The nine months of the course was subdivided into two semesters of about 4.5 months each. Semester-1 consisted of four theory papers, six experiments and seminar. The first paper on Atmosphere provided detailed study of the structure, processes and dynamics of the atmosphere of Earth and other planets. The second paper covered the upper atmosphere or the Ionosphere of the Earth, other planets and their satellites. There were two papers on the instrumentation, data analysis, Satellites and Rockets systems. These dealt with the discussions on the principles of the instruments, their working and application. Today we use rockets and satellite for space exploration and its application hence these papers focused and covered in great detail on the technological aspects of these systems including selection of materials, etc. The application of satellite in remote sensing, meteorology, communication, space science and astronomy were interestingly covered in series of lectures.

Semester-II started on December 14, 2012 and consisted of two theory papers, pilot project, six experiments and seminar. The first paper dealt with basics of Solar Physics, Magnetospheric Physics and the second paper on Astronomy & Astrophysics. The Solar Physics discussed the structure and formation of Sun, solar activity, solar wind. The Magnetospheric Physics dealt with interaction of geomagnetism with the solar wind and energetic particles. The paper also provides an overview of Space Weather. The Astronomy and Astrophysics paper provided detail knowledge of motion of celestial objects; formation and

structure of stars, planets and galaxies with the observations of celestial objects at radio, infrared, optical, X-ray and Gamma rays. This also provided adequate information of major astronomical facilities in the world as of now. The semester-II external examinations were held during February 4-7, 2013.

The performance of the course participants was satisfactory by and large and the current batch was found to be well equipped in English language to cope up the day to day work, a welcome change from the previous courses.

In order to develop interest and confidence of space science, high emphasis was given towards hands-on experiments, interaction with the faculty and among students. Two interaction workshops were organized during in each semester with the faculty. The participants organized a space science workshop on October 29, 2012. This workshop was inaugurated by the Director PRL and entire work was carried by the students. Director PRL emphasized the need of the pilot research projects and he encouraged each of the participants to pursue the research project forward on their return to home country/institute. The topics for presentation and discussion were Solar radiation and its effects on atmosphere, Aerosols, Greenhouse gases and their effects, Dynamics of earth's atmosphere, An insight into the atmosphere of terrestrial planets, Structure and variability of earth's atmosphere, Ionospeheric plasma dynamics, Radio refractive index of air, Ionospheres of other planets and satellites, Optical techniques, Lasers, Airglow, Data analysis techniques, Space exploration: Launch Vehicles, Spacecraft Attitude and Remote Sensing. It was a successful event and provided ample evidence that the students learnt the subject and had good confidence. During the educational and technical visit to Andhra University, Vishakhapatanam, the second workshop was organized at Physics Department, Andhra University on "Glimpses of Space Science: A Novice view". The topics for presentations and discussion were Sun-The unique laboratory, Comets- Their orbits, surface and composition, HR Diagram - An important tool in Astronomy, Variable Stars, Earth's magnetosphere, Atmospheric Aerosol, Stratospheric Ozone Depletion.

Educational and technical visits were arranged to familiarize with instruments and conduct some experiments. There were two technical visits: one to the Northern India which covered visits to many educational institutes e.g. Birla Planetarium Jaipur; National Physical Laboratory, New Delhi; Indian Institute of Remote Sensing, Dehradun; Forest Research Institute, Dehradun; Semi Conductor Laboratory, Chandigarh and International Radio Science Centre, Jodhpur. The participants also visited places of historical and tourism importance e.g. Taj Mahal, Agra; India Gate, Red Fort, New Delhi and Desert, Sand Dunes of Jaislmeir, Rajasthan.

Another technical visit was to Southern India, wherein participants visited Indian Institute of Astrophysics, Bengaluru; Kodaikanal Observatory, Kodaikanal; and Andhra University

Course participants at Taj Mahal, Agra

SAS course participants at Infrared Observatory, Mount Abu

Course participants with dignitaries after being successfully graduated

Participants at Cyclone Warning Centre during visit to Visakhapatnam

Vishakhapatanam. At Kodaikanal Observatory two hands-on experiments were conducted by the students. These were to measure sunspots area and solar magnetic field.

The participants in their last three months, worked on the pilot project. Each participant was allotted a project problem under the supervision of one supervisor from PRL. The broad topics chose were:

- Ionospheric Thermospheric response to prolonged southward IMF Bz period during moderate geomagnetic storm
- Emissions of VOCs from biomass burning sources and their ozone formation potential over India
- Study of Total Column Ozone, Water Vapour and AOT over Western Sites in India
- Spectral distribution of aerosol optical depths: MISR
- Aerosol scattering coefficients and asymmetry parameter: Spectral and seasonal variations
- Aerosol scattering coefficients and asymmetry parameter: Spectral and seasonal variations
- Solar X-ray Spectrometer (SOXS)
- Temporal variation of AOD over West and North India MODIS and GOCART
- Multi-wavelength investigations of solar eruptive phenomena
- Upper tropospheric Ozone over New Delhi
- Analysis of Spatial variability of Oceanic parameters using Radar Altimetric measurements from Space
- Photometric of the Globular Cluster M53 and the Open Clusters; NGC2362 and NGC2129
- Middle Atmospheric Temperature and Ozone over Sub-tropical and Mid-latitude Locations using Satellite Observations
- Photometric and Polarimetric observations of Comets
- Observing the Sun in white-light and H-alpha

The project work was evaluated by the external subject experts alongwith the faculty of PRL and all the participants successfully completed the project. The eight PG course in Space and Atmospheric Sciences concluded with the valedictory function held at Bopal Campus on April 29, 2013. This was a joint Valedictory function for Space Science as well as SATMET courses. Prof. P P Kale, Former Director, SAC was the Chief Guest and distributed diploma certificates to the course participants.

Nine students have secured distinction, four passed in first class, and remaining one declared as pass. The first three rank holders received CSSTEAP excellence medals and certificates from the Chief Guest.

CSSTEAP Excellence Awards

Mr. Janaka Adassuriya from Sri Lanka - Gold Medal
Mr. K. Hareef Baba Shaeb from India - Silver Medal
Ms. Sonam Arora from India - Bronze Medal

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INTERNATIONAL SHORT COURSE ON HYPERSPECTRAL REMOTE SENSING AND ITS APPLICATIONS

Hyperspectral Remote Sensing is emerging as a promising technology for dection and identification of minerals, terrestrial vegetation & natural resources, hence a traning course to generate awarenes among users, researches and professional was conducted from June 3-28, 2013 by IIRS Dehradun. A total of 19 participants from 7 countries in Asia Pacific Region namely seven from India, four from Vietnam, three from Bangladesh, two from Uzbekistan and one each from Mongolia, Myanmar, Nepal attended the course. The overall objective of this training course was to provide awareness about the concepts of Hyperspectral Remote sensing, various aspects of data processing, usefulness of hyperspectral data in various applications through demonstration of case studies for developing capacity in practical use of hyperspectral remote sensing data for vegetation species mapping, mineral mapping, soil, atmosphere and snow studies etc. The course was designed in a modular structure and provided a blend of theory, practical exercises and assignments. It consisted of two modules. Module-1 covered the fundamentals of Hyperspectral Remote sensing, Basic spectroscopic principles, Emerging hyperspectral sensors, data quality issues, spectral characteristics of various land cover features, data preprocessing, atmospheric corrections, Ground data collection and spectral library creation, Hyperspectral data processing for feature extraction. A field visit to Forest Research Institute, Dehradun with Spectro-radiometer for spectral profile & library collection and to Ponta near Dehradun with Sunphotometer and spectral collection was organized for the benefit of the participants. Module-2 covered applications of Hyperspectral Remote Sensing in Agriculture & Soils, Forestry, Atmosphere and Geology, Snow, Ice and glacier studies, planetary science.

In the last week the participants carried out a small case study in the area of their interest and presented their results in the following application areas

- Vegetation Species and forest type mapping
- Snow parameter Retrieval
- Land use land cover mapping
- Mineral mapping
- Crop identification and crop stress monitoring
- Trace gas estimation using hyperspectral sounder data
- Spectral unmixing and Hyperspectral data processing aspects

Apart from experienced faculty from IIRS, invited guest facutly Mr. D.R.M. Sumudraiah and Dr. Prakash Chauhan from Space Application Centre, Ahemdabad; Dr. P. Srinivas from ADRIN, Hyderabad; Prof. D. Ramakrishnan from IIT, Bombay; Dr. R.N. Sahoo from Indian Agricultural Research Institute (IARI), New Delhi; Dr. S. Sanjeevi from Anna University and Dr. S.H. Negi from SASE, Chandigarh delivered lectures. The training material consisting of lecture notes, presentation slides,

Hyperspectral short course participants in lecture session

Inaugural function of short course in Hyperspectral Remote Sensing & its Applications

practical handouts etc was provided both to the participants on a CD. At the end of the course a formal feedback was taken from the participants in general all the participants appreciated the program.

A valedictory function was organised on 28 June in IIRS. Dr. Y.V.N. Krishna Murthy, Director, CSSTEAP & IIRS distributed certificates to the participants.

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Dr. YVN Krishna Murthy Director, IIRS & CSSTEAP awarding certificates

Valedictory function of the Hyperspectral Remote Sensing short course

INTERNATIONAL SHORT COURSE ON NAVIGATION & SATELLITE POSITIONING SYSTEMS

The second International training course on Navigation and Satellite Positioning System by CSSTEAP was conducted at Space Applications Centre, Ahmedabad during June 17, 2013 and July 12, 2013. The objective of this short course was to create an awareness of existing and upcoming Satellite Positioning Technology, to expertise researchers and professionals Navigation and Satellite Positioning Technology, to upgrade on going activities related to use of GNSS technology and to maximize the benefit of the use and applications of GNSS to support sustainable development. Sixteen participants from 10 countries of Asia Pacific region namely three each from India and Mongolia, two each from Myanmar and Nepal, one each from Indonesia, Kyrgyzstan, Tajikistan, Thailand and Vietnam attended the course. The academic background of participants were communication, applications of Navigation in remote sensing etc. The formal inaugural of the course was held on June17, 2013 at SAC, Ahmedabad. Dr. Y.V.N Krishna Murthy Director, CSSTEAP inaugurated the course.

The course was structured and balanced between theory, practical exercises and field visits. The Course schedule was covered in four modules distributed in four weeks. The first week dealt on Introduction to GNSS in which overview of GPS, Gallelio, Compass, IRNSS with Introduction to Matlab were covered. During the second week orbital dynamics of GPS orbit, Satellite & User position algorithms, concept of Fourier transformations, error source, new modulation schemes for navigation were covered. During the third week antennas, DGPS, GPS augmentation, GPS receivers were covered. In the last week GNSS data processing and applications relating to aviation, fleet monitoring, surveying, seismology, mobile

mapping, GNSS altimetery etc were dealt. Practical exercises and demonstrations were conducted related to GNSS. Experiments with different types of GNSS receivers in stand alone mode and integrated with communications systems were conducted. Computer based exercises using MATLAB simulation was conducted.

Participants also made seminar presentations on topics like Automatic Identification System (AIS) for Maritime Safety, Vehicle Navigation, Tracking and Management, Surveying and mapping using GNSS and GNSS Based Search and Rescue.

The faculty for the NAVSAT course were mainly drawn from SAC apart from invited guest faculty Dr. M.R. Sivaraman, Dr. I.C. Mateida and Dr. P.M. Udani - experienced retired ISRO Scientists and also Dr. A. Sengupta from National Physical Laboratory, New Delhi and Dr. G. Vyasaraj and Dr. H.N. Suhas from M/s. Accord, Bengaluru and Dr. S. Sunda from Airport Authority of India, New Delhi delivered lectures. Local visits were arranged to the participants during the week ends.

All the students expressed theirs view that the overall conduct of the course was extremely good with quality teaching, practical and technical visits. The classroom arrangements and hostel stay was comfortable.

A Valedictory function was organized on July 12, 2013 in SAC. Dr S. Kalyanaraman, Former Program Director IRS, ISRO was the Chief Guest of the function. Mr. A.S.Kiran Kumar, Director SAC, Mr. Vilas Palsule Director DECU, Dr. Sarnam Singh Program Coordinator CSSTEAP and Mr. K.S. Parikh, Deputy Director, SNAA, SAC were present on the occasion.

Mr. V.S. Palsule, Director, DECU briefly mentioned the utilisation of GNSS societal applications. Mr. A.S.Kiran Kumar, Director, SAC addressed the participants and mentioned about how the course will be helping the faculty also in updating the new technologies and beneficial to the organisation. He also said that the learning process is to be continued for the professional growth. The Chief Guest, Dr. S.Kalyanaraman, in his valedictory address mentioned about utility of the course and summarized the GNSS fundamentals. He also mentioned that GNSS applications become a basic need for the common man in his day-to-day life. Chief Guest distributed certificates to the successful participants.

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NAVSAT short course participants visiting communication facility at SAC, Ahmedabad

Dr. S.Kalyanaraman, Chief Guest awarding certificates during valedictory function of NAVSAT short course

Course participants alongwith dignatories and faculty

Dr. S.K Saha, Dean Academics awarding certificates to the course participants

INTERNATIONAL TRAINING COURSE ON FLOOD RISK MAPPING, MODELLING AND ASSESSMENT USING SPACE TECHNOLOGY

The international training course commenced from July 22-26, 2013 at CSSTEAP, IIRS campus, Dehradun with 19 participants joined the course, from 11 countries of Asia Pacific region namely seven from India, two each from China and Sri Lanka and one each from Bhutan, Combodia, Fiji, Indonesia, Myanmar, Nepal and Philippines. The overall objective of this training course was to allow disaster management communities with easy, quick and accurate access to flood related information and dissemination through the support agencies, disaster charter and research/ academic institutions for improved understanding on flood risk monitoring and planning, rapid responses system during recovery phase. The scope of the training was to familiarize the participants with a broad array of methodologies and tools for flood hazard data collection, analysis and management and flood risk mapping policy in support of flood risk assessment, in the broader context of Integrated Flood Management, mult-hazard risk assessment and flood risk management. The training was jointly organized by CSSTEAP, International Water Management Institute (IWMI), Sri Lanka, United Nations Office for Outer Space Affairs (UN-OOSA), United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP). A formal inaugural function was organized on July 22, 2013. The function was attended by resources persons, Dr. Shirish Ravan, UN-SPIDER Bejing; Dr. Giriraj Amarnath and Mr. Rajah Ameer from IWMI, Colombo; Dr. Wai Leong Timothy Loh from UN-ESCAP, Bangkok; Mr. Anusom Rungsipanich, GISTDA, Bangkok; Dr. Wang Ping, NDRCC, Bejing; Dr. Bharat Sharma, IWMI, New Delhi apart from faculty from Water Resources and other Departments of IIRS. Dr. Y.V.N Krishna Murthy Director, IIRS and CSSTEAP was the Chief Guest on the function. In his addressed he mentioned the need and assess of the use the space technology in disaster risk reduction and the role of CSSTEAP in collaboration with UN-OOSA, UN-ESCAP and IMWI for this initiative.

The course was designed in a modular structure and provided a blend of theory, and practical experience. It covered the Flood inundation mapping, monitoring and damage assessment using space technology; global flood hotspot and risk assessment; climate change and disaster risk reduction; global flood detection system; Flood inundation modeling using HEC tools, Emergency response and rapid mapping with case studies of Indian, South Asian floods and rapid mapping. Extensive hands on practical interactive sessions were conducted for the participants. To have a field experience, a field survey and visit was conducted at the landslide and flood

affected areas adjoining river Ganga around 40 kms from Dehradun for the benefit of participants.

Experienced faculty from IIRS, Dr. Shirish Ravan, UN-SPIDER Bejing; Dr. Giriraj Amarnath and Mr. Rajah Ameer from IWMI, Colombo; Dr. Wai Leong Timothy Loh from UN-ESCAP, Bangkok; Mr. Anusom Rungsipanich, GISTDA, Bangkok; Dr. Wang Ping, NDRCC, Bejing; Dr. Bharat Sharma, IWMI, New Delhi; Dr. Durga Rao, National Remote Sensing Centre Hyderabad apart from Faculty from Water Resources, IIRS were the resource persons for the training program. The training material consisting of lecture notes, presentation slides, practical handouts etc was provided to the participants on a DVD. At the end of the course a formal feedback was taken from the participants and in general all the participants appreciated the program.

A valedictory function was organized on July 26, 2013 in IIRS. Dr. S. K Saha, Dean IIRS distributed the certificates to all the participants. Dr. Shirish Ravan, Dr. Giriraj Amarnath, Dr. Wai Leong Timothy Loh, Dr. Sarnam Singh, Dr. S.P Aggarwal were present on the occasion.

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SUB-REGIONAL TRAINING ON DEVELOPMENT OF GEO-REFERENCED DISASTER RISK MANAGEMENT INFORMATION SYSTEMS FOR SAARC COUNTRIES

Sub-regional training on development of geo-referenced disaster risk management information systems for SAARC countries was conducted joined by Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) Dehradun, United Nations Economic and Social Commission for Asia and the Pacific (UN-ESCAP) and Asian Institute of Technology (AIT) Bangkok during August 26-29, 2013 at IIRS, Dehradun. The training programme was inaugurated by Dr. Y.V.N. Krishna Murthy, Director, CSSTEAP and IIRS in presence of Dr. Tae Hyung Kim, Economic officer UN-ESCAP and other delegates from UN-ESCAP, AIT, CSSTEAP and IIRS. Total of 16 participants from SAARC member countries viz. five from India, two each from Afghanistan, Bangladesh, Bhutan, Sri Lanka and one each from Maldives, Nepal, Pakistan and Thailand participated in this training programme. A total of 13 technical sessions were

Dr. Y.V.N Krishna Murthy, Director, IIRS deleivering lecture during the training programme

Participants understanding Aoustic doppler curret profiler that measures water current velocities

Course participants of Geo-Referenced Disaster Risk Management alongwith the dignitaries and faculty

Dr. YNV Krishna Murthy distributing certificates to the course participants of Geo-Referenced Disaster Risk Management

conducted with main emphasis on development of Geo-Portal for Disaster Risk Reduction (DRR), utilizations of web services and online applications tools for DRR.

A special session was conducted by Dr. Tae Hyung Kim on "Improving Disaster Risk Management through Geo-referenced Information System in the ESCAP region". The representative of SDMC, New Delhi presented data access and sharing mechanism through South Asia Disaster Knowledge Network (SADKN) to the participants in detail. The resource persons from UN-ESCAP Mr. Rajendra Aryabandu and Mrs. Madhavi Aryabandu also shared their expertise and conducted technical sessions on different themes of Geo-DRR. The capacity building activities of CSSTEAP/IIRS and AIT was presented by Dr. Sarnam Singh and Dr. Lal Samarakoon respectively. Detailed technical sessions and hands-on exercises on Geo-DRM portal being developed under UN-ESCAP programme was conducted by a team from AIT Bangkok. The technical session on Sub-regional Geo-DRM Information Systems also covered the training on WebGIS and open source software technology and their utilization for DRR. The special sessions on Indian experiences on Early Warning system for disaster management and location based services and space based inputs for disaster management and its services through ISRO Bhuvan portal was presented by Dr. S.K. Srivastav, and Dr. Harish Karnatak from IIRS respectively. The participants from member countries also presented the status of their country, data availability and also the country specific requirements which should be part of proposed Geo-DRM portal. The participants also got awareness of Institutional, policy issues and networking requirement in SAARC countries for Geo-DRR data and information services. The concluding session on "Way Forward..." was conducted by Mr. Rajendra Aryabandu, UN-ESCAP and Dr. Harish Karnatak, CSSTEAP/IIRS. The highlights of the training programme and feedback from participants was submitted to UN-ESCAP. The feedback received from participants was excellent fo technical sessions, lab and internet arrangements, logistic etc., while some other issues on availability and data update mechanism of SADKN required technical and policy leve revamping. The valedictory function was organized on Augus 29, 2013 wherein Dr. Y.V.N. Krishna Murthy, Director CSSTEAP and IIRS distributed certificates to the participants Dr. Lal Samarakoon, Dr. Rajendra Aryabadu, Dr. S.K. Saha, D Sarnam Singh alongwith senior faculty of IIRS were preser during the function.

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INTERNATIONAL TRAINING COURSE IN SMALL SATELLITE MISSIONS

CSSTEAP will be organizing second two weeks short term international training course on "Small Satellite Missions" at Indian Institute of Remote Sensing (IIRS), ISRO, Dehradun jointly by IIRS and ISAC from November 18-29, 2013. The objective of the course is to create awareness about small satellites, space technology and opportunities. The course is aimed for decision makers, senior space technologists, managers, researchers and professionals. The agencies and institutions involved in space-based technology would also get benefited from this course.

BACKGROUND OF CSSTEAP

In response to the UN General Assembly Resolution (45/72 of 11th December, 1990) endorsing the recommendations of UNISPACE-82 the United Nations Office for Outer Space Affairs (UN-OOSA) prepared a project document (A/AC.105/534) envisaging the establishment of Centres for Space Science & Technology Education in the developing countries. The objective of the Centres is to enhance the capabilities of the member states in different areas of space science and technology that can advance their social and economic development. The first of such centre, named as Centre for Space Science & Technology Education in Asia & the Pacific (CSSTEAP) was established in India in November 1995. Department of Space, Government of India has made available appropriate facilities and expertise to the Centre through the Indian Institute of Remote Sensing (IIRS) Dehradun, Space Applications Centre (SAC), Physical Research Laboratory (PRL) Ahmedabad and ISRO Satellite Centre (ISAC), Bengaluru. The Centre is an education and training institution that is capable of high attainments in the development and transfer of knowledge in the fields of space science & technology. The emphasis of the Centre is on in-depth education, training and application programmes, linkage to global programmes / databases; execution of pilot projects, continuing education and awareness and appraisal programmes. The Centre offers Post Graduate level and short courses in the fields of (a) Remote Sensing and Geographic Information System, (b) Satellite Communications and GPS, (c) Satellite Meteorology and Global Climate, (d) Space and Atmospheric Science (e) Small Satellite Missions, A set of standard curricula developed by the United Nations is adapted for the educational programmes. The Centre is affiliated to the United Nations and its education programmes are recognized by Andhra University, Visakhapatnam, India for awarding M.Tech. degree (after completion of one year project).

Dr. K. Radhakrishnan, Chairman,ISRO & Chairman CSSTEAP GB during cultural evening at IIRS, Dehradun

CSSTEAP Hqrs. at Dehradun

Forthcoming symposia/workshops in area of Space Science & Technology

S.No	Theme	Duration	Location	Web address
1.	UAV-based Remote Sensing Methods for Monitoring Vegetation	September 9-10, 2013	Cologne, Germany	http://www.tr32db.de/workshop2013
2.	International Workshop on Advanced Geospatial Technologies for Sustainable Environment and Culture	September 12-13, 2013	Pokhara, Nepal	www.agtse.wrc.edu.np
3.	Global Conference for Open Source Geospatial Software - "Geo for All"	September 17-21, 2013	Nottingham, U.K	http://2013.foss4g.org/
4.	International Conference Agriculture & Competences (AGRICOM 2013)	September 19-20, 2013	Viterbo, Italy	http://agricomconference.pbworks.com/
5.	Conference on Sustainable Development of Energy, Water and Environment Systems	September 22-27, 2013	Dubrovnik, Croatia	http://www.dubrovnik2013.sdewes.org
6.	International Conference on Renewable Energy and Environment	September 23-24, 2013	Phuket, Thailand	http://www.icree.net/
7.	SPIE Remote Sensing 2013	September 23-26, 2013	Dresden, Germany	http://www.isprs.org/calendar/2013.aspx
8.	13th International Scientific and Technical Conference From Imagery to Map: Digital Photogrammetric Technologies	September 23-26, 2013	Fontainebleau, France	http://www.racurs.ru/France2013/en/?link=2
9.	1st ITaRS Summer School Aerosol Remote Sensing, Processes & Applications	September 23-October 4, 2013	Bucharest, Romania	http://www.isprs.org/calendar/2013.aspx
10.	International FIG workshop on the Land Administration Domain Model	September 24-25, 2013	Kuala Lumpur, Malaysia	www.isoladm.org
11.	Global Conference on Global Conference of Agriculture Economoics and Environment Research	September 27-29, 2013	Kuala Lumpur, Malaysia	http://www.gcaeer.org/
12.	International Conference on Global Food Security	September 29-October 2, 2013	Noordwijkerhout, The Netherlands	http://www.globalfoodsecurityconference.com
13.	Science for the Environment	October 3-4, 2013	Aarhus, Denmark	http://dce-conference.au.dk
14.	International Conference on Sensors and Models in Remote Sensing and Photogrammetry	October 5-8, 2013	Tehran, Iran	smpr.ut.ac.ir
15.	National Conference on Environment and Biodiversity of India	October 6, 2013	Pune, India	http://www.ebiconference.com
16.	International Conference on Environment Pollution and Prevention	October 7-8, 2013	Melaka, Malaysia	http://www.icepp.org/
17.	International Conference on Food and Agricultural Sciences	October 7-8, 2013	Melaka, Malaysia	http://www.icfas.org/
18.	Advances and Activities in Planetary Mapping and Databases	October 11-14, 2013	Moscow, Russia	www.miigaik.ru/eng/news.htm

S.No	Theme	Duration	Location	Web address
19.	9th EARSeL Forest Fires Special Interest Group Workshop on Quantifying the environmental impact of forest fires	October 15-17, 2013	Coombe Abbey, U.K	http://www.earsel.org/SIG/FF/9th-workshop/index.php
20.	International Conference on "Agriculture, Food Technologies and Environment- New Approaches	October 19-20, 2013	New Delhi, India	http://www.krishisanskriti.org/jnu.html
21.	United Nations/United Arab Emirates Symposium on Basic Space Technology 20-23 October 2013	October 20-23, 2013	Dubai, UAE	http://www.unoosa.org/oosa/en/SAP/bsti/fundamentals.html.
22.	34rd Asian Conference on Remote Sensing Bridging Sustainable Asia	October 20-24, 2013	Bali, Indonesia	www.acrs2013.com
23.	International Conference on Enviromental Hazards	October 29-30, 2013	Tehran, Iran	http://ICEH2013.ir
24.	International Workshop on Web Mapping and Geoprocessing Services and Applications	November 11-12, 2013	Xuzhou, China	http://www.cumtklei.cn/en/gsgcbs.htm
25.	International Conference Spatial Data Infrastructures and Spatial Information Management	November 13-16, 2013	Skopje	www.conf2013.geo-see.org
26.	International Conference on Sustainable Environment and Agriculture	November 17-18, 2013	Abu Dhabi, UAE	http://www.icsea.org/
27.	Pacific Islands GIS&RS User Conference Connecting the Pacific with Maps	November 18-22, 2013	Suva, Fiji	http://picgisrs.appspot.com
28.	Joint International Workshop of ISPRS WG VIII/1 and WG IV/4 on Geospatioal Data for Disaster and Risk Reduction	November 21-22, 2013	Hyderabad, India	http://www.isprs.org/calendar/2013.aspx
29.	National Symposium on RS & GIS for Environment with special emphasis on Marine and Coastal Dynamics	December 4-6, 2013	Visakhapatnam, India	www.isgvizag.org
30.	International Conference on Geoinformation for Disaster Management	December 9-11, 2013	Hanoi, Viet Nam	www.gi4dm2013.com
31.	International Conference on Underground Space Technology	December 13-14, 2013	Stockholm, Sweden	http://www.icust.org/
32.	International Conference on Bio-Diversity	December 16-17, 2013	Colombo, Sri Lanka	http://futureevents.org/biodiversity
33.	The Geospatial Momentum for Society and Environment	December 16-19, 2013	Ahmedabad, India	http://applied-geoinformatics.org
34.	Innovative Learning Tools 2013 With specific emphasis on Strategies for Earth Resources Management	December 20-21, 2013	Ahmedabad, India	http://www.isprs.org/calendar/2013.aspx
35.	International Conferences on Geological, Geographical, Aerospaces and Earth Sciences	December 23-24, 2013	Jakarta, Indonesia	http://www.aeroearth.org/

Ongoing Courses

- Eighteenth Post Graduate course in Remote Sensing & Geographic Information System at IIRS, Dehradun from July 1, 2013 to March 31, 2014.
- Eighth Post Graduate course in Satellite Communications at SAC, Ahmedabad from August 1, 2013 to April 30, 2014.

Future Courses

- International training course in Small Satellites at IIRS Dehradun and ISAC, Bengaluru from November 18-29, 2013.
- Nineteenth Post Graduate course in Remote Sensing & Geographic Information System at IIRS, Dehradun from July 1, 2014 to March 31, 2015.
- Ninth Post Graduate course in Satellite Meteorology & Global Climate at SAC, Ahmedabad from August 1, 2014 to April 30, 2015.
- Ninth Post Graduate course in Space & Atmospheric Science at PRL, Ahmedabad from August 1, 2014 to April 30, 2015.

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CSSTEAP welcomes views and opinions of the readers on the Newsletter. Short communications on space science and technology education which may be relevant to Asia Pacific Region are also welcome. Views expressed in the articles of the newsletter are those of the authors.