

**EDUCATION , TRAINING AND CAPACITY BUILDING IN SPREADING AWARENESS
OF REMOTE SENSING , GIS AND GEOSPATIAL TECHNOLOGY IN A RURAL
VILLAGES IN MAHARASHTRA THROUGH IIRS ISRO OUTREACH PROGRAM BY
PILLAI HOC COLLEGE OF ENGINEERING AND TECHNOLOGY (PHCET)
– A WELL ANALYSED CASE STUDY**

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KEY WORDS: Capacity building, ISRS, rural education, space science.

ABSTRACT: Globally the role of education in the field space science is rising up across various sectors and the need to spread awareness according at various levels and stages is the need of the hour. India is a country wherein the maximum youth population does their basics education in villages and later move to cities for higher education. Hence a sound awareness of geospatial technologies in terms of space science is vital for improving the capacity building. To fulfill the above-mentioned gap, Pillai HOC College of Engineering and Technology, PHCET at Rasayani a remote village in interior Maharashtra is teaching the rural children in schools and colleges across various villages the basics, importance and application of space science. PHCET is fulfilling this objective by being a Outreach Network Institute with the support of Indian Institute of Remote Sensing IIRS, Dehradun from July 2017. PHCET also under the umbrella of Indian Society of Remote Sensing ISRS Mumbai Chapter conducts various seminars, workshops, space science fair etc. to inculcate awareness of choosing space science as their carrier. Till date around 7,000 plus students have been taught for free at this IIRS Outreach Centre and about 60 plus courses in various domains like remote sensing, GIS, GNSS etc have been conducted. PHCET is planning to build a student's satellite in the coming years ahead under the guidance of Indian Space Research Organisation. Many students after competition of these outreach courses have gone to IIRS for internship and have done various recent project under the guidance of scientists of IIRS. This case study signifies that post rural school and college education these young students have developed interest to pursue the future education in the field of space science.

1 INTRODUCTION

Universally the importance of various geo spatial technologies such as in space science, remote sensing, GIS etc is widely expanding mostly across all countries. In the recent past India also have taken major steps to improve the quality and quantity of education and research works across academia through many awareness programmes, and one of the major initiative is through Outreach programmes by Indian Institute of Remote Sensing (ISRO) , Dehradun, India. IIRS Outreach programmes targets Indian students across the whole country majorly in academic institution, industry and government organizations wherein free online courses are being taught by leading ISRO scientists in E-Class platforms. In the past few years many university across India have introduced Remote Sensing and GIS in the curriculum of undergraduate and post graduate level. Indian Institute of Remote Sensing IIRS ISRO has appreciated Pillai HOC College of Engineering and Technology (PHCET) for influencing and involving rural students in learning this new technology through capacity building and has appreciated by awarding annual award 2018 to Mr. Karthik Nagarajan for his significant contribution as IIRS Outreach Coordinator . This

paper signifies the different modules, techniques and methods introduced in education , training and capacity building in spreading awarness of remote sensing , GIS and geospacial technology in a rural village in Maharashtra through IIRS outreach program by Pillai HOC College of Engineering and Technology. Refer figure 1.



Figure 1: Well equipped Conclave hall with latest technology for video conferencing, audio visual facilities, webinar interactions, soft boards etc. with good internet speed at PHCET

2 LITERATURE REVIEW

IIRS ISRO Dehradun has successfully conducted many outreach courses and so far with participation of over 2,10,000+ participants from 2,500+ academic institutions, government departments and industry. Many technical papers, research and case studies had been referred in writing this paper which is incooperated ahead in various sessions of this paper.

3 OBJECTIVE

The objective of this IIRS ISRO outreach centre at PHCET is

1. Conduct IIRS Outreach courses and educate rural students in villages and spread awareness about geospacial technologies such as remote sening / GIS and its applications
2. Inculcating capacity buidling by conducting seminars , webinars, short term training programmes etc by inviting scientists and eminent speakers from various renowned organisations.
3. Proving hands-on practicals for students across schools and colleges.
4. Conducting various activities such as competitions , exhibitions etc to motivate students.
5. Colabrating with new chapters such ans ISRS at present. (and ISG and ISPRS in future)
6. Sending students for intenships at ISRO centres across India for reseach activities and inparting capacity building.

4 METHODOLY

The methodology of our IIRS ISRO outreach centre at Pillai HOC College of Engineering and Technology , Rasayani is to impart capacity building by online and offline mode.Refer figure 2

5 ONLINE MODE OF IIRS ISRO OUTREACH CENTER AT PHCET

Online modes of e-learning and training is categorized by online courses which varies from few weeks to months daily for 1-2 hours and online workshops which are normally conducted through the day for about 8-10 hours though E-Class portal. E Class platforms interface are provided to all the participants through which the registrations, schedules of courses, study materials, online examination and certification is done. In online mode hands-on practical and examinations are also conducted which are briefly explained below.

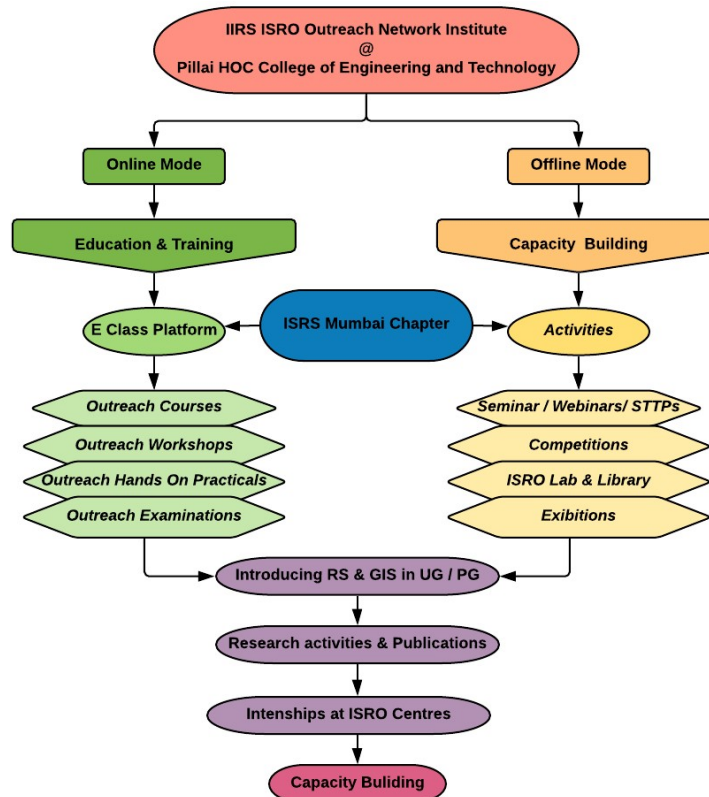


Figure 2: Methodology of Capacity Building IIRS ISRO Outreach Centre at PHCET, Rasayani.

5.1 Conducted 52 Courses through IIRS ISRO Outreach Program

Over all 52 Courses are conducted with about 6 courses in 2017, 13 courses in 2018, 17 in 2019 and 16 in 2020 respectively. Refer figure 3.

In **2017** courses such as UAV Remote Sensing and its applications, Basic of RS, GIS & GNSS, Remote Sensing and Digital Image Analysis, Hyperspectral remote sensing and its Applications, Global Navigation Satellite System & Geographical Information System, RS & GIS Applications were conducted.

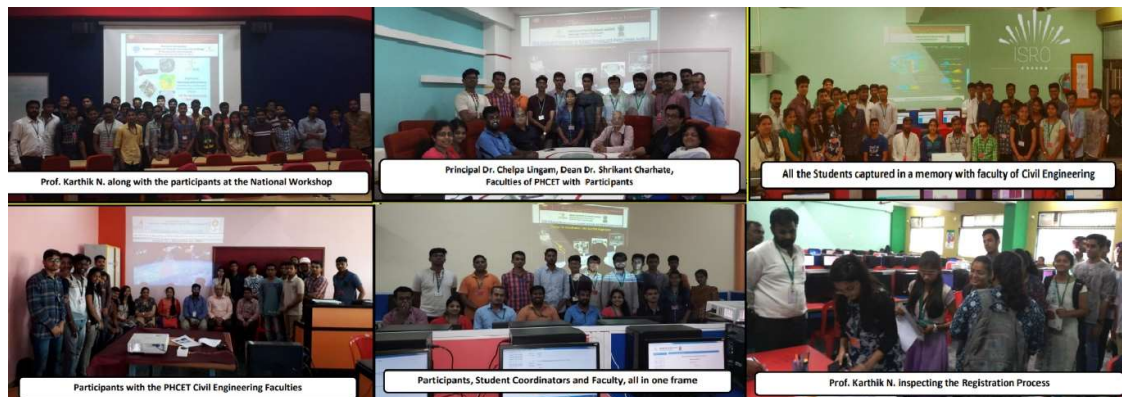


Figure 3: Conduction of IIRS ISRO Online Courses at Outreach Centre at PHCET

In **2018** courses such as Close-Range Photogrammetry and Terrestrial Laser Scanning, Hyperspectral Remote Sensing and Its Applications, Geomatics for Forest Fire Management, RS & GIS applications in Water Resources, Geospatial Modelling for Watershed Management, Advanced Image Analysis, Geospatial Inputs for AMRUT Program, Advanced Geospatial

Modelling tools and techniques, Basic of RS, GIS & GNSS, Remote Sensing & Digital Image Analysis, Global Navigation Satellite System and Geographical Information System Module, RS & GIS Applications, Satellite Remote Sensing in Agrometeorological Applications.

In **2019** courses such as Hyperspectral remote sensing and its Applications, Principles of Polarimetric SAR Remote Sensing and its Processing, Advances in Forest Remote Sensing, Mapping, Monitoring and Modelling of Landslide and Earthquake Hazards, RS and GIS Applications in Watershed Management, Advances in Remote Sensing and geospatial technologies for Disaster early warning, monitoring and mitigation, Satellite Remote Sensing for Air Pollution Studies, Digital Photogrammetry based 3D modelling, Geoprocessing using Python, Basic of RS, GIS & GNSS, Remote Sensing & Digital Image Analysis, Global Navigation Satellite System, Geographical Information System, RS & GIS Applications, Web GIS – Geo Visualization and Online Mapping, RS & GIS in Urban & Regional Planning, NESAC Remote Sensing and GIS Technological Advances and Applications.

In **2020** courses such as Geoprocessing and Visualization in Web Platforms, Space Based Application of Geospatial Technologies for Disaster Risk Reduction, Overview of Planetary Geosciences with special emphasis to the Moon and Mars, Application of Geoinformatics in Ecological Studies, Satellite Photogrammetry and its Applications, Geospatial Inputs for Enabling Master Plan Formulation, Remote Sensing Applications in Agricultural Water Management, Basic of RS, GIS & GNSS, Remote Sensing & Digital Image Analysis, Global Navigation Satellite System, Understanding of coastal ocean processes using remote sensing and numerical modelling, Global Information System, RS and GIS Applications, Basics of Geo Computation and Geo-Web Services, Health GIS, Basics of SAR Remote Sensing, Basics Principles of Remote Sensing Technology were conducted.

5.2 Conducted 10 Workshops through IIRS ISRO Outreach Program

Over all 52 Courses are conducted with about 02 courses in 2018, 03 in 2019 and 05 in 20120 respectively. Refer figure 4.

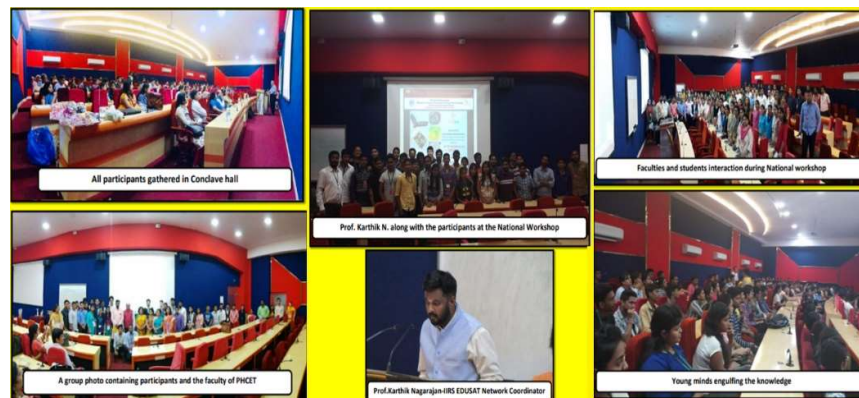


Figure 4: Conduction of IIRS ISRO Online Workshops at Outreach Centre at PHCET

In **2018** workshops on Geo Spatial Technologies and Sendai framework for Disaster Risk Reduction and Hydro metrological Disaster Management were conducted.

In **2019** workshops on Workshop on Microwave Remote Sensing in Agriculture, Satellite data access from online data repositories and ISRO Bhuvan geoportal and Remote Sensing of the Moon by Indian Lunar Missions with Emphasis on Spectroscopic Analysis were conducted.

In **2020** workshop on Hindi introduction to space science, Machine Learning for Remote Sensing Data Classifications, NESAC Remote Sensing and GIS Technological Advances and Applications, Geospatial Technologies for Disaster Risk Reduction, Workshop on Crowd Sourcing and Participatory GIS were conducted.

5.3.1 Outreach Hands on Practical Bhuvan-Workshop

A seminar on hands on training and map making using Quantum GIS was conducted for students on 10th January 2018 to spread awareness of BHUVAN (refer figure 5) program by Dr. Monika Kannan- chief Editor: Khoj-The International Peer Reviewed Journal. The objective of the workshop was to teach all the students how to download satellite data from BHUVAN portal. Bhuvan is a ISRO based web portal which helps the user to download and explore map-based contents which covers all Indian states and is available in four Indian languages. Multiple features such as Visualization of Satellite Maps and Imagery, Image analysis, satellite data downloading for free as shown in figure 5. Various departments of state governments, industry and academia uses this platform for different applications.



Figure 5: Bhuvan Hands on Practical conducted at Outreach Centre, PHCET
Bhuvan Portal (Source: https://bhuvan.nrsc.gov.in/bhuvan_links.php#)

5.3.2 Live Hands On-Workshops-On-GNSS and GPS

A hands-on training on GNSS was conducted for students on 10th January 2018 (refer figure 6) program by Mr. Virendra Patel (research scholar at SVNIT



Figure 6: GNSS hands-on Practical conducted at Outreach Centre, PHCET

5.4 Outreach Examinations

After the Outreach courses are over, study materials are provided to participants and objective type exams are conducted from IIRS ISRO Dehradun center which is supervised by our faculties at our center as shown in figure 7.



Figure 7: Conduction of IIRS ISRO Online Exams at Outreach Centre, PHCET

6 OFFLINE MODE ACTIVITIES OF IIRS ISRO OUTREACH CENTER AT PHCET

Many offline modes activities are conducted at the outreach center such as seminars, webinars, STTPs, competitions, exhibitions etc. A special ISRO lab and library is opened at the center so that the rural students can enhance their knowledge. In offline mode hands-on practical and examinations are also conducted which are briefly explained below.

6.1.1 Seminar on RESPOND Program

A seminar on A view towards Indian Space Program and opportunities in space was conducted for students on 28th January 2019 to spread awareness of Respond program by Mr. Nitesh kumar Aggarwal from UR Rao Satellite Centre & IISST, Trivandrum. The objective of the seminar was how students can make projects for ISRO, how under-graduate and post-graduate students can submit project proposal to ISRO and the procedure for applying funds from ISRO under Respond. Respond programme acts as a vital connection between premiere academic institutions in India and ISRO to work on R&D projects which are significance to support current & future ISRO prog.



Figure 8: Conduction of RESPOND programmer at Outreach Centre, PHCET
(Source: <https://www.isro.gov.in/research-and-academia-interface/respond-projects>)

6.1.2 Short Term Training Programmes (STTPS)

Pillai HOC College of Engineering and Technology has is organised two STTPs (figure 9&10)
- Indian Society of Technical Education (ISTE) approved one-week STTP “Application of Remote Sensing and Geographic Information System in Disaster Management: Response, Recovery and Reconstruction ” from 05th January, 2018 (Friday) to 11th January,2018 (Thursday). Refer figure 10

- AICTE and ISTE approved one-week Short Term Training Program (STTP) on “Advances in Disaster Management and Risk Reduction - A Remote Sensing and GIS Approach ” along with Orientation programme for in association with University of Mumbai for faculty from 24th - 29th June 2019 Refer figure 9

Experts from industry and academia will join hands and had deliver seminars about emerging trends in Remote Sensing (RS) and Geographic Information System (GIS) and its application in Disaster Management (DM). Eminent Speakers about from ISRO/ IIRS / CIDCO / MMRDA/ BMC etc deliverd the lectures and enhance the participants knowledge. Hands on Software training will be taught High-tech Computer Lab. Free Bus Service (inform in advance). Every day Breakfast/Lunch/High Tea. Free Accommodation. Program Kit will be provided. Many renowned scientist and resource person were invited for delivering seminars (refer figure 10)



Figure 9: Conduction of STTPs Courses at Outreach Centre, PHCET

Dr. Shrish Ravan (Head of the UN-SPIDER Office, United Nations, Beijing), DRM Samudraiah-Deputy Director (Retired) SAC, ISRO., Dr. Shashikant A. Sharma-Scientist- SG & Group Head, SAC ISRO, Dr. Vaibhav Garg from IIRS Dehradun, Mr. Kamal Pandey from IIRS Dehradun etc. and from various big shots from Maharashtra Jeevan Pradikaran, MMRDA and from other government colleges all over India etc along with a national workshop on. The participants includes people from various organizations, industries, faculties from various colleges and department (Civil, Mechanical, Electronics, Computer Engg etc.) from all over Maharashtra, Post graduate and Under graduate students. The objective of conducting these kinds of exams are to spread awareness of RS and GIS to the grass root level and bringing in its applications in various fields of science and engineering so as the make the life of a common man better and extending its utility in making smart city



Figure 10: STTP-Application of Remote Sensing and Geographic Information System in Disaster Management: Response, Recovery and Reconstruction " from 05th-11th Jan, 2018

6.2 Competitions

Many offline competitions such as Prayog – A national level science technical festival Satellite making contest, painting competitions for rural students and participants. (refer figure 11). Various other competitions such as RS-GIS Poster Exhibitions, National Environment Day, Engineer’s Day, World water Day, National Remote Sensing Day are conducted.



Figure 11: Conduction of competitions at Outreach Centre, PHCET

6.3 ISRO Lab and Library

The ISRO Lab at PHCET was inaugurated by Dr. DRM Samudraiah, Deputy Director (Retired), Space Applications Centre Space Application Centre (SAC), Indian Space research Organisation ISRO on 9th January 2018 as seen in figure 12. ISRO lab and library are equipped with many journals, magazines, newsletters, notice boards, equipment's, computers etc. for the students to understand space science and many inspirational stories of scientists and framed and kept.



Figure 12: ISRO Lab inauguration and library at Outreach Centre, PHCET

6.4 Exhibitions

Former ISRO Chairman Dr. A. S. Kiran Kumar (2nd from Right) interacted with students / staffs of Pillai 's College of various Engineering streams at VJTI, Matunga (Mumbai) on 28th December 2018. He interacted and inspired students to consider SPACE SCIENCE as a strong carrier and told them to dream big as shown in figure 13.



Figure 13: ISRO Space Exhibition visit organized by PHCET.

7 INDIAN SOCIETY OF REMOTE SENSING -ISRS MUMBAI CHAPTER

The Indian Society of Remote Sensing (ISRS) Mumbai Chapter is established in for a tenure of three years from 2019-21 at Rasayani, Maharashtra (India). The chapter is structured by electing a chairman, secretary, joint secretary and treasurer A total life member from 92 has been increased to 165 till date. Refer figure 14. The prime objective of this joining hands with this chapter is to bring in progress, development, improving and propagating the role of geospatial technology to the grass root level in the villages across Maharashtra state. Through this chapter many activities such as webinars, seminars, hands-on training of softwares etc. are regularly conducted to spread and inbuilt awareness.

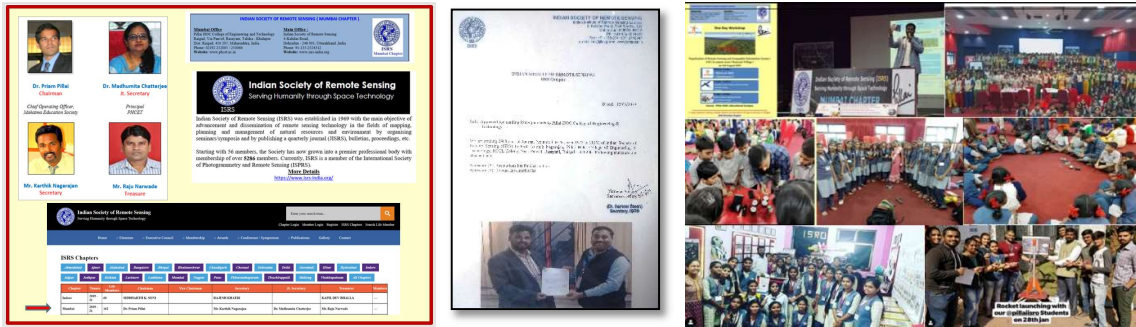


Figure 14: Indian Society of Remote Sensing ISRS – Mumbai Chapter

ISRS Mumbai Chapter invited many schools in and around Rasayani Village for One day Workshop on Popularization of Remote Sensing and Geographic System(Space Science) in Remote Areas on 3rd August 2019 The prime objective of the Workshop was to help towards advancement , dissemination and application Remote Sensing and Geographic System(Space Science) in remote areas ss many school lies in Rasayani which has a Rural background area , this initiative is taken to sensitize the young students, teachers and researches and inspire them in dreaming big in this field of Space Science. Activities Conducted in workshop, expert lectures, movie on Space Science, satellite competition • rover making activity, painting Competitions we conducted. ISRS has also provided free journals of JISRS to these rural students.

 Mr. Karthik Nagarpalan Associate Professor Civil Engg Dept., PHCET (NNRMS 2017)	 Archana R. Lokhande M.E. (Planning in Construction Engineering and Management) B.E. (Civil Engineering)	 Poojyam S. Tiwari Designation: Scientist/Engineer - SF Department: Remote Sensing and Geoinformatics Group Field of Expertise: Photogrammetry, Automatic Feature Extraction	 Akshata V Patel B.E. (INFORMATION TECHNOLOGY)
 Mr. Raju Narwade Associate Professor Civil Engg Dept., PHCET (NNRMS 2018)	 Divyshree P Yadav M.E. (Planning in Construction Engineering and Management) B.E. (Civil Engineering)	 Prof. Hina Pande Designation: Scientist/Engineer - SF Department: Photogrammetry and Remote Sensing Field of Expertise: Photogrammetry and Image Analysis	 Rohan Kumar B.E. (COMPUTER ENGINEERING)
 Ms. Manisha Jangade Associate Professor Civil Engg Dept., PHCET (NNRMS 2019)	 Nivrutti DhyanaBhosale M.E. (Planning in Construction Engineering and Management) B.E. (Civil Engineering)	 Dr. Praveen K. Thakur Designation: Scientist/Engineer - SF Department: Water Resources Department Field of Expertise: Snow/Glacier, Flood and Groundwater Hydrology, Hydrological Modelling, Planetary Remote Sensing	 Akshay M Anarse B.E. (INFORMATION TECHNOLOGY)
	 Rahul Unnikrishnan Nair M.E. (Planning in Construction Engineering and Management) B.E. (Civil Engineering)	 Prof. Raghavendra S Designation: Scientist/Engineer - SD Department: Photogrammetry and Remote Sensing Department Field of Expertise: UAVs, GIS, and Remote Sensing	 MR. KAMAL PANDEY Designation: Scientist/Engineer - SD & Web Information Manager Field of Expertise: Geospatial Software Design and Development
Ph.D. Research Scholars	P.G. Students		U.G. Students

Figure 15: Ph.D., P.G. & U.G. students of PHCET for internships at ISRO Dehradun

8 INTERNSHIPS

The IIRS ISRO Outreach center at PHCET have sent many participants to IIRS ISRO Dehradun 3 Ph.D. research scholars for 2 months training for National Natural Resources Management System (NNRMS), 4 Post Graduate students and 3 under graduate students for internships as shown in figure 15.

9 RESULTS AND DISCUSSIONS

An overall feedback from 428 random students were taken and the figures are quite promising. Feedback analysis was done at outreach center to bring quality education and increase capacity building. About 97.3% are from engineering back ground as shown in figure 16

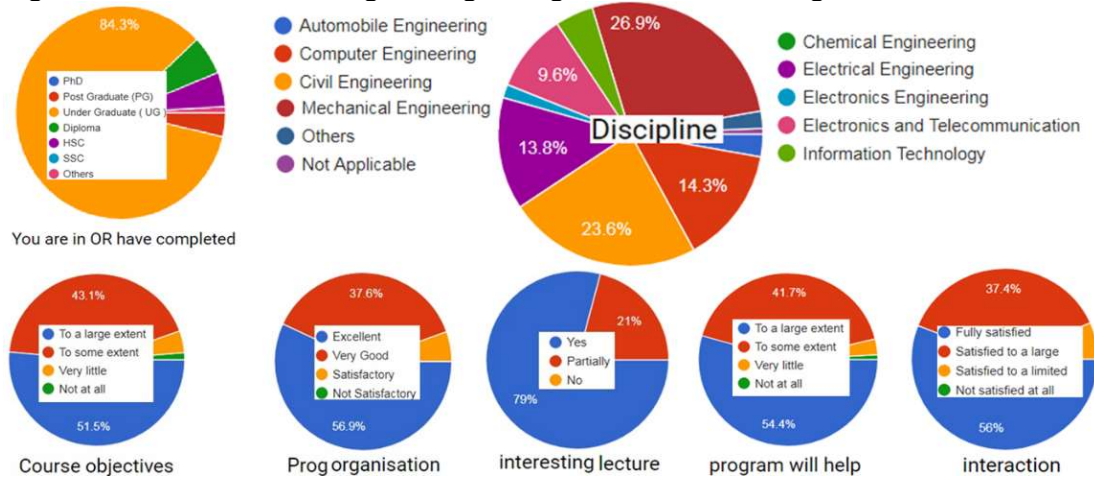


Figure 16: Feedback from students of IIRS Outreach Centre (PHCET)

By continuing this work, IIRS ISRO also appreciated this noble cause by annual award in the year 2018 for the significant contribution as IIRS outreach coordinator as in figure 18.



Figure 18: Annual award 2018 at IIRS ISRO Dehradun

10 CONCLUSIONS AND FUTURE SCOPE

Total 52 outreach courses and 10 outreach workshops have been successfully completed by IIRS ISRO outreach center at PHCET with about 7000+ rural students participating. Feedback given by students shows that 69% students are interested in learning how to make satellites, 44.2% are interested in Rocket science, 30.3% showed their interest in making mars and moon rovers.94.6% students commented that the objective of the course covered to a large extent. I have attended a 2 weeks programme on Small Satellite Mission organized by CSSTEAP so that in future we can impart these satellites making project to the students at our outreach center. The students who have enriched their knowledge in these outreach courses will be filtered and we are planning for student’s satellite mission wherein students from rural villages from Maharashtra will built their own satellite and set a bench mark for the generation ahead.

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