



**Hands on Training Program  
on  
Advanced Instrumentation Techniques  
for  
Material Characterization & Analysis**

**[ कौशल भारत - कुशल भारत ]**

**(12-19 July, 2022)**

Organized by

Central Instrumentation Laboratory (CIL),  
Deenbandhu Chhotu Ram University of Science and  
Technology (DCRUST), Murthal, Haryana

*in collaboration with*

Department of Physics, DCRUST Murthal  
(FIST Assisted)

and

Sophisticated Analytical Instrumentation Facility (SAIF)  
Panjab University, Chandigarh

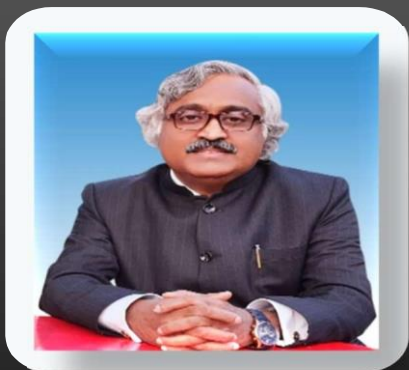
Under

**Synergistic Training Program Utilizing the  
Scientific and Technological Infrastructure (STUTI)**

**Department of Science and Technology, Government of India**

**Hands on Training Program  
on  
Advanced Instrumentation Techniques for  
Material Characterization & Analysis**

**ORGANIZERS**



**Prof. Rajendrakumar Anayath**  
Vice Chancellor  
(Patron-in-Chief)  
DCRUST, Murthal



**Prof. Ashok K Sharma**  
Director CIL, DCRUST, Murthal  
STUTI Training Coordinator



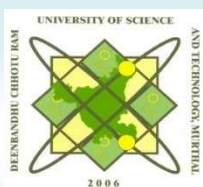
**Prof. Rajni Shukla**  
Chairperson  
Dept. of Physics  
DCRUST, Murthal



**Prof. G.R. Chaudhary**  
Director, SAIF/CIL  
STUTI Program Coordinator - PMU  
Panjab University, Chandigarh

**“Synergistic Training program Utilizing the Scientific and Technological Infrastructure (STUTI) Program – 2022”**

STUTI Program of the Department of Science & Technology (DST), Government of India, is intended to build human resource and its knowledge through open access to S&T Infrastructure across the country. This will be achieved by organizing short term courses/ workshops on the awareness, use and application of various instruments and analytical techniques. The Scheme will provide grants for organizing different [training programs](#).



**Prof. (Dr.) Rajendrakumar Anayath  
Vice Chancellor (DCRUST, Murthal)**



**MESSAGE**

It is a great pleasure to welcome all delegates and participants to the training program on “Advanced Instrumentation Techniques for Material Characterization and Analysis” under the aegis of Synergistic Training program Utilizing the Scientific and Technological (STUTI) – an initiative of Department of Science and Technology (DST), at Deenbandhu Chhotu Ram University of Science and Technology, Murthal (Sonipat) and Sophisticated Analytical Instrument Facilities (SAIF), Panjab University, Chandigarh. This programme will emphasize the recent advances in interdisciplinary research on processing, morphology, structure, properties and applications of nanomaterials in various fields. I would like to congratulate the Central Instrumentation Laboratory (CIL) and Department of Physics, DCRUST, Murthal for providing such a good opportunity to the young researchers having passion and interest in the domain of novel materials.

This programme is unique as it enables the researchers and students to acquire practical knowledge about various state-of-the-art technological equipment's and learn about their applications which will help in leading the country towards development in the field of research and innovation in our country. This hands-on-training program would undoubtedly be another milestone in DST's initiative towards building human resources through STUTI.

I express my best wishes for the grand success of this event.

(Prof. (Dr.) Rajendrakumar Anayath)



**Prof. (Dr.) Raj Kumar**  
**Vice-Chancellor (Panjab University, Chandigarh)**



MESSAGE

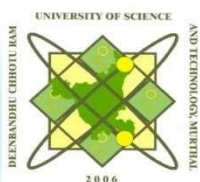
A cordial welcome to the all the participants of the Training Program entitled “Advanced Instrumentation Techniques for Material Characterization & Analysis” under the “Synergistic Training program Utilizing the Science and Technological Infrastructure (STUTI)” at the Department of Physics, DCRUST, Murthal in association with Panjab University, Chandigarh. I extend my sincere thanks to the Department of Science and Technology (DST) for awarding the grant under the STUTI program. This is an excellent initiative in an endeavor to build human resources and their knowledge capacity through open access to Science and Technology infrastructure all across the country.

I congratulate Sophisticated Analytical Instrumentation Facility (SAIF)/ Central Instrumentation Laboratory (CIL), Panjab University, Chandigarh for being selected as a Program Management Unit (PMU) and also for executing their role as a hub manager for working in an ensemble with many other educational and research institutes/universities to fulfill the aims of this program.

I applaud the organizing team of the STUTI Program, DCRUST, Murthal for organizing the Training Program that helps the young researchers to learn characterization techniques and synthesis of the nanomaterials. I firmly believe that this program will be executed further in great spirit.

The endeavor of the organizing committee will bring fruitful accomplishments. I wish the event great success.

(Prof. (Dr.) Raj Kumar)



**Prof. Ashok Kumar Sharma**  
**Director, CIL/ STUTI Co-ordinator (DCRUST, Murthal)**



### MESSAGE

I am honored and take great pleasure in extending a warm welcome to all the participants in STUTI training program. The main aim of the Scheme 'Synergistic raining program Utilizing the Scientific and Technological Infrastructure' (STUTI) is proposed to build human resource and its knowledge capacity through open access S&T Infrastructure has been thoroughly accomplished through these training programs. STUTI scheme provides hands-on training and sensitization of the state-of-the-art equipment for one-week duration. Materials and devices at the nanoscale hold vast promise for innovation in every industry and public endeavour including health, food, transportation, environment, electronics and have been heralded as the next industrial revolution. Various characterization techniques are extensively used by researchers for academics and industrial applications. This programme will focus on learning various tools and techniques needed for nanomaterial synthesis and characterization.

As a part of this event Central Instrumentation Laboratory (CIL), DCRUST, Murthal is extremely delighted and grateful. The CIL houses a wide range of sophisticated analytical and fabrication equipment, maintain them and ensure a fair utilization among the research community. I am confident that the endeavour of the organizing committee will be a fruitful accomplishment.

Once again, I welcome all the participants and wish the event a great success.

(Prof. Ashok Kumar Sharma)



**Prof. G. R. Chaudhary**  
**Director, CIL/ STUTI Co-ordinator (PU, Chandigarh)**



### MESSAGE

Greetings from SAIF, PU, Chandigarh

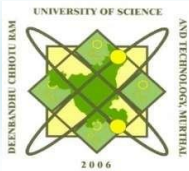
I feel delighted to share that the STUTI Program has been a great success so far. The prestigious DST-supported STUTI program envisions hands-on Training Programs and sensitization of the state-of-the-art equipment as well as toward its sharing in various institutions while ensuring the transparent access to science & technology facilities.

Sophisticated Analytical Instrumentation Facility (SAIF), Panjab University, Chandigarh express our deepest gratitude to the Department of Science and Technology for choosing us to act as a Program Management Unit (PMU) and feel proud to be a part of this program. Our department is always striving for prompt services and quality analysis to support researchers from academia, R&Ds labs, and industries all over India. We provide full support and dedication for executing this prestigious STUTI program in association with the other educational and research institutes/universities.

The Training program on “Advanced Instrumentation Techniques for Material Characterization & Analysis” at the Department of Physics, DCRUST, Murthal will impart practical hands-on training on sophisticated instruments and nanomaterials synthesis followed by characterization techniques. The participants will be able to use advanced analytical techniques and instruments more effectively during their research work.

I also firmly believe that this Training Program will not only enhance the quality of research but also assist in optimum utilization of the instrumentation facilities at their institute.

(Prof. G. R. Chaudhary)



**Prof. Rajni Shukla**  
**STUTI Co-Coordinator (DCRUST, Murthal)**



### MESSAGE

“Creativity is seeing what everyone else has seen, and thinking what no one else has thought.”

- Albert Einstein

It's an honour and pleasure to welcome the young, inquisitive and creative mind to hand on training program on advanced Instrumentation techniques for material characterization and analysis. A budding researcher/scientist in the field of novel and smart materials can be creative and innovative only if he/she has sufficient knowledge on synthesising, characterizing and analysing the material. In the present training programme, the participants will not only be exposed to various technique used for synthesising the new emerging tailored materials but also have hand on exposure to advanced instruments like X- Ray Diffractometer (XRD), SEM, FESEM, P-E loop Tracer, ME/MR Loop Tracer, UV- visible Spectroscopy, Fourier Transform Infra-Red Analyzer, Electrometric Analysis etc. The analysis of the data obtained from various instruments will help the participants to study the structural, electrical, magnetic, optical, electrochemical etc properties of the materials thereby resulting in proposing the material for various applications.

Nanomaterials specially ferrites and its composites, Ferrofluids, Composites of Conducting polymer, metal oxide semiconductors etc are being probed all over the world by scientists and researchers because of their unique properties and applications in Electromagnetic shielding, energy storage, water treatment, sensors, dye degradations etc. In the present training the eminent academicians will expose the participants to new emerging innovative materials and diverse advanced instrumentation. Further, analysing and playing with the data will horn the skills for new findings and innovation in the field of material science.

I am sure the training will not only provide an unforgettable cerebral experience but also a delightful stay in the pollution free green campus of the university. I invite you all to enjoy this unique opportunity offered by DST, PU and DCRUST to brush up the grey cell and be more creative and innovative.

Wishing an enjoyable and healthy stay in the University Campus to all.

(Prof. Rajni Shukla)



## **DEPARTMENT OF SCIENCE AND TECHNOLOGY**

Department of Science & Technology (DST) was established in May 1971, with the objective of promoting new areas of Science & Technology (S&T) and to play the role of a nodal department for organizing, coordinating and promoting S&T activities in the country. The Department has major responsibilities for specific projects and programmes such as Formulation of policies relating to Science and Technology, Matters relating to the Scientific Advisory Committee of the Cabinet (SACC), Promotion of new areas of Science and Technology with special emphasis on emerging areas, Coordination and integration of areas of Science & Technology having cross-sectoral linkages in which a number of institutions and departments have interest and capabilities, Undertaking or financially sponsoring scientific and technological surveys, research design and development, where necessary and Support and Grants-in-aid to Scientific Research Institutions, Scientific Associations and Bodies.

DST has many scientific and engineering programmes that are aimed to promote research in science. It includes creation of Mega Science facilities and launch Mega Science projects in and out of the country to improve access to such state-of-the-art facilities for the Indian scientific community, especially from the academic sector. Because of technical complexities and requirement of large resources, such projects are manifestly multi-agency, multi-institutional and, quite often, international in character. DST and the Department of Atomic Energy (DAE) have been jointly promoting most of such projects in the country. Another innovative program is, Innovation of Science Pursuit for Inspire Research (INSPIRE) for attracting of young talent to science. The R&D Infrastructure Division of the Department aims to strengthen the S&T infrastructure of the country by fostering well- equipped R&D labs in the academic/research institutes/universities as well as a strong culture of research collaboration between institutions and across disciplines. It has four schemes viz. Fund for Improvement of S&T Infrastructure in Universities and Higher Educational Institutions (FIST), Promotion of University Research and Scientific Excellence (PURSE), Sophisticated Analytical Instrument Facilities (SAIF), Sophisticated Analytical & Technical Help Institutes (SATHI) and Synergistic Training Program Utilizing the Scientific and Technological Infrastructure (STUTI). The objectives of these program, at large, are establishment of R&D labs, canters, upgradation of research facilities orienting towards creating a self-reliant India.

### **SYNERGISTIC TRAINING PROGRAM UTILIZING THE SCIENTIFIC AND TECHNOLOGICAL INFRASTRUCTURE (STUTI)**

The program has been designed to cater to human resource and its capacity building through open access to S&T Infrastructure across the country by organizing short term courses/workshops on the awareness, use and application of various instruments and analytical techniques.



## DEENBANDHU CHHOTU RAM UNIVERSITY OF SCIENCE AND TECHNOLOGY, MURTHAL

Deenbandhu Chhotu Ram University of Science & Technology, Murthal (A Govt. of Haryana NAAC "A" grade accredited University) came into being on 6<sup>th</sup> November, 2006 by upgrading erstwhile Chhotu Ram State College of Engineering, Murthal through an Act 29 of 2006 of the Legislature of the state of Haryana with the vision to facilitate and promote studies and research in emerging areas of higher education with focus on new frontiers of science, engineering, technology, architecture and management studies, humanities, and also to achieve excellence in these and connected fields. The University has been considered eligible for grants under Section 12(B) of UGC Act, 1956 in March, 2009. The University has got affiliating status and the technical and professional College/Institutes located in the District Sonapat have been affiliated to the University. Six B.Tech programmes of the University have also been accredited by National Board of Accreditation (NBA). University has a Central Instrumentation Laboratory which is available to scholars belong to different department or outside institute as central research facility.



### **Location**

The University is located in NCR on National Highway No. 1 (G. T. Road) about 50 km from ISBT, New Delhi towards Chandigarh and 8 km from Sonipat railway station. The location of the University falls within one of the growing industrial belts of Haryana extending from Kundli to Panipat.

### Campus

It is a residential university with a campus sprawling over 273 acres of land. Architecturally the campus has been developed in four distinct zones – academic, residences, hostels and recreational. The academic premises comprise of five blocks including one administrative block. One iconic building i.e., Library cum Computer Centre is also completed and is operational and a convention centre is under construction.

### Academic Programmes

The University intends to impart high-end education through 31 Regular PG Courses and 10 Regular UG Courses. University is also running Ph.D. Programme in almost all the disciplines. University also offers PG diploma in Forensic Biotechnology, Beginner's and Certificate Courses in foreign languages such as French and German. Few UGC Career Oriented Programmes are also conducted to enhance the breadth of knowledge and skills of engineering students as well as other/outside candidates.

## CENTRAL INSTRUMENTATION LABORATORY (CIL)

There are number of educational institutions and industries surrounding this local area, but no significant facilities are available in the surrounding where academicians, researchers, technologists can get together and share their views & experiences about new techniques and applications of various instruments in research under one roof. In order to cater the needs of all the departments for sophisticated instruments at our campus, Central Instrumentation Laboratory was established in April 2011.

The CIL is located in the premises of central workshop. All students, researchers and faculty members from various science and engineering departments of the university and its affiliated colleges can avail the services of CIL as per the guidelines of the CIL. While outside users from Industries, Research & Development Organizations and other educational institutions can be allowed to avail this facility with permission. These guidelines are regularly reviewed from time to time.



### Objectives

The objectives of CIL include the following:

- To carry out the analysis of samples received from researchers working in various educational and research institutions, industries, labs etc.
- To provide facilities to researchers to carry out measurements on sophisticated instruments not available in their own institutions.
- To organize short term courses/workshops/training on the use and application of various instruments for the benefit of research scholars, teachers and personnel from other laboratories, universities and industries.
- To train the UG/PG students and research scholars about latest sophisticated instruments available in research field.

### Optimum utilization of CIL

The main focus of university has to be Research & development programmers. Research scholars are always free to access the instrument available in CIL. Students of PG courses like M.Sc., M. Tech can utilize the machines / equipments and infrastructure generated under CIL at regular interval at different levels of their course/program.

Further, CIL is planning to increase the utility and that may be achieved by:

- One short theory paper of instruments may be introduced in the curriculum of M.Sc./ M.Tech./ Pre-Ph.D students.
- Internal orientation programmes for Lab technician/ assistants belonging to B.Tech. Courses are to be organized at regular interval.

## DEPARTMENT OF PHYSICS, DCRUST MURTHAL

The Department of Physics attained its present status as an independent department in January 2009, an extension of Department of Applied Science (from 1987) of erstwhile Chhotu Ram State College of Engineering, Murthal. The department is presently offering, Dual Degree B.Sc. (Hons.) M.Sc. (Physics), two-year M.Sc. (Physics) program with specialization in Electronic, Condense Matter Physics. The department has four research Labs namely Material Research Lab, Hydrogen Energy Research Lab, Nano Lab & Simulation Lab with well-equipped facilities to do research in the recent advancement of Physics. A high-end research lab (FIST Lab), funded by Department of Science & Technology, GOI; is equipped with Fluorescence Spectrometer, ME/MR loop tracer, Sputtering Unit, Impedance analyzer, Temperature, UV-VIS-NIR Spectrometer & Humidity control cabinet. The FIST Lab is catering to research scholars of various departments of the university. Some equipment such as Powder X-Ray Diffractometer, Electron Beam coating Unit, R.F. Induction Furnace, DTA etc. are also available in the department for PG dissertation and research studies.

## SAIF/CIL (PANJAB UNIVERSITY)

The Sophisticated Analytical Instrumentation Facility (SAIF)/Central Instrumentation Laboratory (CIL) formerly known as RSIC at Panjab University, Chandigarh was incepted in the earlier years of the 6<sup>th</sup> plan. The complete facilities of USIC, CIL, SAIF and RSIC are working in unison in the service of research and also for imparting practical training to the students through workshops. The Centre also undertakes the design, fabrication and repair of electronic instruments required by students and teachers from the University and the colleges around. It also runs training programmes in technical skills for the benefit of scientific community and associated laboratory staff from different institution.





The Centre houses the following Sophisticated Instruments: Transmission Electron Microscope (TEM) Hitachi (H-7500), Scanning Transmission Electron Microscope (SEM) Model JSM6100 (Jeol) with Image Analyser, Elemental Analyser for CHN (Thermo Scientific), FT-NMR Cryo-magnet Spectrometer 400 MHz (Bruker), X-ray Diffractometer (Powder Method). Panalytical X.Pert Pro, LC-MS Spectrometer Model Q-ToF (Micro Waters), Liquid Nitrogen Plant Stirling (StirLIN-1), FTIR Spectrophotometer Model RZX (Perkin Elmer), UV-VISNIR Spectrophotometer Model Lambda 750 (Perkin Elmer), WD-XRF Spectrometer ModelS8 (TIGER Bruker).

### HIGHLIGHTS OF THE TRAINING PROGRAM

The state-of-the art characterization techniques are imperative for revealing the fascinating and unprecedented features of novel materials of various scales viz. micro, nano, molecular and atomic scales. The aim of this 7-day training is to equip participants with fundamental knowledge and skills required to handle these techniques. The STUTI hands on training will be useful for Faculty/Scientists/Post-Doc Fellows/Ph.D. Fellows/Industry persons who are actively involved in Research and Development (R&D) practices in different areas of materials science, biomedical, pharmaceuticals, and allied fields.

## LEARNING OUTCOMES OF THE PROGRAM

At the end of the training, participants will be conversant with the following:

- Electrochemical Techniques- CV, CD, FRA
- Thermal techniques- TGA, DTA, DSC
- Spectroscopic Techniques- FTIR, UV-Visible, XRD
- Surface Analysis Techniques- Zeta Potential Analyzer, BET
- Vibrating Sample Magnetometry (VSM)
- ME/MR Loop Tracer
- P-E Loop Tracer
- Handling of samples and analytes
- Data Interpretation
- Quantification of data using software

## ORGANIZING COMMITTEES

Patron-in-Chief

**Prof. (Dr) Rajendrakumar Anayath,**  
**Hon'ble Vice Chancellor, DCRUST, Murthal**

STUTI Training Co-ordinator at DCRUST Murthal

**Prof. Ashok Kumar Sharma, Director CIL**

STUTI Training Co-coordinator

**Prof. Rajni Shukla, Chairperson, Dept. of Physics**

STUTI Training Co-ordinator at Panjab University, Chandigarh

**Prof. G.R. Chaudhary, Director, SAIF/CIL**

### **Printing & Purchase Committee**

Dr. Hari Om  
Dr. Vinit Kumar  
Sh. Rohit Ranga  
Sh. Raj Kanwar

### **Registration and Certificate Preparation Committee**

Dr. Priya  
Ms. Manisha  
Ms. Anupama  
Mr. Saurabh Sharma

### **Press Release and Photography Committee**

Dr. Pravesh Gehlot  
Sh. Dilbag Singh

### **Hospitality, Accommodation, Catering and Transport Committee**

Dr. Yogendar Sharma  
Ms. Swati  
Ms. Harita  
Sh. Dheeraj

### **TA / DA / Honorarium Payment Committee**

Dr. Ashok Kumar  
Sh. Sanjay Rathee  
Sh. Vikas Attri  
Sh. Raj Kanwar

### **Technical Assistance, Electrical Affairs and Sound System Committee**

Dr. Vinit Kumar  
Sh. Rohit Ranga

# Workshop Outline

Day-1 12 July, 2022	9:00 am – 10:00 am	<i>INAUGURAL SESSION</i>	
	10:00 am – 11:00 am	Lecture 1: Introduction and scope of High-End characterization techniques.	<i>Prof. G.R Chaudhary, Panjab University, Chandigarh</i>
	11:00 am – 11:15 am	<i>Tea Break</i>	
	11:15am – 12:45 pm	Lecture 2: An effective antimicrobial treatment of waste water using modified conducting polymer silver nanocomposites grafted into Activated Charcoal Membrane.	Dr. S. K. Dhawan Ex-Chief Scientist, CSIR-National Physical Laboratory, New Delhi
	12:45 pm – 1:15 pm	<i>Interactive Session</i>	
	1:15 pm – 2:00 pm	Lunch	
	2:00 pm – 6:00 pm	Experimental synthesis and characterization of nano-materials UV-visible and FTIR spectroscopy along with Differential Thermal Analysis.	CIL, DCRUST, Murthal
Day-2 13 July, 2022	9:00 am – 11:00 am	Lecture 1: Low-cost Production technologies for specialty mushrooms and entrepreneurial aspects.	<i>Dr. Ajay Yadav, MHU, Haryana</i>
	11:00 am – 11:15 am	Tea Break	
	11:15am – 12:45 pm	Lecture 2: Electrochemical characterization of conducting polymer grafted composite for energy storage.	Prof. Ashok K. Sharma DCRUST, Murthal
	12:45 pm – 1:15 pm	Discussion	
	1:15 pm – 2:00 pm	Lunch	



	2:00 pm – 6:00 pm	Cyclic voltammetry (CV), Charge-discharge (CD), Frequency Response Analysis (FRA) characterization.	Thin Film Lab, MV Block, DCRUST Murthal
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Day-3 14 July, 2022	9:00 am – 11:00 am	Lecture 1: Estimation of biological warfare agents using nanomaterials.	<i>Prof. Harish Kumar, Central University of Haryana</i>
	11:00 am – 11:15 am	Tea Break	
	11:15 am – 12:45 pm	Lecture 2: Experimental Synthesis of rare earth doped mixed ferrite for ferrofluid application.	Dr. Vinod Kumar NSUT, Dwarka, Delhi
	12:45 pm – 1:15 pm	Interactive Session	
	1:15 pm – 2:00 pm	Lunch	
	2:00 pm – 6:00 pm	Sample preparation and characterization using X-Ray Diffraction/VSM/ME/MR Loop Tracer, P-E Loop Tracer	DST-FIST Lab, MV Block, DCRUST Murthal

Day-4 15 July, 2022	9:00 am – 11:00 am	Lecture 1: Display Materials: Characterizations and their applications.	<i>Prof. Devender Singh, MD University, Rohtak</i>
	11:00 am – 11:15 am	Tea Break	
	11:15 am – 12:45 pm	Lecture 2: Principle, instrumentation and operation using Dynamic light scattering system.	Dr. Rishi Gupta, Applications Specialist, Characterization Division, Anton Paar India Pvt Ltd, Gurugram
	12:45 pm – 1:15 pm	Interactive Session	
	1:15 pm – 2:00 pm	Lunch	
	2:00 pm – 6:00 pm	Nano Particle characterization using Zetapotential and particle size analyser.	CIL, DCRUST Murthal

Day-5 16 July, 2022	9:00 am – 11:00 am	Lecture 1: Radiation induced modification of Materials and their applications	<i>Dr. Rajesh Kumar, G.G.S. I P UNIVERSITY, Delhi</i>
	11:00 am - 11:15 am	Tea Break	
	11:15am - 12:45 pm	Lecture 2: Metal oxides and biopolymer polymer conducting composite for sensing of heavy metals	Dr. Saroj K. Shukla Department of Polymer Science, Bhaskar Acharya College of Applied Sciences, Delhi University
	12:45 pm – 1:15 pm	Interactive Session	
	1:15 pm – 2:00 pm	Lunch	
	2:00 pm – 6:00 pm	Potentiometric sensing and Characterization of heavy metals	CIL, DCRUST Murthal
Day-6 18 July, 2022	9:00 am – 10:30 am	Lecture 1: Principle, operation and working of electron microscopes	SAIF CIL, Seminar Hall, PU, Chandigarh
	10:30 am - 10:45 am	Doubt and Troubleshooting Session	
	10:45am - 11:00 pm	Tea Break	
	11:00 pm – 12:30 pm	Lecture 2: Insights into fundamentals of SEM, FESEM and sample analysis method.	SAIF CIL, Seminar Hall, PU, Chandigarh
	12:30 pm – 1:00 pm	Doubt and Troubleshooting Session	
	1:00 pm – 2:00 pm	Lunch	
	2:00 pm – 5:30 pm	Hands-on training on SEM and FESEM (Sample preparation and analysis)	SAIF CIL, PU, Chandigarh
	5:30 pm – 6:00 pm	Interactive session - Queries, questions & trouble shooting	

Day-7 19 July, 2022	9:00 am – 10:30 am	Lecture 1: Principle, operation and working of HR-TEM	SAIF CIL, Seminar Hall, PU, Chandigarh
	10:30 am – 10:45 am	Doubt and Troubleshooting Session	
	10:45 am – 11:00 am	Tea Break	
	11:00 am – 12:30 pm	Lecture 2: Sample preparation and analysis using HRTEM	SAIF CIL, PU, Chandigarh
	12:30 pm – 1:00 pm	Doubt and Troubleshooting Session	
	1:00 pm – 2:00 pm	Lunch	
	2:00 pm – 3:00 pm	Feedback	
	3:00 pm – 6:00 pm	Valedictory	SAIF CIL, Seminar Hall, PU, Chandigarh

*Day 1*

**12-07-2022**  
**Tuesday**

## Inauguration

The DST supported seven days STUTI hands-on Training Program on “Advanced Instrumentation Techniques for Material characterization & Analysis” is started from 12<sup>th</sup>-19<sup>th</sup> July 2022 at the Department of Physics (FIST Assisted) & Central Instrumentation Laboratory (CIL), Deenbandhu Chhotu Ram University of Science and Technology (DCRUST), Murthal, Haryana, India under STUTI program in association with Sophisticated Analytical Instrumentation Laboratory (SAIF), Panjab University, Chandigarh.

The Scheme ‘Synergistic Training program Utilizing the Scientific and Technological Infrastructure’ (STUTI) is supported by the Department of Science and Technology, Government of India is intended to build human resources and its knowledge capacity through open access to S&T Infrastructure.

It envisions hands-on training and sensitization of the state-of-art instruments in various institutes/departments having availed schemes under FIST/PURSE/CURIE/SAIF/ SATHI schemes.

The training program is inaugurated with the patronship of Honorable Prof. Rajendra Kumar Anayatha, Vice-chancellor, (Patron-in-chief) DCRUST, Murthal, Worthy Prof. Suresh Kumar, Registrar, DCRUST, Murthal, and Prof. Ganga Ram Chaudhary, Director SAIF/CIL, Panjab University, Chandigarh. Prof. Ganga Ram Chaudhary is the Coordinator of the STUTI Program-PMU, PU, Chandigarh, and Guest of Honour in this training program.

Prof. Ashok K Sharma, Director, CIL, and Prof. Rajni Shukla, Chairperson, Department of Physics are the coordinators of the STUTI training program at DCRUST, Murthal.

Prof. Ashok K Sharma gives cordial welcome to the dignitaries and all the participants of the STUTI program. Highlights of the STUTI program and its learning outcomes are given to the participants. The program is going to be held for the first five days at DCRUST, Murthal while the last two days will be scheduled at SAIF, PU,

Chandigarh.

Prof. Ganga Ram Chaudhary, Director, SAIF, PU, Chandigarh emphasized the goals and visions of the STUTI scheme to the participants. Participants from different institutes/universities in India have been participating in this training program. The lab Manual of the training program is unveiled by all the dignitaries in the presence of all the participants.

Worthy Registrar Prof. Suresh Kumar addressed the participants and highly appreciates the efforts of the organizing committee members of the training program for the commencement of such a wonderful event. He critically mentioned the importance of material science and nano-science applications amongst the researchers keeping in mind the changing paradigm of technology.

Honorable Vice-Chancellor, Prof. Rajendra Kumar Anayatha, addresses the participants with the modern-day methods of research and technologies. Emphasization of the involvement of the amalgamation of the different fields of the sciences & its convergence into the research methods for success is discussed with the participants.

Prof. Rajni Shukla presents the vote of thanks to the dignitaries and wishes good luck to all the participants in the training program.

Many eminent resource persons are invited for delivering expert talks during the 7 days training program to impart participants with the basic knowledge and skills required to analyze different characterization techniques. Participants will be imparted hands-on training on several instruments such as Electrochemical Techniques-CV, CD, FRA; Thermal Techniques, Spectroscopic Techniques, Surface Analysis Techniques etc. Department of Physics & Central Instrumentation Laboratory (CIL), DCRUST, Murthal appreciates the remarkable efforts and commitments of the organizing members, technical staff and research scholars for the successful execution of STUTI supported training program.

The event is further graced by the presence of Dr. Priya Saharan, Dr. Indu & Dr. Vinit of CIL, DCRUST, Murthal.



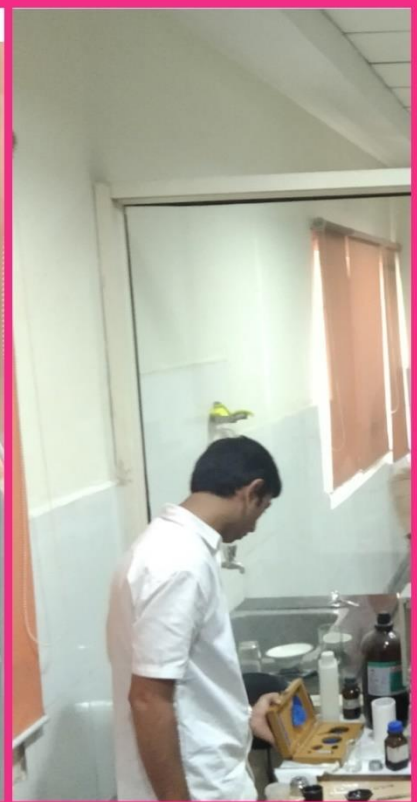




Professor G. R. Chaudhary has delivered a lecture on Introduction and scope of High-End characterization techniques. Various methods of synthesis and future applications of the instruments are discussed. A thorough case studies are discussed during the lecture.

Dr S K Dhawan delivered a lecture on effective antimicrobial treatment of waste water using modified conducting polymer silver nanocomposites grafted into activated charcoal membrane. The discussion on how to develop a process for the polymerization of pyrrole on activated charcoal membrane encapsulated with silver nanoparticles so that the resultant membrane can be used for removing e-coli from waste water.

During the second half, a hands-on training is imparted to the participants. Training on experimental synthesis and characterization of nano-materials UV- visible and FTIR spectroscopy along with Differential Thermal Analysis.



*Day 2*

**13-07-2022**  
**Wednesday**

Dr. Ajay Yadav, Registrar, Maharana Pratap University and Additional Director, HAIC Mushroom center, Murthal delivered a talk on low-cost production technologies for specialty mushrooms and entrepreneurial aspects.

Prof. Satish Khasa, department of Physics and Director Research, DCRUST delivered a lecture on optical and photoluminescence properties of rare earth doped alkali bismuth borate glasses. The discussion on how to fabricate electrode material via in situ oxidative polymerization methodology so that the resultant composite can be used for super capacitive application.

This process involves grafting of polyaniline polymer over carbon nanotube so that synergistic properties of composite further used for electrochemical properties and good cycle stability.

During the second half, hands-on training is provided to the participants on cyclic voltammetry (CV), Charge-discharge (CD), Frequency Response Analysis (FRA) characterization. Different samples were analyzed by the participants by the participants during the training.

Various doubts and queries of the participants were solved during the hands-on training.

Participants were felt knowledgeable and appreciated the efforts of the DST-STUTI for creating a platform where participants can be imparted with technical and practical knowledge.



*Day 3*

**14-07-2022**  
**Thursday**

Prof. Harish Kumar, Central University of Haryana delivered an expert talk on “Estimation of biological warfare agents using nanomaterials. Numerous doubts of the participants were solved during the session. Prof. Suman Lata, DCRUST, Murthal presented a talk on “Environment friendly and low-cost approach to control corrosion”. A discussion on the followings has been undertaken during the lectures.

- Synthesis of nano-size ferrite particles.
- Analysis of properties of developed materials using various characterization techniques like, powder X-ray diffraction, transmission electron microscope, vibrating sample magnetometer, electrical conductivity etc.
- Developed of ferrofluids from synthesized super-paramagnetic nano-particles.
- Applications of nano-magnetic particles and magnetic fluids by using their unique properties for the significant advancement in scientific technologies have been focused.

During second half, an interactive hands-on training on X-Ray diffraction/VSM/ME/MR/Loop Tracer was given to the participants. The sample preparation techniques, analysis and interpretation methods were learned by the participants. Praiseworthy feedback was given by the participants as they were satisfied with the imparted trainings.



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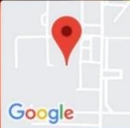


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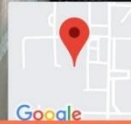
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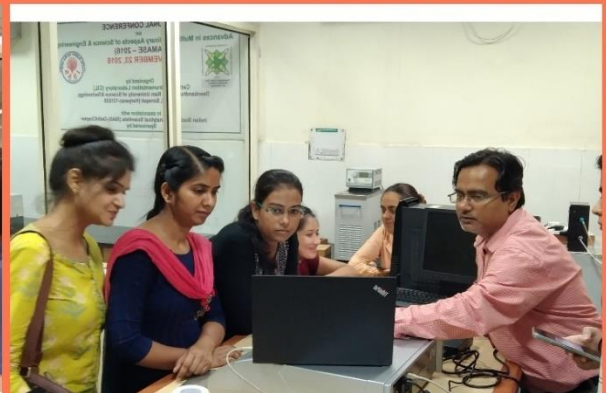
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GPS Map Camera



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GPS Map Camera





GPS Map Camera

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GPS Map Camera

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*Day 4*

**15-07-2022**  
**Friday**

Talearth doped mixed ferrite for ferrofluid application was delivered by Dr. Vinod Kumar, NSUT, Delhi. Saroj K. Shukla has delivered a lecture on metal oxides and biopolymer polymer conducting composite for sensing of heavy metals. The discussion on the basic requirement for interactive sensing substrate with reversible nature for repetitive applications with better sensing properties sensing range, response time, reproducibility and competitive accuracy has taken place.

During second half, an interactive hands-on training on Nano Particle characterization using Zeta potential and particle size analyzer. Praiseworthy feedback was given by the participants as they were satisfied with the imparted trainings.



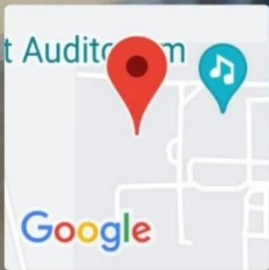
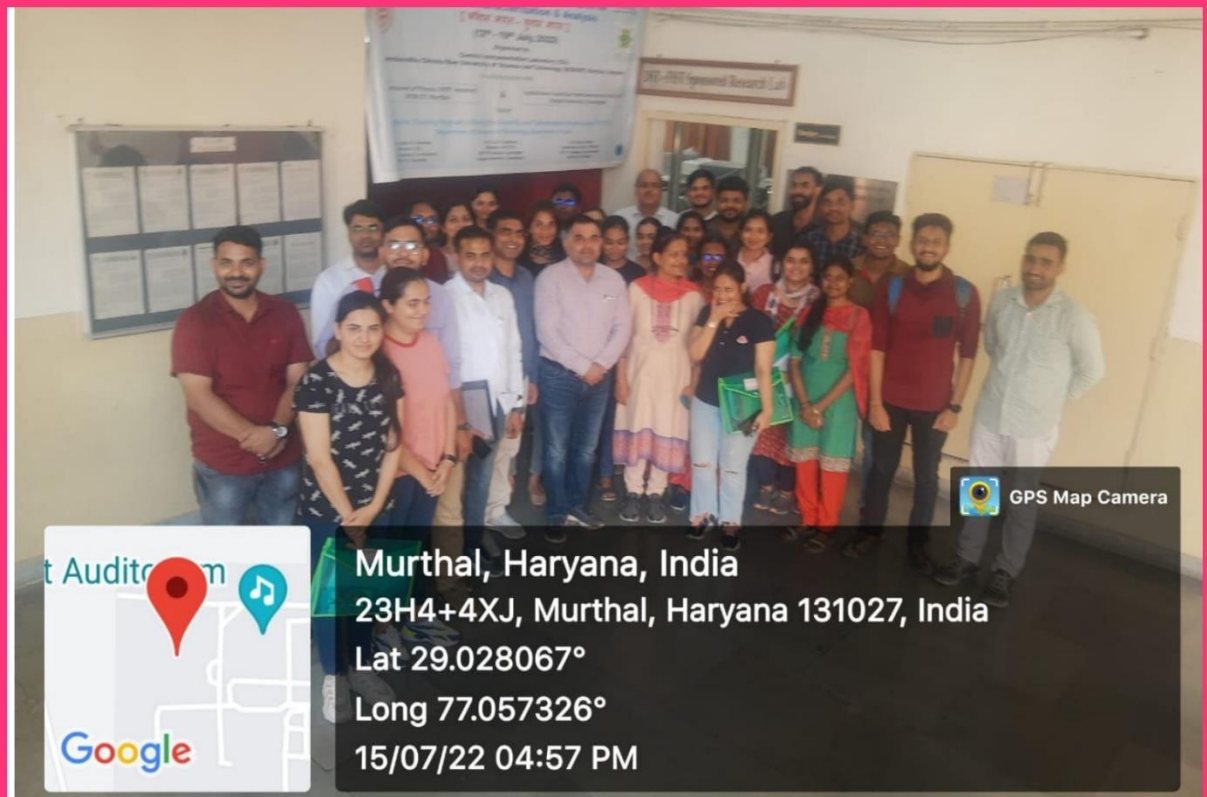
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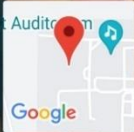
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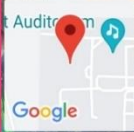
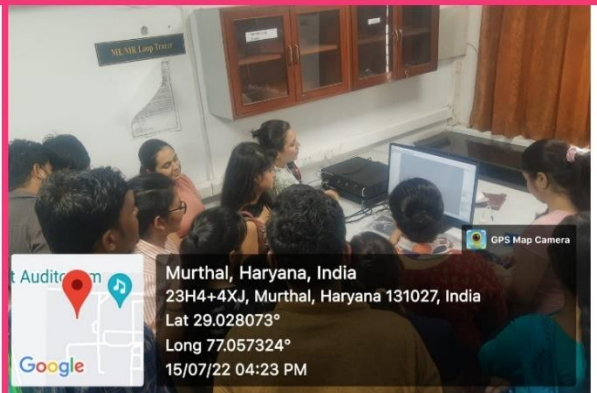
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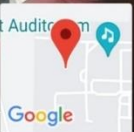
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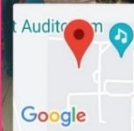
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15/07/22 03:24 PM



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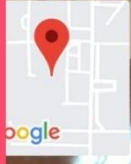
*Day 5*

**16-07-2022**  
**Saturday**

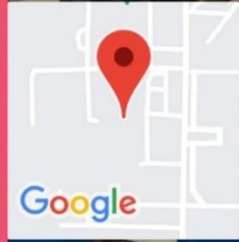
Expert talk on Display materials: Characterization and their applications was given by Prof. Devender Singh, MD University, Rohtak. Prof. Rajendra Kumar Anayatha, Vice-chancellor, also interacted with the participants. An interactive session followed by doubts and troubleshooting was occurred during the lectures.

During the second half, the hands-on training on particle characterization using Zeta potential and particle size analyzer was imparted to the participants followed by queries. Participants felt motivated and appreciated the efforts of the organizing committee of the Department of physics & CIL for providing practical training on instruments.

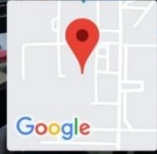




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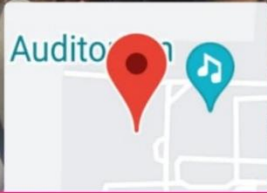


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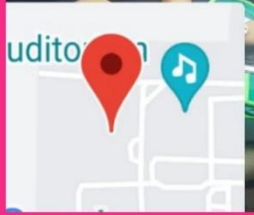


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*DAY 6*

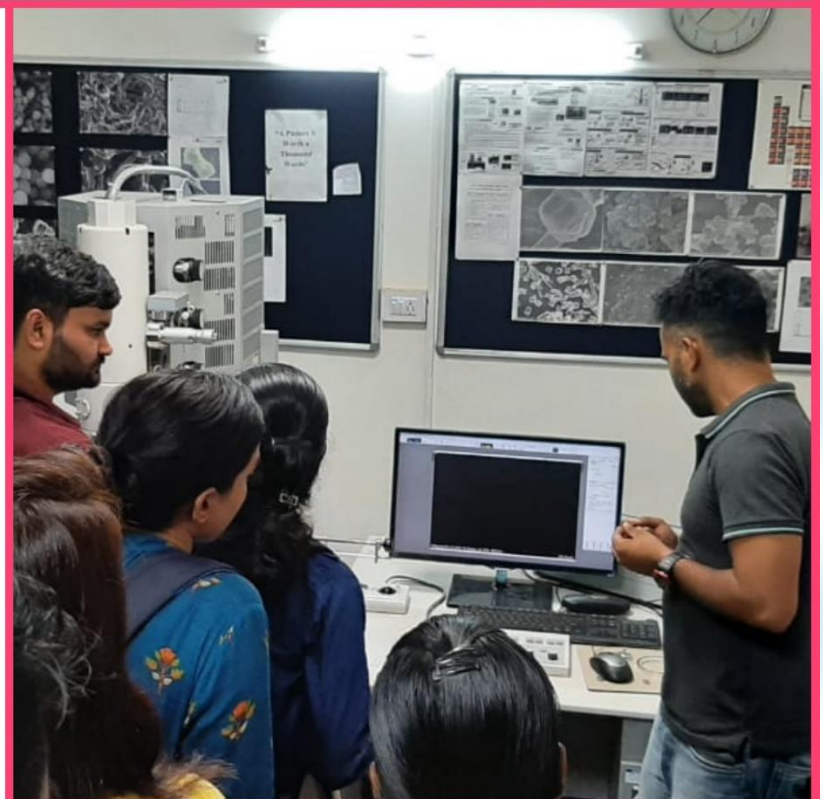
**18-07-2022**

**Monday**

Expert talk on Electron Microscopy: Fundamentals, applications and future advancement was given by Dr. Ramesh K Sharma, Panjab University, Chandigarh and Dr. Sandeep Kumar, GJUST, Hisar. An interactive session followed by doubts and troubleshooting was occurred between the experts and participants.

During the second half, the hands-on training on FESEM & HR-TEM was given to the participants followed by queries, doubts & Sample analysis. Participants felt motivated and appreciated the efforts of the trainer, experts & organizing committee of the SAIF, Panjab University, Chandigarh.





*DAY 7*

**20-07-2022**  
**Tuesday**

On the seventh day of the DST STUTI training program, the lecture on instrumentation & electron microscopy was given by the Er. H.P.S Kang, SAIF, PU, Chandigarh. A detailed discussion on working principle, interpretation and applications in different fields of research. The future advancement in an electron microscopy was also covered during the lecture.

The doubts of the participants were covered during the practical hands-on training on microscopy. Participants gained practical experience on confocal microscopy.

### VALEDICTION

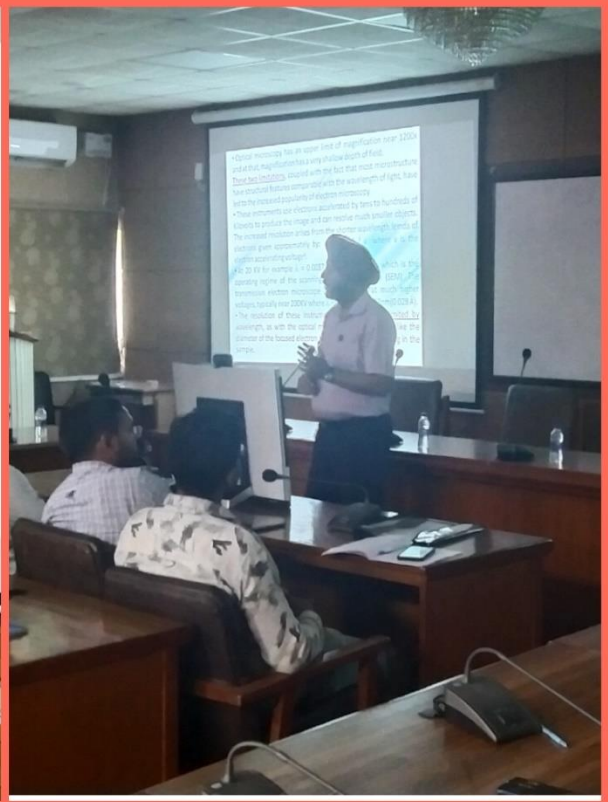
During the Valediction ceremony, the feedback of the participants, felicitation and certificate distribution took place. Dr. G S Kapur Ji, Executive Director IOCL, R&D Faridabad was the Chief Guest of Valedictory Function.

Participants felt motivated and appreciated the efforts of the organizing committee of the Department of physics, CIL, DCRUST & SAIF, Panjab University, Chandigarh for training and hands on experience.

Participants were thankful to the DST, Government of India, for creating platform where scientific knowledge and hands-on training of high-end instruments can be accessed easily.

They are also thankful for the free of cost analysis of their research samples.















*Keep on going*



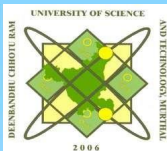
## List of participants

Date:  
12<sup>th</sup> July to 19<sup>th</sup> July 2022

Sr. No	Candidate Name	Gender	Educational Qualification	Institution Name
1.	ASHISH DUBEY	Male	RESEARCH SCHOLAR	Guru Ghasidas University Bilaspur, Chhattisgarh
2.	SHIVANGI RAO	Female	RESEARCH SCHOLAR	University of Delhi, Delhi
3.	SHIPRA VARSHNEY	Female	RESEARCH SCHOLAR	Guru Gobind Singh Indraprastha University, Delhi
4.	SHUBHAM PANDEY	Male	RESEARCH SCHOLAR	Institute Of Nuclear Medicine & Allied Sciences (Inmas-Drdo), New Delhi
5.	RAHUL KUMAR	Male	RESEARCH SCHOLAR	CSIR-NPL, Delhi
6.	MANSI DUBEY	Female	RESEARCH SCHOLAR	University of Delhi, Delhi
7.	NISARG RAVAL	Male	RESEARCH SCHOLAR	Department Of Physics, Saurashtra University, Rajkot, Gujarat
8.	SWEETY	Female	RESEARCH SCHOLAR	DCRUST, Murthal, Haryana
9.	USHA RANI	Female	RESEARCH SCHOLAR	Kurukshetra University, Haryana
10.	KAJAL SAINI	Female	RESEARCH SCHOLAR	YMCA, Faridabad, Haryana
11.	POOJA DEVI	Female	RESEARCH SCHOLAR	Guru Jambheshwar University of Science and Technology, Hisar - Haryana
12.	TARUNAA SHARMA	Female	RESEARCH SCHOLAR	Guru Jambheshwar University of Science and Technology, Hisar - Haryana
13.	DEEPAK SHARMA	Male	RESEARCH SCHOLAR	DCRUST, Murthal, Haryana
14.	DEEPAK PARMAR	Male	RESEARCH SCHOLAR	MDU, Rohtak, Haryana
15.	CHANKIT	Male	RESEARCH SCHOLAR	DCRUST, Murthal, Haryana
16.	PIYUSH SIROHA	Male	RESEARCH SCHOLAR	Central University of Haryana
17.	AKSHAY KUMAR	Male	RESEARCH SCHOLAR	Central University of Haryana
18.	Aaqib rashid	Male	RESEARCH SCHOLAR	Nit Srinagar, Jammu & Kashmir

19.	KUMAR ABHISEK	Male	RESEARCH SCHOLAR	Central University of Jharkhand
20.	M. NITHYA LAKSHMI	Female	RESEARCH SCHOLAR	Periyar University, Tamil Nadu
21.	HANNA K H	Female	STUDENT	MES College Marampally Aluva, Kerala
22.	DR. BENJAMIN HUDSON BABY	Male	ASSISTANT PROFESSOR	MES College Marampally Aluva, Kerala
23.	VINEET SAHU	Male	RESEARCH SCHOLAR	Barakatullah University Bhopal, Madhya Pradesh
24.	KISHOR VINOD PATIL	Male	RESEARCH SCHOLAR	Shivaji University, Kolhapur, Maharashtra
25.	SATISH SAMBHAJI PHALAKE	Male	RESEARCH SCHOLAR	Dy Patil University Kolhapur, Maharashtra
26.	KESHU	Female	RESEARCH SCHOLAR	NIT, Jalandhar, Punjab
27.	E ARUL KUMAR	Male	RESEARCH ASSOCIATE	Savita School Of Engineering, Chennai, Tamil Nadu
28.	N SUMATHI	Female	RESEARCH SCHOLAR	Chikkaiah Naicker College, Tamil Nadu
29.	ASARANYA	Female	RESEARCH SCHOLAR	Chikkaiah Naicker College, Tamil Nadu
30.	M. KALAIYARASI	Female	RESEARCH SCHOLAR	Arignar Anna Govt Arts College Cheyyar, Tamil Nadu
31.	R. Kandeegan	Male	RESEARCH SCHOLAR	Kongunadu Arts and Science College, Tamil Nadu
32.	ALKA	Female	RESEARCH SCHOLAR	Banaras Hindu University (BHU), Varanasi, Uttar Pradesh
33.	ANAND MAURYA	Male	RESEARCH SCHOLAR	Banaras Hindu University (BHU), Varanasi, Uttar Pradesh





## Central Instrumentation Laboratory (CIL) Deenbandhu Chhotu Ram University of Science and Technology (DCRUST), Murthal



- We invite young and experienced researchers, R&D Labs, MSME and Industries to make use of the instrumentation facilities available with CIL, DCRUST, Murthal.
- Samples submission for CIL Instruments will be accepted only through prescribed requisition form available at webpage <https://dcrust.edu.in/central-instrument-laboratory>.
- Tel.: 0130- 2484113 | E-mail: [directorcil@dcrustm.org](mailto:directorcil@dcrustm.org).