# CONTACT

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*...on mission for transferring technology through education, research and capacity building*

## NEW DIRECTOR

Dr. YVN Krishna Murthy Scientist/Engineer 'H' has taken over as the Director of the Indian Institute of Remote Sensing (IIRS), Dehradun from September 1, 2012. Previously, as Deputy Director (Remote Sensing Application Area; RSA), National Remote Sensing Centre(NRSC), he has spearheaded major remote sensing application projects under the umbrella of NRSC. During his tenure as DD (RSA), the wastelands atlas of India (change analysis) was released by Hon. Minister for Rural Development) and the land degradation atlas was released by Chairman, PC-NNRMS. He has contributed in the DMS programme and has initiated the Aerial Hyperspectral Campaign. As Project Director for a national level project titled "Space Based Information System for Decentralised Planning (SIS-DP)", he has achieved the task of ortho-rectified high resolution satellite image base preparation for the whole country and facilitating the concerned Ministries and State Govt's to utilize the SIS-DP inputs for effective implementation of developmental projects under IWMP, MGNREGA, PMGSY etc. Prior to this, as Deputy Director, Regional Centres of NRSC, he has led a team of young scientists in 5 distributed Regional Centres across India in (i) promoting community-based applications such as watershed development, disaggregated poverty mapping; (ii) customized products and services development with indigenous software, developed using Open Source tools; (iii) technology promotion at the grass-root level; (iv) developing a strong linkage with Govt. Departments, Industries and Academia. He has also directed Regional Centres from ISRO Hqrs, Bangalore and also had been the Head of RRSC Central at Nagpur. He undertook research work on information systems for Municipal & Small Towns and District Planning at the International Institute for Aerospace Survey and Earth Sciences, ITC, The Netherlands. His expertise extends to the field of Remote Sensing, Image Processing, GIS and their Applications for various natural and cultural resources management. As Project Director, Integrated Mission for Sustainable Development (IMSD) program in Maharashtra, he ensured the outreach of space inputs to the common man.

Dr. Krishna Murthy has about 175 technical papers and 150 reports to his credit. He has guided 5 Ph.D. scholars and guided in the development of nearly 25 customized, open source software tools. He is the recipient of "Hari Om Ashram Prerit Dr. Vikram Sarabhai Research Award" (2003), "Indian Society of Geomatics award" (2009), "ISRO Team Excellence Award (2009)" and "Astronautical Society of India Team Achievement Award" (2009).

IIRS family welcomes our new director.Currently as Director IIRS, Dehradun, Dr. Krishna Murthy is engaged in research, development, capacity building and technology promotion in various disciplines of applied sciences and geospatial technology.

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### COURSE CALENDAR 2013

# ORIENTATION COURSE FOR INDIAN FOREST SERVICE OFFICERS

A refresher course for Indian Forest Service Officers on Application of Remote Sensing and GIS in forestry was organized by Forestry and Ecology Department from 27th August to 31st August 2012. The course was sponsored by Ministry of Environment and Forest (MoEF), Govt. of India and is awarded to the Centres of Excellence in remote sensing and GIS in forestry and is a compulsory course. The eighth course on "Application of Remote Sensing and GIS in Forestry was attended by 13 senior officers from various states in the country. The course was inaugurated by Shri. P.R. Sinha, Director, Wildlife Institute of India. During the inauguration function the chief guest also released the National Biodiversity Information System (http//:www.bis.iirs. gov.in) and dedicated it to the nation.

The course included classroom lectures and hands-on practical covering major applications in the forestry and ecology. The topics included fundamentals of remote sensing and GIS, GPS - technology and applications, spectral properties of vegetation, visual and digital image interpretation for forest mapping, revision and update of forest working plan, biodiversity characterization at landscape level, growing stock estimation, forest change detection and monitoring, forest fire risk assessment, geoinformatics in wildlife management and open-source software and data. Two guest lectures on forest cover monitoring in India by Shri M.L. Srivastava, Joint Director, Forest Survey of India and Ecosystem Goods and Services by Prof. S.P. Singh, former Vice-chacellor Garhwal University, Srinagar were organized for the benefit of the course participants. The lectures and practicals were appreciated by the participants. Some of the participants also expressed their desire to collaborate with IIRS in some of their future work, especially in forest working plan preparation.

The participants were also taken for half day field work although many of the participants have requested for one day field trip. The Divisional Forest Officer and the range forest officers from Mussoorie Forest Division joined the team during the field work. The participants felt that the field work was useful for them to relate the image elements with the forest in the field. The logistic arrangements were appreciated by the officers as mentioned in the feedback which was forwarded to MoEF, New Delhi.

**S.P.S. Kushwaha & Arijit Roy**

# REMOTE SENSING: AN OVERVIEW FOR DECISION MAKERS

Remote Sensing: An Overview for Decision Makers course is organized every year at Indian Institute of Remote Sensing for senior level officials who are involved in decision making in their respective departments/organizations. This year the course was organized from 19th to 22nd June 2012. 19 senior officials from 16 departments from all over country, namely Minor Irrigation Division, Jalna, Punjab Remote Sensing Centre, Ludhiana, Survey of India, Eastern Zone, Kolkata. Department of Forest, Punjab, Town planning department, Nasik, Slum Rehabilitation Authority, Mumbai, H.P.forest department, Atomic Minerals Directorate for Exploration & Research, Hyderabad, Kolkata,Port Trust, Kolkata, Botanical Survey of India, Shillong, Town Planner & Valuation Dept., Aurangabad, Indira Gandhi National Forest Academy, Dehradun, Tamilnadu Forest Dept., Chennai, Deptartment of Health & Family welfare, Gandhinagar, Gujarat, Dept. of

Health & Family Welfare, Delhi, DIPAC,New Delhi, North Eastern Regional Institute of water & Land Management, Kalibhomora, Tezpur, joined the course.

The course focussed on Overview of RS & GIS, Operational Remote Sensing application in Natural Resources Management, Overview of GIS/GPS, Policies and Institutions of Remote Sensing, Open source software and open data sources, Geological disaster monitoring and Management, Hydro meteorological disaster monitoring and Management, High resolution RS data and field scale implementation. Theme specific exposure on remote sensing application in Agriculture & Soil, Forestry & Ecology, Geosciences, Human Settlement Analysis, Marine & Atmosphere Sciences, Water Resources, were arranged for all participants separately as per their discipline and interest. The participants were also given exposure on Current trends in Remote Sensing & Geospatial technology, Satellite communication for disaster management, Space based information support and Decentralized Planning: Rural Development. Field excursion to nearby areas was organized in the afternoon session. For the benefit of the participants few specialized guest lecturers were organized. These lectures include a lecture on "Space based information support and Decentralized Planning: Rural Development" delivered by an eminent expert , Project director of SIS DIP project.

At the end valedictory function was organized and feedback was taken from the course participants. Dr. P.S. Roy, Director, IIRS in his valedictory address emphasized the importance of such type of courses for Decision Makers and commitment of IIRS, towards capacity building among user departments.

**S.P. Aggarwal & Bhaskar Nigam**

## APPLICATION OF REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM: AN OVERVIEW FOR ISS OFFICERS

A short refresher course for senior level officers sponsored by National Academy of Statistical Administration was organized from 30th July to 3rdAugust, 2012. Fourteen senior level officers (directors and deputy directors) from National Academy of Statistical Administration, Ministry of Statistics & PI, Govt. of India, New Delhi participated in the course. The aim of the course was to make the course participants aware of the immense potential of remote sensing and GIS in natural resource management. During course, the emphasis was given to the basics of Remote Sensing, GIS and Global Positioning Systems (GPS), applications in Agriculture & Soil, Geosciences, Foresry & Ecology, Human Settlement Analysis, Water Resources, Marine & Atmosphere etc. The overall course included 08 topical lectures and an equal number of practical; forenoons were reserved for lectures while afternoons were marked for practical. One day field visit was organized for the participants to expose them to GPS technique and ground verification of image elements. The lecture notes

were also provided to course participants in both hard as well soft formats. A formal feedback was taken at the end of course wherein the participants showed keen interest in the lectures and practical and suggested that geostatistics aspects should b incorporated in future.

**M. Kudrat**

## SHORT TRAINING COURSE IN RS AND GIS FOR HUDCO OFFICIALS

A short training course in RS and GIS was organized for the officials of Housing and Urban Development Corporation (HUDCO), Ministry of Housing and Poverty Alleviation, Government of India from 3 to 7 September, 2012. This course was funded by HUDCO. Total ten officers from HUDCO HQ and other regional centres participated in the course. There were officers from New Delhi, Bhopal, Ranchi, Kolkata, Dehra Dun, Guwahati and Lucknow. The course covered overview of Remote Sensing, Digital Image Processing,

Geoinformatics and Global Positioning System,raster and vector data model, Network analysis and Mobile Mapping, application in urban and regional planning, mobile mapping, ANN in urban growth analysis, Urban Information System, damage assessment due to earthquake, Network analysis for water supply system and Open source tools for spatial data processing: Web-based data viewers/portals. Many participants were exposed to geospatial technology application in urban planning for the first time. Director, IIRS also made a very informative presentation on utilization of Bhuvan portal and NUIS data overlaid on the same, for urban related applications. It provides an opportunity to know about the open source tools for spatial data, which was new experience to the participants Afternoon sessions were utilized for hands-on practice in data down-loading, image registration, interpretation etc. All the participants were provided with lecture notes in hard copy and soft copy format. ILWIS software was also made available to all the

participants in a CD so that they can practice in their respective office environment. This course provides an opportunity to use the advancement in geospatial technology in day to day activities in their own department and profession.

**B.S. Sokhi & B.D. Bharath**

## P.G. DIPLOMA IN GEOINFORMATION SCIENCE AND EARTH OBSERVATION WITH SPECIALIZATION IN GEOINFORMATICS AND NATURAL HAZARDS AND DISASTER RISK MANAGEMENT (NHDRM)

IIRS in collaboration with Faculty of Geo-Information Science and Earth Observation (formerly known as ITC), Twente University (TU), The Netherlands has introduced modular courses (M. Sc and PG Diploma) in Geoinformation Science and Earth Observation with specializations in Geoinformatics and Natural Hazards and Disaster Risk Management (NHDRM). These courses are being successfully organized as Joint Education Programme (JEP) between two institutions since 2001. In 2011, fifteen participants had joined PG Diploma in NHDRM and nine participants joined the PG diploma in Geoinformatics. All the Twenty four participants completed their course and received Diploma in a valedictory function attended by Dr. David Rossitier, Associate Professor, Faculty of

Geoinformation Science and Earth Observation, University of Twente.

**P.K. Champati Ray**

## BENGALURU SPACE EXPO

IIRS participated in the recently concluded Bangaluru Space Expo (BSX 2012) which was organised by Antrix Corporation Ltd. and was a phenomenal success. It was well attended by more than 275 delegates from ISRO, around 200 International delegates from global space industry at the World Space Biz 2012 conference and over 2000 visitors. On the occasion, Chairman, ISRO gave a thought provoking keynote address on Indian Space Industry and future challenges.

IIRS had put up panels at the ISRO pavilion giving information about its courses, research activities and the Edusat program. Hand out materials on courses at IIRS:


M.Tech, M.Sc., PG Diploma, CSSTEAP and ITEC were distributed during the conference cum exhibition to the visitors. The queries of the visitors were replied during the exhibition along with distribution of IIRS course calendar. Dr. P K Champati Ray, Sh. Ashutosh Bhardwaj and Dr. Subrata Nandy attended to the queries of visitors. Many students and foreign delegates visited IIRS panels and showed keen interest in the activities at IIRS. ISRO dignitaries also visited IIRS panels and enquired about its recent activities. IIRS research activities were also displayed through presentation on a LCD panel. Overall it was a unique experience for IIRS to interact with delegates and visitors at Space Expo and provide information about capacity building and research activities in Geoinformatics technology and applications at IIRS.

**Ashutosh Bhardwaj & Subrata Nandy**

# TRAINING WORKSHOP ON OPEN SOURCE SOFTWARE SOLUTIONS FOR GEOSPATIAL DOMAIN

In India, the revolution in Information and communication technology (ICT) during last decade has drastically enhanced the awareness toward power of geospatial technologies in daily life. The utilization of geospatial tools and technologies is also limited due to unavailability of data and vendor specific expensive software solutions. Today, large amount of geo-spatial data from government agencies in India like OSM series maps of SOI and high resolution satellite data of ISRO (as per Remote Sensing Data Policy 2011) is available for access in public domain. The software solutions for geo-data creation, processing, analysis and management are not more restricted to vendor specific tools and technologies. The Free and open source software (FOSS) tools are emerging as an important development for future GIS to provide interoperable and open system architecture. The licensing dependency and cost of the vendor specific solution in GIS domain maynot enhance the outreach of this powerful technology at grassroots level specially in the developing country like India.

The capacity building in FOSS and free and open data sources is an important activity to enhance the outreach of geospatial technology at various levels in the country. IIRS has conducted one week of special training workshop on OPEN SOURCE SOFTWARE SOLUTIONS FOR GEOSPATIAL DOMAIN during 6th to 9th August 2012. About 50 participants from different parts of the country with multi-disciplinary background were trained during the workshop. The main objective of

the training workshop was to promote the use of open source software solutions for geo-spatial domain and transfer the technology through capacity building.

The participants of this training workshop were GIS Professionals, scientists and researchers and faculty from academia. The training programme covered all the areas of geo-spatial technologies like Desktop based systems (RS & GIS), Database Management System (Geo-RDBMS), Geo-statistical analysis, 3-D modelling and Web based GIS. The participants were trained in Quantum GIS, GRASS, R, and Blender for GIS activities like data creation, data processing, analysis and spatial modelling. The special session on GeoRDBMS using POSTGIS and PostgreSQL, data accesses from open data sources like Open street Map (OSM), ISRO Bhuvan (NOEDA) etc., were conducted. The training session on OGC web services using Geoserver was also conducted where development of GeoWeb 2.0 applications using OpenLayer API and GeoRDBMS was introduced.

The training workshop was technically supported by OSGEO-India. Many new topics of remote sensing and GIS using open source software were introduced first time with full hands-on experience to the participants.

**Harish Chandra Karnatak**

# NATIONAL REMOTE SENSING DAY CELEBRATIONS

National Remote Sensing Day was celebrated on 13th August, 2012 (12th being Sunday) to commemorate the birth anniversary of Dr. Vikram Sarabhai, a renowned scientist of our country and 'Father of Indian Space Programme'. Indian Society of Remote Sensing Dehradun Chapter (ISRS-DC) organized the function at Indian Institute of Remote Sensing, Dehradun. As part of the celebrations, an elocution competition and a science quiz were organized for the school children.

Out of twelve schools of Dehradun, which participated in Science Quiz competition, Cambrian Hall School team stood first, followed by Convent of Jesus and Mary in second and Brightlands school team stood third. In the elocution competition on topic "Remote Sensing in School Curriculum" Kendriya Vidyalaya-ONGC participant stood first, Kendriya Vidyalaya-FRI participant stood second and Jaswant Modern Senior Secondary School participant stood third. All

participants performed very well. Jury consisting of Prof. B.S. Sokhi, Dr. P.K. Champati Ray and Dr. S.P.S. Kushwaha evaluated the performance of the candidates.

The prizes and certificates were distributed by Dr. S.P.S. Kushwaha to all the winning teams and participants on behalf of Director, IIRS. Dr. George Philip, Chairman, ISRS-DC presented mementoes to all the school children.A popular lecture on 'Remote Sensing for Forest and Environmental Monitoring' by Dr. J.K. Rawat, IFS, Ex. PCCF, Haryana and Former Director, Forest Survey of India, Dehradun, was also organized to orient school children on the significance of satellite remote sensing. The entire event was organized with the team effort of ISRS-DC Executive Council Members.

**B.D.Bharath**

# ISRO PARTICIPATION IN RAMNAGAR SCIENTIFIC LITERACY FESTIVAL 2012, UTTARAKHAND

People of Ramnagar, a small town adjacent to Jim Corbett National Park came in direct contact with scientists of ISRO, DRDO, DAE and many organisations during "Ramnagar Scientific Literacy Festival 2012", 4-6 September 2012. This event was organised with active support and initiative of Shri Satpal Maharaj, Honourable Member of Parliament (Lok Sabha) and Chairman, Standing Committee on Defence, and Member, Public Accounts Committee. The programme was coordinated by Dr. S.K. Pandey. Dr. P.K. Champati ray (Head, Geosciences and Geohazards Dept.) and Dr. Ajanta Goswami (Scientist/Engineer-SD) represented ISRO in this important event. With coordination and help from Mr. D. Karnik, Director, P&PR and Mr. B. R. Guruprasad, PRO, the exhibition materials consisting of models of PSLV, GSLV, GSLV MK-III, Chandrayaan-1, SRE and several high quality posters on achievements and accomplishments of ISRO were put up for demonstration and awareness generation.

The programme was organised in the compound of GPP Girls Inter College (GPPGIC) and was inaugurated by Honourable Member of Parliament, Shri Satpal Maharaj and Mrs. Amrita Rawat, Honourable Minister of Tourism, Uttarakhand Government. Both the dignitaries visited ISRO stall and were highly impressed with the exhibits.

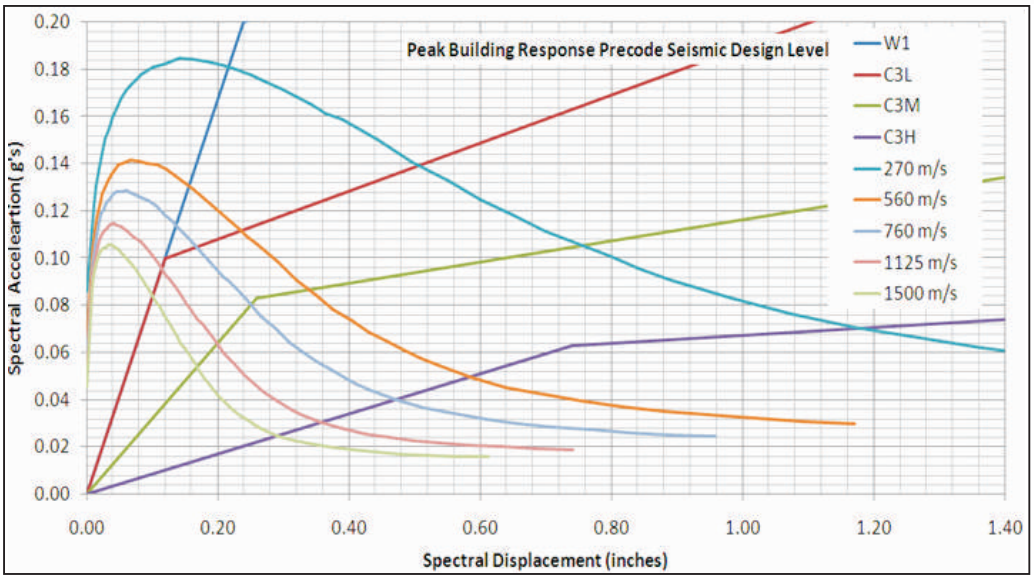
School children were extremely excited to see ISRO models and panels. During exhibition students and general public (more than 1500 visitors) took keen interest in knowing about ISRO and its activities. Emphasis was given on ISRO's 100$^{th}$ launch, GSAT-10, DMS programme particularly landslide hazard mitigation, infrastructure development using high resolution Cartosat-1 and 2 data, RISAT-1, Bhuvan, telemedicine, tele-education and Chandrayaan-1 and 2. In appreciation of participation, Shri Satpal Maharaj honoured all scientists by presenting a shawl, flower bouquet and memorable gifts from Uttarakhand.

**P.K. Champati Ray & Ajanta Goswami**

# EARTHQUAKE BUILDING VULNERABILITY AND DAMAGE ASSESSMENT WITH REFERENCE TO SIKKIM EARTHQUAKE, 2011

An earthquake of 6.9 magnitude with its epicentre near the India-Nepal border (27.70 N, 88.20 E) struck the northern part of Sikkim and surrounding regions on 18-09-2011 at 18: 11 hrs (IMD). Gangtok, capital city of Sikkim, which is around 68.74 km southwest from the epicentre, experienced earthquake intensity of VI in MMI scale. It caused extensive damage, wide spread panic and those who experienced the earthquake realised that the event was large enough and majority of their buildings were not strong enough to sustain another earthquake of same or higher magnitude. In the initial few days, the administration and general public were clue less about the extent of damage. It was felt that there was an urgent need to assess damage as this information was very crucial to relief and rescue operations immediately after the event and was also important for rehabilitation and reconstruction in long run. In order to address this crucial information gap in disaster management, IIRS took it up as a Research topic under the ambit of Joint Education Programme on Geoinformatics for Natural Hazards and Disaster Risk Management between IIRS and Faculty of Geoinformation Sciences and Earth Observation, University of Twente, The Netherlands.

After extensive literature review, it was decided to use HAZUS methodology, developed by FEMA, USA which is a powerful GIS based modelling technique to assess various types of potential seismic hazards. In order to implement the methodology, extensive field work was




**Building response of W1-wooden house, C3L, C3M, C3H- Concrete frames structure, low, medium rise and high rise buildings at different earthquake demand spectra.**

carried out and building characteristics, damage pattern, earthquake triggered landslides, and possible site amplification effects were studied. GIS database was created with all building characteristics. Based on the earthquake magnitude, attenuation and distance from epicentre, earthquake demand and building capacity curves, expected percentage of buildings likely to experience different levels of damage state was determined.

Damages reported by the local authorities were used as reference to validate the generated results and discuss the applicability of the method in Indian context. Based on the terrain conditions, the possible hazard zones and elements at risk, risk map was also generated. The reasons for damage and the failure of structure were discussed and possible methods for retrofitting and improving future constructions have been recommended. It is concluded that the HAZUS methodology can be used in Indian condition; however, the drawback of using such method is that the capacity curves and vulnerability functions given in HAZUS have been derived for building types in the US, which may differ from the other parts of the world. Ideally, such curves and vulnerability functions should be developed for Indian building types and in the absence of such curves, the methodology should be tested for other earthquakes in the Indian region.

**V. P. T. Malladi, P. K. Champati Ray,**
**B. D. Bharath, M. C. J. Damen, N.C. Kingma**

# RELEASE OF GEO WEB PORTAL ON NATIONAL BIODIVERSITY INFORMATION SYSTEM

National Biodiversity Characterization at Landscape Level, a project jointly sponsored by Department of Biotechnology and Department of Space, was implemented to identify and map the potential biodiversity rich areas in India. This project has generated spatial information at three levels viz. Satellite based primary information (vegetation type map, spatial locations of road & village, fire occurrence); geospatially derived or modeled information (disturbance index, fragmentation, biological richness) and geospatially referenced field samples plots. This relatively large spatial information on the above-mentioned facets of biodiversity has been organized in a web based Biodiversity Information System (BIS) for prioritization, conservation and bio-prospecting. The major products are:

- **Spatial Data on 1:** 50,000 scale for entire India:
  - Vegetation Type,
  - Fragmentation,
  - Disturbance Index,
  - Biological Richness.
- **Species Database:** Phytosociological database for 16,000+ sample plots for entire India.

The study provides information of high disturbance and high biological richness areas suggesting future management strategies and formulating action plans. The study has generated for the first time baseline database which will be a valuable input towards climate change study in the Indian Subcontinent.

A national geo-spatial repository of these data sets has been generate at Indian Institute of Remote Sensing (IIRS) Dehradun and published for public access in internet domain. The geo web portal on national biodiversity information system was released and dedicated to nation on 27th August 2012 by Shri. P.R. Sinha, Director, Wild Life Institute of India (WII) Dehradun in presence of Dr. P.S. Roy, Director IIRS. The URL of the portal is- http://bis.iirs.gov.in .

The main features of the BIS web portal are:

- Adoption of open system architecture for development and deployment of the web services and database management.
- New version of BIS web portal with a sub domain of IIRS main website-http://bis.iirs.gov.in. The national data spatial and non-spatial is organized as a central repository.
- The data download utility using online clip-ship-zip facility. The user can define AOI and can download original GIS layer of vegetation type, Disturbance Index, Fragmentation and Biological Richness map.
- One new software module (Biodiversity Spatial Viewer) is developed with advance online GIS utilities like: effective geo-visualization using map cache technique, overlay of Bhuvan satellite imagery (56mt to 5.8 mt), connection to remote GIS servers, adding user defined servers, basic GIS navigation tools, area and distance measurement, spatial filter, overlay of sample plot grid data (with advanced filtering utility), layer swapping for effective visualization, layer transparency, search places and search species etc.
- The important literature and findings of the national project are published in the web portal.
- The e-book of national report on BCLL is downloadable from the website.


*http://bis.iirs.gov.in*


**Harish Karnatak, Arijit Roy, Kapil Oberai and Kamal Pandey**

# JOYS AND PERILS OF DOING SCIENCE IN MOUNTAINS

*Day, 25 December 2007, Time 11: 30 PM, Place Gangotri temple:* This was my 2nd leg of field work for taking ground truth for snow parameters during ASAR overpass in 2007, 1st being in Manali area during 16-22 December 2007. The vehicle was same vintage ambassador with Sardar driver, Shrawan. We started our journey in morning from Dehradun to first Uttarkashi and then to snow bound areas of Gangotri if road is open, as it had snowed during 2nd week of December in this area. We reached Uttarkashi at 6 PM and asked locals, whether road upto Gangotri is open. They told that road is open and we took a decision to move and stop may be at Harsil. On our way, we asked BRO and other hydro-power workers about road condition upto Gangotri. They confirmed that road is open and even said that GMVN rest house and some places may be open near temple area. As we moved from Harsil towards Gangotri we saw little snow patches on our way but nothing dangerous so we kept moving. The night and some icing near Bharon Ghati did caused few problems, but we finally reached by 11 PM at Gangotri. Chill cold air and rumbling sound of Bhagirathi waters greeted our arrival. To our surprise entire town looked like Ghost town, with all shops and ashrams closed with all locks covered with thick cloths and all approach roads were covered with thin layer of ice. We checked both the left as well as right bank, but all shops and hotels were closed. Only few rooms below parking area were opened, and when we closely saw those rooms with torch it was written, *Karagar (prison)!!!*. After all our efforts to find shelter vanished, we finally decided that we must visit Gangotri temple and then come back in vehicle for some rest. A ray of light coming from a *Diya* greeted us as reached temple, this made sure that someone is nearby, who must have lighted these Diya's. Our guess was right, we found one Babaji ashram just opposite to temple and after knocking for 15 minutes, one Babaji did open his door and gave us shelter, tea and bread to eat. In the

**a) Approach road with icing,**

**b) With babaji @ Gangotri,**

**c) Mauni baba with instructions**

**d) DGPS survey near Dhundi, Manali**

**e) Daytime view of Marhi, Manali from Rohtang**

morning, he told us about one Gujarati ashram on left bank, where 2-3 persons are still there, so we shifted to that place. It was 26th December and at 4: 30 PM and 11: 30 PM, I had ASAR overpass, but there was no measurable snow near temple area, so I needed to know weather in upstream areas there is some good patch of snow. The babaji and Gujarati ashram people suggested that few saints do visit Goumukh and they might know about snow conditions. As I started searching for these saints, I could find only two Babajis, one had no knowledge of snow in upstream areas and other Babaji did not say anything but wrote on small piece of slate, *"12 saal ka maun vrat hai, 11.5 ho gaye!!!",* and also gave few written instructions to us. Finally we went trekking few kilometres towards Bhojbasa road took few snow sample readings and also took few reading in night near temple area.

*Day, 11 July 2008, Time 08: 30 PM, place Rohtang Top:* It was my 2nd DGPS survey, me with my two students and one scientist from SASE Manali were taking last rover reading at Rohtang pass top. This was the last rover of that hectic day, as we had gone to leeward side of Rohtang and conducted rover survey at Chatru, Koksar etc. As common on leeward side, even in Monsoon season, the weather was pleasant and no rains. However, as we came back to Rohtang late in the evening and setup our last point, it started raining heavily, rainfall intensity started increasing and we had to cut short our point reading to 35 minutes. What followed next was nothing short of adventure ride. As we started our approximately 50 km decent to Manali, the rainfall intensity suddenly increased from medium to very high levels, with thunderous sound and rain eroding the barren land made the road a virtual muddy river. As our Sumo driver kept his patience and we helped him in navigating the slopes from both the sides. As rain became incessant, the visibility dropped to few meters, our speed to about 10-15 km/h and it was really difficult to drive specially at bends. Despite the heavy rains and thunderous lightning, a scientist mind had other ideas to share with students: "*Look, if we can get the TRMM image of today we can get rainfall intensity and even lightening information as it has Precipitation Radar (PR) as well as Lightening Imaging Sensor (LIS).....!!!*". As we reached the Kothi, the stream, which we started following from ridge now already swollen to torrential stream and in-fact, had overflowed over the small concrete bridge, leaving behind pool of mud and debris with big boulders on road and bridge. This forced us to come out of our vehicle and clear few of boulders of lying on that bridge. Finally, we managed to reach the Manali safely by midnight 12: 30 AM.

There are many such real life stories and experiences with me, senior faculty and other colleagues at IIRS of various joys, adventures and perils of working and doing science in Himalayas. In nutshell, few things can be learned from the above experiences;

*Morals of the stories:* Always avoid cross Rohtang top, any mountain pass, or any glacier area after 3 PM in any season, as weather is highly unpredictable in these areas, causing heavy rainfall or even snowfall anytime. The safety saves, also avoid moving in high mountains in late hours and take shelter in nearest town after sunset.

**Praveen Thakur**

# MODELING SURFACE RUNOFF AND NUTRIENT LOSS AT WATERSHED SCALE

Soil erosion modeling is based on an understanding of the physical laws and landscape processes such as runoff and soil loss occurring in the natural environment. It removes the upper horizons of the soil that results in a reduction in soil quality i.e. a diminution of the soil's productivity for agriculture or other vegetation. Models can provide long-term simulations of various combinations of cropping systems and conservation practices, and assist in selection of appropriate conservation approaches for improved environmental benefits. There are several models that are being used to simulate runoff, sediment and nutrient loss and management effects with alternative land uses at watershed scale.

An experimental micro-watershed (Fig.1) covering an area of 57 hectare was instrumented with measurement of weather parameters, runoff and soil hydrologic characteristics in the year 2003. The micro-watershed is part of the Sitlarao watershed lies between latitudes of $30^0$ 24' 39'' to $30^0$ 29' 05'' N and longitude $77^0$ 45' 33'' to

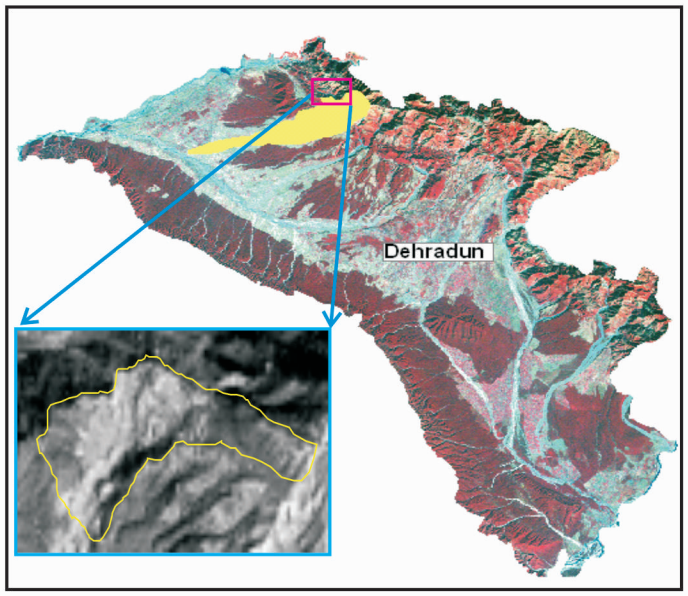



**Fig. 1. Location map of the watershed in Doon valley, Dehradun**

77$^0$ 57' 46'' E covering an area of 52 sq Km. and is located in the Doon valley of Himalayan region in Dehradun district of Uttarakhand. It represents moderately steep to very steep sloping hills where elevation ranges from 960 to 1480m. The sub-watershed comprises of forest cover (30 %), scrub (18 %) and terraced crop land (51 %). A rectangular weir structure with stage-level recorder (self-recording) was constructed (Fig. 2a) at second order stream to record surface run-off measurements. Two automatic weather stations (AWS) were installed (Fig. 2b) in the watershed

The present study was undertaken to study surface runoff, soil erosion and nutrient loss at watershed scale using physical/process based (APEX) model. The Agricultural Policy Environmental eXtender (APEX) model is a distributed, continuous, daily time-step small watershed-scale hydrologic/water quality model.

A large inputs required by the model have been collected from study area with comprehensive field visits. The sensitivity analysis was carried out to evaluate surface runoff and sediment loss response with changes in model input of hydrologic parameters. Further the model was calibrated and validated for daily runoff, sediment and nutrients loading at watershed outlet.

A total of 40 rainy days runoff and sediment data collected in year 2011 out of which half of the events data were used for calibration and remaining for validation. Analysis showed that SCS CN number was found most sensitive to runoff, followed by saturated hydraulic conductivity, available water-holding capacity, CN retention parameter and C factor whereas erosion control practice (P) factor was found to be most sensitive, followed by C factor, sediment routing coefficient, average upland slope and soil erodibility (K) factor for the sediment and nutrient loss. APEX model calibrated for the sub-watershed and it predicted quite well for the surface runoff (r=0.88), sediment loss (r=0.88) and various nutrients of total carbon (r=0.69), total nitrogen (r=0.71) and available phosphorus (r=0.77). Surface runoff was predicted quite well for low

**Fig. 2a. Surface runoff gauging site**

**(2b). Automatic Weather Station (AWS)**

and medium rainfall; however it was over predicted for high rainfall events. Over prediction may be attributed to the unaccountable conservation measures and practices which were not accounted by the model. Similarly, sediment loss was estimated on daily basis at the watershed scale and was well predicted for low and medium rainfalls but under-estimated for high rainfall events. The area is prone to *landslips* at high rainfalls that was not accounted by the model. This may be the reason for under prediction of sediment loss by APEX model. The Hydrological assessment of this model will facilitate future modelling applications using APEX to the Himalayan watersheds for watershed analysis including water quality management, impacts of alternates land management practices etc.

**Suresh Kumar**

## AWARDS

Dr. N.R. Patel Scientist/Engineer-SF, Agriculture and Soil Department has received the prestigious Hari Om Ashram Prerit Dr. Vikram Sarabhai Research Award for 2011 for his contribution and achievement in the field of Space Applications to agrometeorology and major emphasis in particular retrieval of crop biophysical parameters to quantify primary production.

## NEW FACULTY AND STAFF

Dr. Shuchita Srivastava joined institute in August 2012 as Scientist/Engineer SD in Marine and Atmospheric Sciences Division. She is Ph.D. (Atmospheric Science) from Physical Research Laboratory, Ahmedabad. Prior to joining IIRS, she was Assistant Professor at Indian Centre for Climate and Societal Impacts Research, Ahmedabad.

Ganesh Kumar Kota joined institute in April, 2012 as Scientist/ Engineer- SC. He is B.Tech (Electrical & Electronics Engg.) from Jawaharlal Nehru Technological University, Hyderabad.

Dr. Shovan Lal Chattoraj joined institute in August, 2012 as Scientist/ Engineer-SD in Geosciences & Geohazards Department. He is Ph.D. (Geology) from Earth Sciences Department, IIT Bombay. Prior to joining IIRS (ISRO) he worked as a Geologist in National Hydroelectric Power Corporation (NHPC) Ltd. for 3 years and was posted in Teesta-IV Hydroelectric Project, East Sikkim and Corp. Office in Faridabad, Haryana.

Aniruddha Ajay Deshmukh joined institute in April, 2012 as Scientific Assistant. He is M.Sc. (Geoinformatics) from Pune University. He is currently associated with Data Equipment Section (DES) and looking after "Map Library" in IIRS.

Dr. Stutee Gupta joined IIRS on September, 2012 as Scientist/ Engineer SD. She is Ph. D with specialisation in Forest Informatics from FRI University, Dehradun. Prior to joining IIRS, she was working with RMSI Pvt. Ltd. Hyderabad.

Yogesh Ghotekar Msc. (organic Chemistry) K.T.H.M. College Nashik University of Pune has joined institute in April-2012 as Scientific Assistant in Agriculture & Soil Division.

Mahadevaswamy. M joined institute in April, 2012 as Technical Assistant. He is Diploma in Electronics and Communication Engg. He is currently associated with Geoinformatics Department (GID) and working in IIRS Outreach Program (i.e. EDUSAT Program).

Md. Sarwar Alam joined institute in May 2012 as Technician 'B' (Instrumentation & Electro. Mech.), He is Diploma in Electrical Engg. and taken Apprenticeship Training from Naval Dockyard Visakhapatnam (INDIAN NAVY). He has associate with Data Equipment Section (DES) in Instrument Lab IIRS.

## VISITORS

IIRS being a premier training institute has visitors throughout the year . This year ( April 2012 onwards ) students and faculty from Kerala Agricultural University, Govt. P.G.College Lansdowne, Institute of Forestry, Tribhuvan University, Central Academy for State Forest Service, Burnihar, Assam, State Forest Service College, Dehradun, Tamilnadu Agricultural University, Mettupalayam, Kathmandu Forestry College, Nepal, Guru Ghasidas University, Chattisgarh, M.S. University, Baroda, J.N.P.G. College, Lucknow, Kalipada ghosh Tarai Mahavidyalaya, Bagdogra and Officials from HUDCO, Forest Department, Nepal, ICIMOD Kathmandu, Nepal visited the institute. Approximately 300 personals visited the institute between April 2012 to October 2012.

## SUPERANNUATIONS

IIRS family bids adieu to our colleagues who superannuated recently and wish them a happy, healthy and fruitful life ahead.

**Dr. P.S. Roy**
(Director, and
Outstanding Scientist )
31.08.2012

**Dr. A.P. Subudhi**
(Scientist/Engineer-SF)
30.06.2012

**K.K. Das**
(Scientist/Engineer-SF)
30.06.2012

**Mr. M.L. Batra**
(Administrative Officer)
31.07.2012

**Shri Gulshan**
(Sr. LVD 'A')
30.06.2012

EDITOR
Minakshi Kumar

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Sr. A.K.Sardar
Shri. P.K.Gupta
Ms. Mamta Kumari
Dr. Arijit Roy
Dr.Ajanta Goswami
Dr. Vaibhav Garg

# TRAINING CALENDAR 2013

| Sl. No | Course Code | Course Name | Entrance Requirements | No. of Seats | Starting Date | Passing Out Date | Course Fee for Individual Candidate | | | Apply by Date |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | dd mm yy | dd mm yy | Govt. Spons. ₹ | Open ₹ | Foreign US $ | |
| **POST GRADUATE DIPLOMA COURSES** | | | | | | | | | | |
| 1. | D-AS | Agriculture & Soils | M.Sc in Agriculture/B.Sc. Agriculture (4 years)/B.E./ B. TECH in Agriculture Engg./Geoinformatics/Master in Geogrpahy/ M.Sc. Environmental Science | 6 | 19.08.2013 | 20.06.2014 | Nil | 60,000 | 6,000 | 31.05.2013 |
| 2. | D-FE | Forestry Resources & Ecosystem Analysis | M.Sc. Forestry/Ecology/Botany/Wildlife Sciences/ Zoology/ Environmental Sciences/ Master in Geography, / B.E. (Geoinformatics) /B.Sc. Forestry (4 Years) / Forest Officers (B.Sc.+ 2 years experience) | 6 | 19.08.2013 | 20.06.2014 | Nil | 60,000 | 6,000 | 31.05.2013 |
| 3. | D-GG | Geosciences | M.Sc./M.Sc.(Tech.)/M.Tech. in Geology/Applied Geology/ Geophysics/ Earth Sciences/ Geoexploration/ Petroleum Engineering or equivalent / Geoengineering/Mining Engineering/ Environmental Sciences, Geography Geography (Specialization in Geomorphology) or B.Tech. /B.E. in Civil Engineering, Geosciences, Petroleum Engineering, Mining Engineering, Mineral Processing Geoinformation. | 6 | 19.08.2013 | 20.06.2014 | Nil | 60,000 | 6,000 | 31.05.2013 |
| 4. | D-MS | Marine & Atmospheric Science | M.Sc. in Marine Science/Earth Science / Geography/ Natural Science / Physics/ Atmospheric Science/ Environmental Sciences/B.E. (Geoinformation). | 6 | 19.08.2013 | 20.06.2014 | Nil | 60,000 | 6,000 | 31.05.2013 |
| 5. | D-UR | Human Settlement Analysis | Master in Planning / B.E. (Civil) /Geinformation/ B.B. Architecture/B. Planning / Master in Geography | 6 | 19.08.2013 | 20.06.2014 | Nil | 60,000 | 6,000 | 31.05.2013 |
| 6. | D-WR | Water Resources | B.E. / B.Tech. / M.E. / M.Tech. Civil Engineering / Agricultural Engineering / Geoinformatics / M.Sc. in Geology / Environmental Sciences | 6 | 19.08.2013 | 20.06.2014 | Nil | 60,000 | 6,000 | 31.05.2013 |
| 7. | D-PR | Photogrammetry and Remote Sensing | BE/B.Tech./M.Sc./M.Tech. Physics, Maths, App. Maths, Statistics, Geophysics, Meteorology, Oceanography, Geology, Physical Science, Earth science, Natural/ Environmental Sc., Geoinformatics/ Master in Geography or MCA (with B.Sc. degree). The candidates should have mathematics as one subject upto 10 + 2 level. Govt. employee with Bachelors degree in science and 2 years experience. | 6 | 19.08.2013 | 20.06.2014 | Nil | 60,000 | 6,000 | 31.05.2013 |
| **M.TECH. COURSE** | | | | | | | | | | |
| 8. | +M-RG | M.Tech. in RS & GIS | M.Sc. in Natural/ Physical Sciences /Geography/ M.Sc. Geoinformatics/Geomatics/ Earth Sciences/ Geoexploration/ Petroleum Engineering or equivalent / Geoengineering/ Mining Engineering/ Environmental Sciences/ Natural Hazards/ Disaster management B.E. Or B.Tech. (Civil Engg. & Agricultural Engg.) Elec. and Electronics/ Computer Sciences/Computer Engg./ B. Tech. Geoinformatics Engineering, or B.Tech (IT) / B.E. in Geosciences / Geomatics, Petroleum Engineering, Mining Engineering, Mineral Processing / B.Arch./ M.Planning / B Planning/ / Master in Computer Applications (with B.Sc. degree) / B.Sc. (Forestry / Agriculture, both with 4 years duration course). | 20 | 19.08.2013 | 14.08.2015 | Nil | 1,44, 000 + 20,000 (Andhra. Fee) Univ. Regn | 14,400 + 250 (Andhra Univ. Regn. Fee) | 24.05.2013 |

Note :
- Master degree should be with Bachelor in Sciences.
- Preference will be given to Mathematics in 10+ 2 standard.
- Candidates should have secured a minimum of 55 % marks in the qualifying examination.
- M. Tech. is accredited by Andhra University, Visakhapatnam and from 2nd module onwards the students admitted to this course will have to select one of the following disciplines:
- (i) Sustainable Agriculture, (ii) Forest Resources & Ecosystem Analysis, (iii) Geosciences, (iv) Marine and Atmospheric Sciences,(v) Human Settlement Analysis (vi) Water Resources, (vii) Satellite Image Processing & Photogrammetry and (viii) Geoinformatics
- The admission for M. Tech. course is based on entrance test and interview. GATE qualified candidates with valid GATE Score will not be required to appear in the entrance test. However they will also be required to appear in the interview along with other candidates. IIRS does not provide any fellowship/ financial assistance to any of its students.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **GEOINFORMATICS : TECHNOLOGY AND APPLICATION** | | | | | | | | | | |
| 9. | D-GI IIRS-ITC Joint Education Program | Post Graduate Diploma in Geoinformation Science & Earth Observation with specialisation in Geoinformatics | M.Sc. / M.Tech. Degree in Physics, Mathematics, Applied Mathematics, Statistics, Geophysics, Metereology, Oceanography, Geology, Agriculture, Urban and Regional Planning, Remote Sensing OR any Natural/Environmental Sciences, Master in Geography / B.E. / B. Tech. (Civil Engineering / Electronics and Communication, Computer Science/ Computer Engineering / IT/Agricultural Engineering / Geoinformations /MCA (with B.Sc. degree). | 10 | 23.09.2013 | 19.07.2013 | Nil | 65,000 | Euro 3000 | 21.06.2013 |
| 10. | M-GI IIRS-ITC Joint Education Program | M. Sc. in Geoinformation Science & Earth Observation with specialisation in Geoinformatics | M.Sc. / M.Tech. Degree in Physics, Mathematics, Applied Mathematics, Statistics, Geophysics, Metereology, Oceanography, Geology, Agriculture, Geography, Urban and Regional Planning/Remote Sensing OR any Natural/Environmental Sciences OR BE/B. Tech. (Civil Engineering / Electronics and Communication / Computer Science / Computer Engineering / IT/Agricultural Engineering / B. Tech. In Geoinformatics / B.Sc. (4 years) Agriculture / Forestry or equivalent OR MCA with Science Graduation or M.Sc. in IT. | 10 | 23.09.2013 | 20.03.2015 | Euro 2000 payable to ITC + {₹ 2,00,000 Approx. own expenditure for visit to ITC} | 1,20,000 payable to IIRS + Euro 2000 payable to ITC + {₹ 2,00,000 Approx. own expenditure for visit to ITC} | Euro 6250 | 24.05.2013 |

Note :
- The candidate should have secured a minimum of 60 % marks in the qualifying examination.
- GATE qualified candidates with valid GATE Score will not be required to appear in the entrance test. However they will also be required to appear in the interview along with other candidates. IIRS does not provide any fellowship/ financial assistance to any of its students.
- The M.Sc. degree is awarded under Joint Education Programme of IIRS-ITC by Faculty of Geoinformation Science and Earth Observation of the University of Twente, The Netherlands.

| Sl. No | Course Code | Course Name | Entrance Requirements | No. of Seats | Starting Date | Passing Out Date | Course Fee for Individual Candidate | | | Apply by Date |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | dd mm yy | dd mm yy | Govt. Spons. ₹ | Open ₹ | Foreign US $ | |
| 11. | D-NHDRM IIRS-ITC Joint Education Program | PG Diploma in Geoinformation Science & Earth Observation with specialisation in Natural Hazards & Disaster Risk Management | M.Sc. in Natural Sciences / Earth Sciences / Physical Sciences or B.Arch/ B.Planning / M. Planning or B.E. / B.Tech. in Civil Engineering/ Agricultural Eng./ Environmental Eng/ Geosciences/ Geoexploration/ Earthquake Engineering or B.Sc. (Forestry / Agriculture, both with 4 years duration course) or Master in Geography or Forest Officers (Graduates in Science with 2 years experience). | 10 | 23.09.2013 | 19.07.2013 | Nil | 65,000 | Euro 3000 | 21.06.2013 |
| 12. | M-NHDRM IIRS-ITC Joint Education Program | M. Sc. in Geoinformation Science & Earth Observation with specialisation in Natural Hazards & Disaster Risk Management | M.Sc. in Natural Sciences / Earth Sciences /Physical Sciences / Agriculture or M.Sc. In Geography /P.G.in Urban and Regional Planning /B.Arch/ B.Planning/M. Planning or B.E./B.Tech./ M.E. / M.Tech. in Civil Engineering / Agricultural Engineering /Environmental Eng/ Geosciences/ Geoexploration/Earthquake Engg /IT/CS/ECE or B.Sc. (Forestry / Agriculture, both with 4 years duration course) or M.Sc. Geography. | 10 | 23.09.2013 | 20.03.2015 | Euro 2000 payable to ITC + (₹ 2,00,000 Approx. own expenditure for visit to ITC) | 1,20,000 payable to IIRS +Euro 2000 payable to ITC + (₹ 2,00,000 Approx. own expenditure for visit to ITC) | Euro 7000 | 21.05.2013 |

Note :
- The candidate should have secured a minimum of 60 % marks in the qualifying examination.
- GATE qualified candidates with valid GATE Score will not be required to appear in the entrance test. However they will also be required to appear in the interview along with other candidates. IIRS does not provide any fellowship/ financial assistance to any of its students.
- The M.Sc. degree is awarded under Joint Education Programme of IIRS-ITC by Faculty of Geoinformation Science and Earth Observation of the University of Twente, The Netherlands.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **REMOTE SENSING APPLICATIONS : THEME SPECIFIC ORIENTATION COURSE** | | | | | | | | | | |
| 13. | O-DM | Remote Sensing -An Overview for Decision Makers | Decision makers in organizations (with 10 years experience in service). | 10 | 18.06.2013 | 21.06.2013 | 7,000 @ | 7,000 @ | 700 @ | 18.05.2013 |
| **INTERNATIONAL PROGRAMMES** | | | | | | | | | | |
| 14. | S-RS | Short Course on Remote Sensing with special emphasis on Digital Image Processing (ITEC Sponsored) | Post Graduate degree in natural sciences, graduate in any engineering discipline, or graduate in natural sciences with sufficient knowledge of mathematics/statistics at high school level. Middle level resources managers and professionals from Govt., NGOs, Universities with 2 years work experience relevant to natural science/management/ data-map handling. Age: Upto 45 Years or so. | 20 | 07.01.2013 | 01.03.2013 | 20,000 | 20,000 | $ 2000 | 28.11.2012 |
| 15. | S-GI | Short Course on Geoinformatics (ITEC Sponsored) | Post Graduate degree in natural sciences, graduate in any engineering discipline, or graduate n natural sciences with sufficient knowledge of i mathematics/statistics at high school level. Middle level resources managers and professionals from Govt., NGOs, Universities with 2years work experience relevant to natural science/management/data-map handling. Age : Up to 45 years. | 20 | 23.09.2013 | 15.11.2013 | 20,000 | 20,000 | $ 2000 | 23.08.2013 |
| **CERTIFICATE COURSE** | | | | | | | | | | |
| 16 | C-RS | Short Course on Remote Sensing and Image Interpretation | Engineering Graduate / Post Graduates in Science and Geography. | 5 | 07.01.2013 | 01.03.2013 | Nil | 12,000 | 1200 | 28.11.2012 |
| **NNRMS - ISRO SPONSORED CERTIFICATE COURSES : FOR UNIVERSITY FACULTY ONLY** | | | | | | | | | | |
| 17. | N-GI | GIS Technology and Advances | Post Graduate Degree in Science/Engineering Graduate. The candidates should have 2 yrs. teaching experience at PG level. | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |
| 18 | N-WR | RS & GIS Applications to Water Resources | B.E. / B. Tech., M.E./M. Tech.(Civil & Agricultural Engineering) with 2 years teaching / research experience. | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |
| 19 | N-FE | RS & GIS applications to Forestry/Botany/Ecology/ Wildlife /Environmental Sciences | Post Graduate Degree Botany/Ecology/Forestry/ Environment/ Zoology / Wildlife Science/ Life Science. The candidates should have 2 yrs. teaching experience . at PG level | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |
| 20 | N-UR | RS & GIS Applications to Urban & Regional Planning | M. Planning/ B.E.(Civil)/B. Arch. / B Planning / Master in Geography. The candidates should have 2 yrs. teaching experience at PG level. | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |
| 21 | N-CM | Cartography and Mapping | Post Graduate Degree in Science/Geography. The candidates should have 2 yrs. teaching experience at PG level | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |
| 22 | N-GG | RS & GIS Applications to Geosciences | Post Graduate Degree in Geology/ Applied Geology/ Geophysics/ Geography. The candidates should have 2 yrs. teaching experience at PG level. | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |
| 23 | N-GA | RS & GIS Applications to Agriculture and Soils | Post Graduate Degree in Science / Agriculture / Geography / Environmental Sciences . The candidates should have 2 yrs. teaching experience at PG level. | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |
| 24. | N-MA | RS & GIS Applications to Meteorology & Atmospheric Sciences | Post Graduate Degree in Science / Marine Sciences / Meteorology / Atmospheric / E nvironmental Sciences. The candidates should have 2 yrs. teaching experience at PG level. | 8 | 06.05.2013 | 28.06.2013 | Nil | 12000 | 1200 | 15.02.2013 |

**Note : Please note the following important information:**
- If the date of commencement falls on holiday, course will start from next working day.
- Sponsoring organizations are required to meet all expenses viz., traveling allowance, daily allowance, contingent expenses, medical expenses etc., for their candidates EXCEPT course fee. **However Courses at Sl. Nos. 13, 14 & 15 are paid courses for all** including Govt. organizations also. In case of NNRMS sponsored course, the candidates admitted are paid TA/DA by IIRS as per DOS rules applicable for this course.
- The Govt. Organizations (Central / State Government bodies / Autonomous Institutions and State and Central Govt. funded Universities) can s**ponsor only permanent staff.** Private Universities & self sponsored candidates have to pay **full course fee** prior to joining the course.
- Security deposit : Self Financed candidates, have to deposit/ remit security deposit one month prior to the commencement of the course, failing which seats would be offered to the waitlisted candidates, as mentioned further:**(i) @ ₹ 4000/-in respect of Certificate Courses (ii) @ ₹ 6000/- in respect of PG Diploma Courses and (iii) @ ₹ 10000/- in respect of M.Sc./ M.Tech. courses.**
- Boarding and lodging charges at IIRS Hostel comes to ₹ 2500 p.m. (approx.). **Local candidates will be considered for hostel accommodation, only if available.**
  * *Includes boarding and lodging charges for the course mentioned at S.No.13.*
- **Number of seats are subject to change in all courses.**

For further details, contact: Director / Group Director, Programme Planning & Evaluation Group, Indian Institute of Remote Sensing, ISRO, Dept. of Space, Govt. of India, 4, Kalidas Road, Dehra Dun Pin- 248 001, UTTARAKHAND (INDIA).
Fax : 91-135- 2741987; 2748041; PHONE: 91-135-2744583, 2524105, 2524106, 2746798, 2524107 & 2524108.
E-mail: admissions@iirs.gov.in; also, please log in : www.iirs.gov.in for details and application form.



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