

CSSTEAP Newsletter

January, 2014



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.

GSLV-D5 AND GSAT-14 LAUNCHED

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GSLV-D5 with Indigenous Cryogenic Stage was successfully launched from the Second Launch Pad (SLP) at Satish Dhawan Space Centre SHAR, Sriharikota on January 05, 2014. GSLV-D5 is the eighth flight of India's Geosynchronous Satellite Launch Vehicle (GSLV). It is also the fourth developmental flight of GSLV. In this successful flight of GSLV-D5, a communication satellite - GSAT-14 was launched very precisely to its intended Geosynchronous Transfer Orbit.

After a smooth countdown of 29 hours, GSLV-D5 lifted off at 1618 hours IST at the opening of the launch window. All the important flight phases, namely, the core stage and strap-on stage propulsion, payload fairing separation, second stage propulsion, cryogenic stage propulsion and spacecraft separation, were executed as planned. After a flight of 17 minutes 5 seconds, GSAT-14 satellite was precisely injected into a Geosynchronous Transfer Orbit with a Perigee (nearest point to Earth) of 175 km and an Apogee (farthest point to Earth) of 35,945 km with an orbital inclination of 19.3 degree with respect to the equator. Immediately after the injection, ISRO's Master Control Facility at Hassan took over the control and commanding of GSAT-14. The solar panels of the satellite were deployed as planned, the satellite health was found normal and the satellite was oriented towards the Sun.

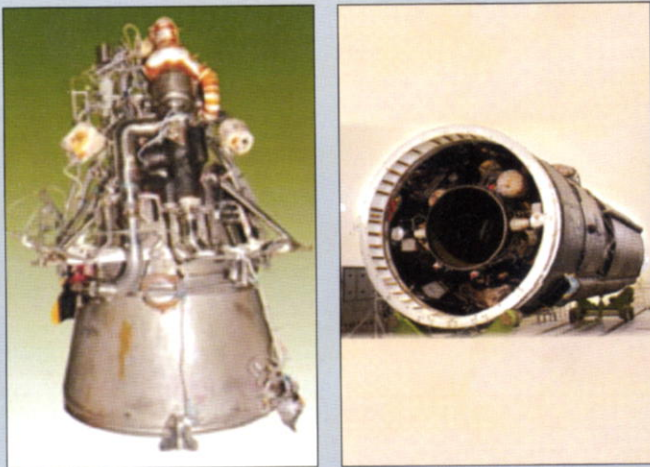
GSLV-D5 Stages at a glance

Parameters	First Stage		Second Stage	Third Stage
	Strap-Ons 4 L40 H	Core Stage S139		
Length (m)	19.7	20.1	11.6	8.7
Diameter (m)	2.1	2.8	2.8	2.8
Propellants	UH ₂₅ & N ₂ O ₂	HTPB	UH ₂₅ & N ₂ O ₂	LH ₂ & LOX
Propellant mass (T)	4 X 42.6	138.2	39.5	12.8
Max. Thrust (kN)	680	4800	720	75
Duration (sec)	148	100	150	720

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Wishing all the readers a Very Happy & Prosperous 2014



Indigenous Cryogenic Upper Stage of GSLV-D5

The vehicle had three stages with an overall height of 49.13m; lift-off mass of 414.75 Ton and lift-off thrust 6773kN. It is configured with its first and second stages similar to the ones flown during earlier GSLV missions. The metallic payload fairing with a diameter of 3.4 m is adopted for this vehicle. S-band telemetry and C-band transponders enable GSLV-D5 performance monitoring, tracking, range safety/flight safety and Preliminary Orbit Determination (POD).

The third stage is the indigenous cryogenic rocket stage which is more efficient and provides more thrust for every kilogram of propellant it burns compared to solid and earth-storable liquid propellant rocket stages. Specific impulse (a measure of the efficiency) achievable with cryogenic propellants (liquid Hydrogen and liquid Oxygen) is much higher compared to earth storable liquid and solid propellants, giving it a substantial payload advantage. However, cryogenic stage is technically a very complex system compared to solid or earth-storable liquid propellant stages due to its use of propellants at extremely low temperatures and the associated thermal and structural problems. Oxygen liquifies at -183 deg C and Hydrogen at -253 deg C. The propellants, at these low temperatures are to be pumped using turbo pumps running at around 40,000 rpm. It also entails complex ground support systems like propellant storage and filling systems, cryo engine and stage test facilities, transportation and handling of cryo fluids and related safety aspects. ISRO's Cryogenic Upper Stage Project (CUSP) envisaged the design and development of the indigenous Cryogenic Upper Stage to replace the stage procured from Russia and used in GSLV flights. The main engine and two smaller steering engines of CUS together develop a nominal thrust of 73.55 kN in vacuum. During the flight, CUS fires for a nominal duration of 720 seconds. Liquid Oxygen (LOX) and Liquid Hydrogen (LH₂) from the respective tanks are fed by individual booster pumps to the main turbopump to ensure a high flow rate of propellants into the combustion chamber. Two gimballed steering engines provide for control of the stage during its thrusting phase.

GSAT-14 Launched on 05.01.2014 is the 23rd geostationary communication satellite of India built by ISRO. The main objectives of GSAT-14 mission are to augment the In-orbit capacity of Extended C and Ku-band transponders & to provide a platform for new experiments. The payloads of GSAT-14 are:

- Six extended C-band transponders for Indian mainland and island coverage with 36 dBW Edge Of Coverage-Effective Isotropic Radiated Power (EOC-EIRP).
- Six Ku-band transponders covering the mainland India with 51.5 dBW EOC-EIRP
- Two Ka-band Beacons operating at 20.2 GHz and 30.5 GHz to carry out attenuation studies

Some of the new technologies being tested on GSAT-14 are:

- Fiber Optic Gyro
- Active Pixel Sun Sensor
- Ka band beacon propagation studies
- Thermal control coating experiments



Two halves of GSLV-D5 payload fairing surrounding GSAT-14 satellite

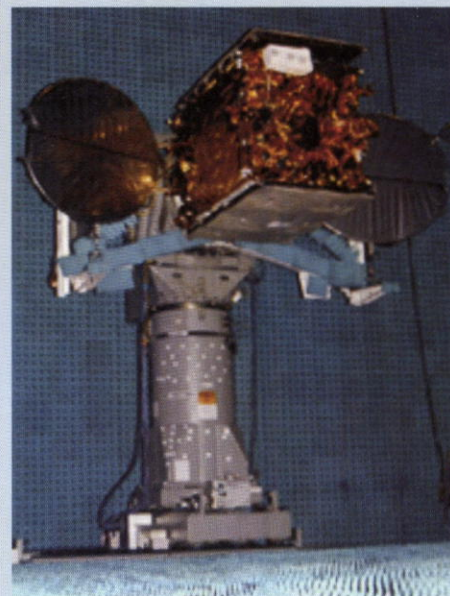
Mass At Lift-Off	1982 kg
Overall Size (m)	2.0 X 2.0 X 3.6
Power	2600 W
Attitude and Orbit Control System (AOCS)	Momentum biased 3-axis stabilized mode
Propulsion System	Bi propellant-Mono Methyl Hydrazine and Mixed Oxides of Nitrogen (MON-3) Antennae One 2m and one 2.2 m single shell shaped reflector Antennae (transmit and receive) Launch date January 05, 2014
Launch site	SDSC, SHAR
Launch vehicle	GSLV-D5
Orbit	74 deg East longitude in geostationary orbit
Mission life	12 Years

Source: www.isro.gov.in

SAGA OF TWENTY-FIVE YEARS OF TRAINING & CAPACITY BUILDING USING INDIAN SATELLITE DATA PRODUCTS

Ever since the launch of first operational Indian remote sensing satellite, IRS-1A on 17th March 1988, India's Earth Observation (EO) capability has grown manifolds in response to application requirements of the country. The resurgence in demand and availability of satellite based remotely sensed data through various follow-on ISRO missions with improved imaging capability viz., IRS-1C & 1D, Oceansat series, Resourcesat-1 & 2, Cartosat-series and RISAT-1 & 2; there has been a greater need to develop capacity in user organizations to assimilate new technologies and derive information which was never before possible. These satellites are also used for Global Missions, in effective planning and usage of Natural Resources and Disaster Management.

After the successful launch of India's first planetary mission, Chandrayaan-1 in 2008 and planned missions to Mars and Chandrayaan-2 and the greater emphasis laid on atmospheric studies with missions like Megha-Tropiques; there is a paradigm shift in remote sensing applications in India and renewed interest for scientific pursuits. Recently, the thrust has been laid on not only how we acquire data, process and analyze but also most importantly how we disseminate through web-based geospatial technology. Thus, the growth and complexities in EO technologies have also necessitated the capacity building for quality manpower development at different levels. The Indian Institute of Remote Sensing (IIRS), formerly known as Indian Photo-Interpretation Institute is one of the oldest institute in the country as well as in the world and has developed strong expertise in the fundamental image interpretation to advanced geospatial modeling techniques and the knowledge extraction using EO data to address national



GSAT-14 at Comprehensive Antenna Test Facility

imperatives and government priorities. In the recent times, it has diversified its programmes with focus on research driven training and educational programmes well integrated with ISRO's research programmes. It is well equipped to meet the future challenges and new paradigms of climate change and disaster management. From the modest beginning in 1966 to accelerated growth during 1988 to 2013, the saga of 25 years of capacity building in remote sensing is illustrated through several projects providing critical inputs for planning and development.

The capacity building in IIRS is realized through training, education and research involving professionals from stakeholder departments, students community and researchers. It is a multitier approach wherein senior level professionals like decision makers to fresh science post-graduate and engineering graduate students are provided with training, education, and research experience for both institutionalization and further advancements of geospatial technologies and their applications. The challenges in capacity building are many and it can be addressed by focusing on alignment of the capacity building programmes in tune with various developmental programmes of Govt. of India; researchers should take up issues or problems faced by user departments as research questions and address conclusively and comprehensively through multi-tier research delivery mechanism.

GOVERNING BOARD MEETING OF CSSTEAP

The 18th meeting of the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) Governing Board (GB) was held at ISRO Hqrs. Bengaluru on November 21, 2013. The meeting was chaired by Dr. K. Radhakrishnan, Chairman, CSSTEAP GB and Secretary, Department of Space; and participated by Dr. Shirish A. Ravan, Head, UN-SPIDER Beijing Office, UN Office for Outer Space Affairs, Vienna International Centre, Vienna, Austria; Dr. Hong Pong Gi, 1st Secretary, Embassy of DPR Korea, New Delhi; Mr. Taufik Maulana, Deputy of Remote Sensing of National Institute of Aeronautics & Space (LAPAN), Jakarta, Indonesia; Prof. T. Dorj, Vice President, Mongolian Academy of Sciences (MAS), Mongolia; Dr. Kyi Thwin, Acting Rector, Myanmar Aerospace Engineering University, Meiktila, Mandalay Division, Myanmar; Mr. Kartar Singh Bhalla, Hony. Consulate General of Nauru, New Delhi; Mr. Tirtha Raj Wagle, Minister-Counsellor, Embassy of Nepal, New Delhi; Ms. Maria Agnes M. Cervantes, Deputy Chief of Mission and Minister, Embassy of Philippines, New Delhi; Eng. S. Panawennage, Director, Arthur C Clarke Centre for Modern Technology, Katubedda, Moratuwa, Colombo Sri Lanka; Dr. Anond Anidvongs, Executive Director, Geo-Informatics and Space Technology Development Agency, Bangkok, Thailand, Dr. Y.V.N. Krishna Murthy, Director CSSTEAP and Secretary GB, CSSTEAP. Others who participated included Mr. Jong Ho Hwang, Councilor, Embassy of DPR Korea, New Delhi; Mr. Agus Hidayat, Head, Cooperation & Public Relations



Dr. K. Radhakrishnan Chairman CSSTEAP GB addressing the GB meeting



18th Governing Board meeting in ISRO Hqrs. Bengaluru

Bureau, Indonesian National Institute of Aeronautics & Space (LAPAN), Jakarta, Indonesia; Shri S. Srinivasan, Additional Secretary, Dept. of Space, ISRO Hqrs; Dr. S.K. Shiva Kumar, Director, ISAC Bengaluru; Mr. V. Koteswara Rao, Scientific Secretary, ISRO Hqrs, Bengaluru; Dr. J.N. Goswami, Director, Physical Research Laboratory, Ahmedabad; Dr. M. Anna Durai, Program Director, IRS & SSS, ISAC, Bengaluru; Dr. J.R. Sharma, Chief General Manager, NRSC, Hyderabad; Mr. Shantanu Bhatawdekar, Asst. Scientific Secretary, ISRO Hqrs, Bengaluru; Dr. N. Prahlada Rao, Director; Mr. G.R.K. Murthy, Chief Controller of Accounts, ISRO Hqrs, Bengaluru; Dr. D. Gowrisankar, Dy. Director, Intl. Cooperation, ISRO Hqrs, Bengaluru, and Dr. Sarnam Singh, Programme Coordinator, CSSTEAP, Course Directors of SATCOM - Dr. Raghunadh K Bhattar, SATMET - Dr. B. Simon and SAS - Prof. Hari Om Vats, Dr. Yogesh Kant, Sc./Engr., IIRS, Dr. Puneet Swaroop, Sc./Engr., IIRS and others.

Highlights of Address by Chairman, CSSTEAP GB

While welcoming the GB members, representatives, Directors of host institutions and special invitees, Dr. K. Radhakrishnan, Chairman, CSSTEAP Governing Board (CSSTEAP-GB)/ Secretary, Department of Space (DOS) apprised the members about the recent activities of the Centre and ISRO's current and future space programmes. He gave a special welcome to Mr. Ali Sadeghi Naini from Iranian Space Agency (ISA) of Islamic Republic of Iran to the Governing Board of CSSTEAP as Iran is the first country to join GB from Middle East Asia.

- Chairman, CSSTEAP-GB informed the members that consequent to the approval of new Director of CSSTEAP in the last GB, Dr.Y.V.N. Krishna Murthy, Director, Indian Institute of Remote Sensing, Dehradun took over the additional charge of the Director of CSSTEAP.
- He informed the house that in last one year, CSSTEAP has organized three Post Graduate Courses with enhanced participation of professionals and scientists. Two short courses being organized for the decision makers and senior managers in the areas of "Navigation & Satellite Positioning Systems" and "Small Satellite Missions" are becoming popular. He also informed the members that short course on "Small Satellite Mission" was underway during the time of GB in November, 2013 at ISRO Satellite Centre, Bengaluru and Indian Institute of Remote Sensing, Dehradun.
- He addressed the need for Disaster Risk Management in Asia Pacific region and sharing of the databases at regional level and informed about Centre organizing two special short courses in collaboration with UNSPIDER/UNOOSA Beijing, UN-ESCAP Bangkok and IWMI Colombo and New Delhi for SAARC countries.
- He also highlighted the significant achievements of Indian Space Research Organisation and informed that India's first Radar Imaging Satellite (RISAT-1), with all-weather imaging capability, carrying C-Band Synthetic Aperture Radar is providing valuable data enabling multiple crop forecasts, particularly during monsoon season and efficient monitoring



Governing Board members alongwith senior officials of ISRO



Special Invitees during 18th GB meeting in ISRO Hqrs. Bengaluru

and assessment of floods in the country. He also mentioned about the natural calamity in the Kedarnath region (of Uttarakhand state) caused due to cloud burst, flash floods and glacial lake breach in June 2013. The Communication satellites, satellite phones and satellite terminals played a key role in planning rescue and rehabilitation operations, particularly in inaccessible remote areas.

- He felt extremely happy to inform the members that this year India has successfully launched 5 satellite missions including the currently ongoing inter-planetary mission to Mars. The launch of first Indian Regional Navigational Satellite (IRNSS-1A) of seven satellite constellation on July 1, 2013, unfolds new vistas of indigenous satellite based navigation services in the country. INSAT-3D launched on July 26, 2013, is an advanced weather satellite of India primarily configured with improved multi-spectral imaging system and a 19 channel Atmospheric Sounder. The damage to human loss due to cyclone "Phailin" in Bay of Bengal and the states like Odisha, Jharkhand and Bihar was minimized due to satellite-based timely early warnings and constant tracking of the cyclonic system. GSAT-7, an advanced communication satellite built by ISRO, was launched on Aug. 30, 2013. It is a multi-band communication satellite operating in C, Ku, S and UHF bands providing communication capabilities over a wide oceanic region including the Indian land-mass.
- He briefed about the futuristic challenging plan ahead towards realization of high power advanced communication satellites, Remote Sensing satellites with very high resolution imaging and microwave imaging in L, S & X bands, Navigation satellites, Meteorological and Weather satellites, Astronomical satellite, Lander-rover system for Chandrayaan-2, etc.
- He emphasized that, as Host country commitment, DOS is providing all necessary supports in terms of man power, infrastructures and finance for the smooth functioning of CSSTEAP with some contribution from UNOOSA. Honorable members agreed that enhanced participation of the member countries by providing support through financial contribution, fellowship to the participants, sponsoring participation of senior managers and technocrats are very much essential to make CSSTEAP an International Institution of Excellence.

Highlights of Remarks by UN Representative

Dr. Shirish Ravan, Head, UNSPIDER Beijing representing UNOOSA highlighted the role of CSSTEAP and the Regional Centres affiliated to the UN in offering the best possible education, research and applications programmes, opportunities and experience to the participants in all its programmes.

- He mentioned that CSSTEAP covers largest area and has created large number of alumni for over 17 years in several countries in Asia and the Pacific. He appreciated for keeping a very high standard in conducting regular courses and its



Governing Board Members During 18th GB meeting in ISRO Hqrs. Bengaluru



Special Invitees during 18th Governing Board meeting in ISRO Hqrs. Bengaluru

initiatives to conduct short term programmes and training workshops in specific application areas such as disaster management, sustainable agriculture, urban studies, environmental management and technology areas such as microwave remote sensing, hyperspectral remote sensing, small satellite missions, etc.

- He expressed deep gratitude to ISRO and specifically to Government of India for providing all financial, man-power and infrastructural support for running activities of the Centre. He mentioned that he came across several alumni of CSSTEAP who have translated their learning to set up operational programmes in their home countries, such as developing early warning systems for meteorological disasters, setting up satellite based communication projects, develop applications for natural resources management, sustainable development and disaster management and so on. He expressed his happiness that in few countries, the CSSTEAP alumni have developed specialized training courses in their own countries in the area of Remote Sensing and GIS.
- He highlighted the organization of short courses with the UNESCAP and the UN-SPIDER programme of UNOOSA and IWMI for providing awareness and skills to officials from developing countries in the areas use of Remote Sensing and GIS in disaster risk reduction and socio-economic development. He expressed gratitude to the Chairman of CSSTEAP Governing Board for approving these special courses and Director CSSTEAP, Programme Coordinator, CSSTEAP and team members for putting extra effort into these courses. It will supplement the standard education curricula of the Centres. He noted that CSSTEAP already conducted a 2nd short course on NAVSAT in this year.

Highlights of Director, CSSTEAP and Future Plans

Dr. Y.V.N. Krishna Murthy, Director, CSSTEAP presented report of the Centre, highlighting Centre's programmes, activities, host country support, etc.

- He reiterated that Centre is involved in capacity building in space science, technology and applications in four assigned areas and also special theme-based short courses. He presented last year's academic activities and highlighted the successful completion of 17th RS & GIS, 8th SATMET and 8th SAS PG Courses; short courses on 'Hyperspectral Remote Sensing (HRS)', 'Navigation & Satellite Positioning Systems' (NAVSAT), 'Small Satellite Missions' (SSM). He apprised the board that the two special courses organized were : (i) Flood Risk Mapping, Modeling and Assessment using Space technology in collaboration with UNOOSA/UNSPIDER Beijing, UNESCAP Bangkok, IWMI Colombo and New Delhi and IIRS Dehradun and (ii) Sub-regional training programme on Geo-referenced Information System for Disaster Risk Management in collaboration with UNESCAP, Bangkok and IIRS Dehradun.
- He further stated that the Centre has conducted 41 PG courses and 32 short-term courses during the last 17 years in



Governing Board members during 18th GB meeting in ISRO Hqrs. Bengaluru



Special invitees during 18th Governing Board meeting in ISRO Hqrs. Bengaluru

four disciplines benefitting around 1260 participants from 34 countries of the Asia and the Pacific region; and 29 participants from 18 countries outside Asia-Pacific region. He mentioned that during the last one year, three students have been awarded M. Tech. degree and five M. Tech. fellowships have been awarded this year. He also informed that two alumni from Nepal have been provided technical guidance and other infrastructural facilities to do Ph.D. research at Centre under the supervision of IIRS faculty. He also highlighted the research areas taken up by students using latest satellite data and advance research in the areas of RS&GIS, SATCOM, SATMET and SAS. Currently 20 students from 11 countries are participating in 18th RS & GIS, 16 students from 8 countries in the 9th SATCOM.

- He further outlined the future activities and the courses to be held in the year 2014. The PG courses planned include 19th RS&GIS, 9th SATMET and 9th SAS and Short Course are on: Microwave Remote Sensing (SAR) and its Applications, Navigation and Satellite Positioning Systems, Small Satellite Missions. The Centre will be collaborating with UNESACP, UNSPIDER and IIRS to conduct 3-4 themes based short courses, mainly related to disasters like Floods, Drought Monitoring and early warning, Open Source GIS, etc.

EIGHTEENTH POST GRADUATE COURSE ON REMOTE SENSING & GEOGRAPHIC INFORMATION SYSTEM

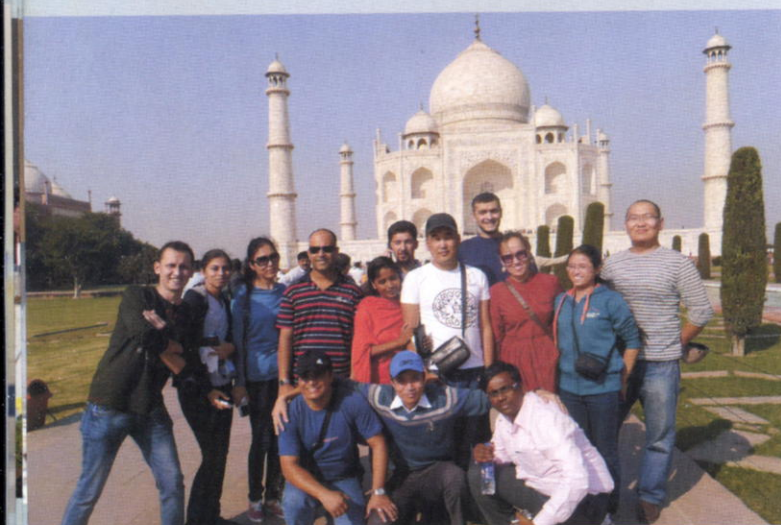
The 18th Post-Graduate Course on Remote Sensing and Geographic Information System (RS&GIS) of CSSTEAP commenced on July 1, 2013 at Indian Institute of Remote Sensing (IIRS), ISRO, Dehradun, one of the host institutions of CSSTEAP. The course is aimed at learning and skill development in the field of geo-spatial technologies for natural resource and disaster management. Total 20 participants from 11 countries of Asia-Pacific Region viz. Bangladesh-1; China-1; India-2; Kazakhstan-2; Kyrgyzstan-1; Maldives-1; Mongolia-2; Nepal-1; Tajikistan-2; Uzbekistan-3 and Vietnam-4 are attending the course. The participants are mainly from Geology, Urban & Regional planning, Ecology & Environment, Geoinformatics, Meteorology, Hydrology, Surveying, Forestry, Cartography and Soil Science background.

The inauguration of the 18th PG course was held on July 8, 2013 at IIRS, Dehradun. Director, CSSTEAP was the Chief Guest of the function. On this occasion, Director, CSSTEAP briefed about the objectives and the activities of the Centre. Course Director briefed about the structure of the academic programme.

The entire course is divided into two semesters. Semester-I consisted of Module-IA of 3 months and Module-IB of one month and semester-II consist of Module-II of 2 months and Module-III of 3 months duration. Semester-I dealt with fundamental of geospatial technologies, recent trends in RS & GIS technology, natural disasters, environmental analysis, monitoring and management. Several field excursions were taken up during this module for ground truth collection and for interpretation and analysis of satellite data. The module ended on September 30, 2013. To improve the English language



Participants at Ramoji Film city, Hyderabad



Participants of 18th RS&GIS course studying histoical feature at Agra

proficiency of some of the students, English language classes beyond office hours in the evening were arranged for three months. Module-1B semester-I was of one month duration on Recent trends in RS & GIS and Environmental analysis and Management from October 1-20, 2013. Dr. P.C Joshi, Emeritus Professor, CSSTEAP delivered lectures on 'Meteorology satellites and sensors', 'Weather analysis, forecasting and modelling'. Guest lectures were also arranged on topics like 'Earth observation system for climate and climate change', 'Forest Fire & Forest Information system' and 'Climate change dynamics'.

In Module-II of Semester-II, eight optional electives viz., Agriculture & Soils, Forest Ecosystem Assessment & Management, Geosciences and Geo-hazards, Urban & Regional Planning, Marine & Atmospheric Science, Water Resources, Satellite Image Analysis & Photogrammetry and Geoinformatics are offered. Out of 20 participants, 4 each have opted in 'Geosciences and Geo-hazards' and 'Satellite Image Analysis & Photogrammetry & 'Water Resources'; 3 participants each in 'Geo-informatics' and 'Water Resources'; 2 participants each in 'Forestry & Ecology' and 'Marine and Atmospheric Science' while one each in 'Agriculture & Soils' and 'Urban and Regional Planning' disciplines. Theory lectures and practical exercises in the above mentioned thematic disciplines were conducted. The subject experts were invited from various Indian Organizations/Institutes/Universities such as India Meteorological Department (IMD); Indian Institute of Technology (IIT), Roorkee; National Remote Sensing Centre (NRSC), Hyderabad; Indian Agriculture Statistical Research Institute (IASRI), New Delhi; Aryabhata Research Institute of Observational Research (ARIES), Nainital; Space Applications Centre (SAC), Ahmedabad; Andhra University, Visakhapatnam, etc to deliver specialized lectures.

Technical and educational visits to Andhra University, Visakhapatnam, National Remote Sensing Centre, Hyderabad and urban features in Agra were undertaken during November 26-December 10, 2013. The participants at NRSC had opportunity to visit technical facilities at NRSC campus and Satellite Receiving Station and Integrated Multi-mission Ground Segment for Earth Observation Satellites (IMGEOS) which is state of art multi-mission ground segment processing enterprise for earth observation satellites and watched the real time acquisition of EO data at Shadnagar, near Hyderabad. IMGEOS provides emergency data products in hours, most of standard products in less than a day. At Andhra University, Visakhapatnam, the educational records of all participants were scrutinized for fixing their M. Tech. eligibility. At Andhra University the participants attended lectures on specialized topics on environmental analysis & management, marine, atmospheric science, watershed etc. A field visits for urban and rural landscape of East Coast, Eastern Ghats and Seascape were also arranged. During educational tours the course participants explored Indian rich heritage and cultural diversity.

In order to provide a wider and state of art exposure in the field of Geoinformatics Technology & Applications, all CSSTEAP participants were deputed to National Symposium on Remote Sensing and GIS for Environment with special emphasis on



Course participants near Labour, Visakhapatnam of 18th RS&GIS course



Participants of 18th RS&GIS Course at Borra Caves, Visakhapatnam

Marine and Coastal Dynamics during December 4-6, 2013 at Visakhapatnam where they were benefitted with the technical knowledge and the interaction with eminent scientists across India and abroad. The participants has also taken part in 2 days tutorials on 'Planetary Exploration' and 'RS & GIS for Environment' during December 2-3, 2013 at Visakhapatnam.

The academic program of the course was organized through class room lectures, tutorials, practical, multimedia self learning packages, field excursion, seminar etc. State of art software and hardware for digital image processing, GIS analysis were used for computer based practical exercises. Lecture notes in the form of printed books and supplementary reading materials were distributed well in advance to the course participants to help easy assimilation of the subject in the class and also for future reading. Soft-copy of the lecture notes was also distributed. Academic performance of the course participants was evaluated through periodic internal, semester and external examinations in the form of written and practical examinations, class test, tutorials seminar and assignments. The Semester-I external examinations were held from October 15-19, 2013 and Semester-II external examination were held from December 23-27, 2013.

On the social front, the participants had glimpses of Indian festivities by their active participation in various festivals such as Dussehra, Diwali, Id-ul-Fitr, Christmas etc.



Dr. Yogesh Kant
Course Coordinator



Dr. Sarnam Singh
Course Director

NINTH POST GRADUATE COURSE ON SATELLITE COMMUNICATION

The 9th Post Graduate course on Satellite Communications started from August 1, 2013 which was announced in the month of December 2012. Twenty six applications were received from nine countries from the Asia Pacific Region. Nineteen participants from 8 countries were selected for the course. Finally 16 participants from six countries joined the course.

The Course commenced on August 1, 2013 at SAC Campus, Bopal, of Space Applications Centre (SAC), Ahmedabad. The formal inaugural session of the course was held on August 1, 2013. Dr. J.S. Parihar Dy. Director, EPSA/SAC, Smt. Mallika Mahajan, Controller, SAC, nominated focal persons for the course from SAC, 16 participants of the course and other CSSTEAP officials attended the inaugural session. Dr. J.S. Parihar welcomed the participants. Dr. Raghunadth K Bhattar, Course Director SATCOM-9 introduced the course and the profile of the students. All participants introduced themselves with a brief introduction about their organization and nature of work carried out by them. Dr. Parihar, briefed the students about the activities of SAC and DECU and introduced the focal

persons for different papers who in turn briefed the students about their papers. Smt. Mallika Mahajan briefed about the administrative formalities and norms to the participants.

The syllabus of the SATCOM-9 course was divided into two Semesters covering different aspects of Satellite Communications and a Pilot project. Participants were also required to make seminar presentations periodically on various topics given to them. This exercise was carried out to improve their presentation skills.

Faculties for the SATCOM-9 course was drawn mainly from well-known academic institutions in India and experienced retired ISRO Scientists. Lectures were also delivered by scientists/engineers working at different ISRO Centers, experts from Indian SATCOM industries and Communications and Broadcasting experts of Govt. of India.

Detailed lecture notes, subject references and reading materials were distributed to the participants. Library facilities of SAC and Internet facilities were made available to the participants. Laboratories and Earth Station facilities of SAC, Ahmedabad were provided for hands on experience in working with different communication systems. Question bank on each paper was made available to the participants for preparation for examination as far as possible. A separate CSSTEAP network was commissioned with access from class room, laboratory and hostel building. With this network the students were able to access the study materials both in word and in presentation form, question bank and exchange mails and check the notices. Air conditioned Lecture room with multimedia presentation facility was used for regular lectures.

Canteen facilities were provided to the participants in the same campus. Hostel accommodation was arranged in the International Hostel with good living facilities with attached Kitchenette. For entertainment, DTH system was provided to them in their rooms. The participants could use the recreation and gym facilities which were available in the hostel area. Initial medical checkup was done for each participant. Centre has provided medical facilities for minor ailments. There were no major health problems reported by the participants during the course.

A number of technical visits to different parts of the country were organized, to give the participants a chance of visiting different SATCOM establishments. Participants submitted their report on the above visits. The places visited included.

- Satish Dhawan Space Centre (ISRO) Sriharikota
- ISRO Satellite Centre (ISRO) Bangalore
- ISITE (ISRO) - Bangalore
- Liquid Propulsion Systems Centre (ISRO) Bangalore
- Master Control Facility (ISRO) Hassan
- Delhi Earth Station/SAC (ISRO) New Delhi
- Abdul Nazir Sab State Institute of Rural Development (Govt. of Karnataka)- Mysore
- National Atmospheric Research Laboratory (DOS) Gadanki
- Radio Astronomy Centre (TIFR) - Ooty



Participants of 9th SATCOM Courses with dignitaries



Participants of 9th SATCOM course on educational visit to Mysore

- Network Operation Control Centre (NOCC, DOT) New Delhi
- All India Radio and Door Darshan Kendra Studio New Delhi
- CSSTEAP Headquarters Dehradun

To evaluate the progress of participants, internal assessment through tutorials, tests and viva voce were carried out at periodic intervals apart from the semester examination. The scientists/ engineers involved in the experiments for different papers did evaluations on the practical abilities of the participants.



Mr P. Satyanarayana
Course Coordinator



Dr. Raghunadh K Bhattar
Course Director

SECOND INTERNATIONAL TRAINING COURSE ON NAVIGATION AND SATELLITE POSITIONING SYSTEMS (NAVSAT)

The International Training Course on Navigation and Satellite Positioning Systems of CSSTEAP commenced on June 17, 2013 at Bopal Campus of Space Applications Centre, Ahmedabad. Sixteen participants from 10 countries of Asia Pacific region attended the course. The formal inaugural session of the course was held on June 17, 2013. The inaugural session was attended by Shri. V.S. Palsule Director, DECU, Dr. Y.V.N. Krishnamurthy, Director, CSSTEAP and Shri. A. P. Shukla, Sc/Engr SNAAs, SAC along with all sixteen participants of the course. Director, DECU welcomed all the participants. Dr. Raghunadh K. Bhattar, Course Director NAVSAT introduced about the course and the profile of the students. Each of the participants introduced themselves with a brief introduction of their organization and nature of work carried by them. Director CSSTEAP, briefed about the ISRO programmes on harnessing space technology for societal benefits, their application potentials and also about the CSSTEAP activities.

The course was conducted for four weeks covering Satellite navigation fundamentals and applications. The faculty included experienced retired ISRO Scientists apart from scientists of SAC, ISRO. Invited lectures were also delivered by scientists/engineers working at different ISRO Centres, experts from Indian Navigation System, industries and communications and aviation experts of Govt. of India. The participants also periodically prepared presentations and delivered seminar.

The valedictory function of the course was held on July 12, 2013. Dr. S. Kalyanaraman, former Program Director IRS, ISRO, was the chief guest. After the invocation, Shri. K.S. Parikh, Dy. Director, SATCOM and Navigation Applications Area, (SNAAs), SAC welcomed Chief Guest, dignitaries, participants, and other invitees. The chief guest gave away the participation certificates to all the sixteen participants from 10



Participants during inaugural function at SAC, Ahmedabad



Participants during valedictory function at SAC, Ahmedabad

countries of Asia Pacific region. Dr. Sarnam Singh, Program Coordinator, CSSTEAP in his address briefed the activities of CSSTEAP and informed the students about the importance of Navigation and GNSS applications. Shri V.S. Palsule, Director, DECU mentioned the utilization of GNSS societal applications. Shri A.S. Kiran Kumar, Director, SAC addressed the participants and mentioned about the significance of course and usefulness to all concerned in updating their knowledge and skills on the new technologies beneficial to their organisation.

The Course Director in his report mentioned that the course schedule was covered in four modules over four week. The first week dealt on Introduction to GNSS in which overview of GPS, Galileo, 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 applications relating to aviation, fleet monitoring, surveying, seismology etc were covered.

On behalf of the participants three students gave their feedback on the conduct of the course. The valedictory function was concluded with vote of thanks from Course Coordinator.



Mr. A.P. Shukla
Course Advisor



Mr P. Satyanarayana
Course Coordinator



Dr. Raghunadh K Bhattar
Course Director

SHORT COURSE ON SMALL SATELLITE MISSIONS

The second International short course on Small Satellite Missions was conducted from 18th - 29th November 2013 at IIRS, Dehradun jointly by ISAC Bengaluru and IIRS Dehradun with the following objectives

- To create an awareness of the potential of space technology and its opportunities.
- To create an awareness of the potential of small satellites.
- To create an awareness the technology involved in small satellites.
- To prompt researchers and professionals in making, launching and utilizing the benefits of small satellites.

Fifteen participants from the space research organizations of Asia-Pacific countries like Vietnam, Kazakhstan, Bangladesh, and Sri Lanka, Indian Universities and Research &



Course participants of and Small Satellite Mission Course with dignitaries

Development organizations joined the course. Additional Secretary for DOS, Mr. S. Srinivasan IAS inaugurated the course.

The course was a blend of theory lectures, video sessions, interactive sessions and demonstration with exhibits. The lectures covered various applications of space technology, potential of small satellites, different orbits suitable for small satellites, details of subsystems of the satellites like structure, thermal, mechanism, power, RF systems, onboard computers, launch vehicle interface, etc. Lectures were delivered by well experienced system engineers from ISAC. Some specialized lectures like payloads for small satellite missions, mission operations scenario and image processing and data quality aspects were delivered by experienced scientists from SAC, ISTRAC and NRSC, respectively.

During the mid course a verbal feedback was obtained from the participants and in the second week lectures, were tuned accordingly. A formal feedback was taken at the end of the course. In general all the participants expressed their satisfaction, they appreciated the quality of presentation and the quantity of content delivered. The valedictory function was held on 29th November 2013, Dr. A.K. Gupta, Director IRDE was the chief guest of the function and he awarded the certificates to the participants.



Courses participants attending the talk by Mr. Tapan Mishra



Mrs. Shefali Agrawal
Course Coordinator



Dr. P. Murgan
Course Director

LIST OF GUEST-LECTURES DELIVERED AT IIRS CONFERENCE HALL:

- Dr. Tapan Mishra Deputy Director, MRSA, SAC, Ahmedabad delivered lecture titled "RISAT-1 Mission, its Potential & Future Microwave Programme of ISRO" on September 2nd, 2013.
- Dr. Ravi Shankar from NRSC Hyderabad lecture delivered to the topic of "Applications of Microwave Remote Sensing in Earth Observation-NRSC Experience" on 13th September, 2013.
- Shri K.V. Govinda, Deputy Director, ICA, ISAC, Bangalore delivered lecture titled "Satellite Integration, Assembly, testing and check out" on 28th October, 2013.
- Dr. Prabhu Ramchandran, Professor from IIT, Mumbai delivered talk on "Scientific programming using Python (matrix, linear and scientific plotting)" on 28th October, 2013.



Mr. Tapan Mishra being felicitated by Dr. Y.V.N. Krishna Murthy

INTERNATIONAL TRAINING COURSE ON MICROWAVE REMOTE SENSING AND ITS APPLICATION

CSSTEAP will be organizing 4 weeks short term International training course on "Microwave Remote Sensing and its Application" at Indian Institute of Remote Sensing(IIRS), ISRO, Dehradun, India by IIRS from May 5-30, 2014. The objective of this course is to generate awareness about the concept of microwave remote sensing and disseminate knowledge and practical applications on use of microwave data. The course is aimed for decision makers, researchers and professionals. The agencies and institutions involved in remote sensing and its application would also get benefitted 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).



CSSTEAP Hqrs. at Dehradun

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

- 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.

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