

# Insight and Hands on Training Program on Analytical Techniques in Chemical, Physical and Biological Sciences



**PROCEEDINGS**

***4<sup>th</sup> – 10<sup>th</sup> November, 2022***

***Organized by***

**Department of Chemistry, University of  
Kashmir, Hazratbal, Srinagar, J&K**

***In association with***

**Sophisticated Analytical Instrumentation  
Facility (SAIF), Panjab University,  
Chandigarh**



# Insight and Hands on Training Program on **Analytical Techniques in Chemical, Physical and Biological Sciences**

4<sup>th</sup> – 10<sup>th</sup> November, 2022

*Under the aegis of*

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



*Organized by*

**Department of Chemistry, University of Kashmir, Hazratbal, Srinagar, J&K**



*In association with*

**Sophisticated Analytical Instrumentation Facility (SAIF), Panjab University,  
Chandigarh**

# Organizers



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**Dr. Dar Aijaz Ahmad,**  
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Member



**Prof. Nilofar Khan**  
**Vice Chancellor,**  
**University of Kashmir,**  
**Hazratbal, Srinagar**

## **Message**

A warm welcome to all the participants of the Seven Days Training Program entitled “**Insight and Hands on Training Program on analytical Techniques in Chemical, Physical and Biological Sciences**” under the aegis of Synergistic Training Program Utilizing the Scientific and Technological Infrastructure (STUTI), an initiative of Department of Science and Technology (DST) at Department of Chemistry, University of Kashmir, Srinagar in association with Sophisticated Analytical Facility (SAIF)/Central Instrumentation Laboratory (CIL), Panjab University, Chandigarh, performing their role as Project Management Unit (PMU). This would be a wonderful platform which has been designed to cater to human resource and its capacity building through open access to Science & Technology Infrastructure across the country by organizing short term courses/workshops on the awareness, use and application of various instruments and analytical techniques.

I extend my warm wishes to Department of Chemistry, University of Kashmir, for taking initiatives and advantage of such opportunities to host these Hand on Training. I am very happy that the allied departments like Department of Botany, Department of Physics, Department of Earth Sciences, Department of Bioresources and Department of Zoology participated in organizing the programme to make the training programme truly an interdisciplinary one.

Techniques involving material characterization, spectroscopy, analytical methods related to food science, biotechnological methods etc. will strengthen various fields in broadening their research. Apart from this, it will aid various researchers and scientists from different parts of the country as well as from the region itself to collaborate with each other in order to utilize their expertise. The program sensitizes the candidates with important analytical techniques related to chemical, physical and biological sciences which is relevant and in line with the trends in the current research fields.

I am sure that the endeavors of the organizing team/committee will be fruitful accomplishment. I wish programme to be very successful in all respects that will provide confidence in research to our faculty and young students.

**(Prof. Nilofar Khan)**



**STUTI Coordinator-PMU  
Panjab University  
Chandigarh**

## **Message**

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 (DST) for choosing us to act as a Program Management Unit (PMU) and feel proud to be a part of this program.

The Training program on “**Analytical Techniques in Chemical, Physical and Biological Sciences**” at the Department of Chemistry, University of Kashmir, Hazratbal, Srinagar, J&K has provided practical hands-on training on sophisticated instruments and their use in chemical, physical and biological sciences such as Rheometer, GC-MS, DSC, Spectrophotometer, XRD etc.

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

**(Prof. G. R. Chaudhary )**



**Head,  
Department of Chemistry,  
University of Kashmir,  
Hazratbal, Srinagar**

## **Message**

It is my privilege to welcome all the participants to University of Kashmir. This seven day training programme on “**Insight and Hands on Training Program on analytical Techniques in Chemical, Physical and Biological Sciences**”, is being organized by The Department of Chemistry, University of Kashmir, under the aegis of STUTI in collaboration with SAIF/CIL, Panjab University.

This training program will surely help young researchers from various institution across the country and J&K with the basic as well as advanced techniques in Basic Medical Sciences and Research. The training curriculum includes the hands-on training sessions of various analytical techniques like food analysis, rheology, spectroscopy, electrochemistry, VSM, ELISA, tissue culture, HPLC, ground penetrating radar system, etc cutting across the barriers of biological, chemical and physical sciences. These sessions would help students and researchers in multidisciplinary fields to gain a better understanding of the various techniques. I am sure each one of you shall gain from this workshop and it shall be helpful in enhancing your research skills.

In addition, I must mention that the support and assistance by the faculty members and staff from our allied departments which include Earth sciences, Botany, Zoology, Bioresources and Physics has been the strong driving force behind organizing this program. I extend my sincere thanks to each of these departments for their cooperation, support and hard work.

**(Prof. Syed Wajaht Amin Shah)**



**Organizing secretary,  
Department of Chemistry,  
University of Kashmir,  
Hazratbal, Srinagar**

## **Message**

I, on the behalf of organizing committee, welcome all the participants for the seven days training programme on “**Insight and Hands on Training Program on analytical Techniques in Chemical, Physical and Biological Sciences**”, being organized by The Department of Chemistry, University of Kashmir, under the aegis of STUTI in collaboration with SAIF/CIL, Panjab University.

Training program encompasses insights and hands-on training on sophisticated instruments used in Chemical, physical and biological sciences such as Rheometer, HPLC, Stopped flow kinetic system, Carbon Analyser, Kjeltex, Soxtec, Bomb Calorimeter, High frequency Impedance Analyzer, Vibrating Sample Magnetometer, UV-Vis Spectrophotometer, Differential Scanning Colorimeter (DSC), Electrochemical workstation, SECM, Microwave Synthesizer, FT-IR and ELISA Reader. This training program will primarily help the participants who are seeking basic and advanced level training in basic sciences-based techniques to get insight into their research. The training program enhances the working horizon among faculty, post-doc fellows, and PhD Fellows. This training program will play a vital role in understanding importance of these analytical techniques in cutting edge research in physical, chemical and biological sciences.

We hope that this training program will stimulate new ideas and approaches for pursuing their respective research and enhance skills in the interdisciplinary scientific fields. I wish all participants a fruitful attendance and involvement in the event and hope that this training program is productive. Thank you for your participation and we wish you a very enjoyable stay in Kashmir.

**(Dr. Aijaz Ahmad)**

### **Brief overview of the general schedule of the program**

There were two scheduled sessions in each day of the program, the morning session (Session-1) and the afternoon session (session-2). In the session-1 lectures were delivered by the experts, and at the end of the lecture each expert was felicitated with a token of gratitude in the form of a momento belonging to the culture of Kashmir. In the session-2 the participants were given hands-on training on various instruments in the departments of Chemistry, Botany, Zoology, Physics and Bio-resources. The participants were divided in 5 different groups with each group consisting of maximum of six participants. The participants attended each hands-on session on group rotation basis.

The program started on 4<sup>th</sup> November 2022 (Friday) with inaugural session and lecture 1 in the old committee room of the administrative block. Later the participants joined the hands-on session in the department of Chemistry. The venue selected for day-2 was the department of botany and zoology where two lectures were delivered in the morning session followed by hands-on session. On day-3 the venue was department of physics and bio-resources where again two lectures were given by the experts followed by the hands on session. From day-4 to day-7 of the training program the venue for morning session was department of earth sciences followed by hands-on session in the department of chemistry.



## DAY-01

Department of Chemistry, University of Kashmir in association with Sophisticated Analytical Instrumentation Facility (SAIF) Panjab University, Chandigarh hosted one week program on, ***“Insight and hands-on training program on analytical techniques in chemical, physical and biological sciences”*** under the aegis of Synergistic Training Program Utilizing the Scientific and Technological Infrastructure (STUTI) from 4<sup>th</sup> – 10<sup>th</sup> November, 2022.

The STUTI scheme involves building of human resources and their knowledge capacity through open access infrastructure across the country. As a compliment to the various schemes of the Department of Science and Technology (DST) the funding for the expansion of research and development infrastructure at academic institutions, the scheme envisions a hands-on training program and sensitization of the state of the art equipment as well as towards sharing while ensuring transparent access to science and technologies facilities.

In the morning of day-1, the session was inaugurated in the presence of worthy chief guest, Prof. Farooq Masoodi (Dean Academic Affairs, University of Kashmir), Prof. Irshad A. Nawchoo (Dean Research, UoK), Dr. Nisar Ahmad Mir (Registrar, UoK), Prof. Syed Wajaht Amin Shah, (Head, department of Chemistry UoK), Dr. Aijaz Ahmad Dar (Associate Professor, department of Chemistry), the organizing secretary of the STUTI training program, the other faculty members of the department of chemistry and other allied departments, and the participants. Prof. Ganga Ram Chaudhary, director SAIF, Chandigarh was the Coordinator of the STUTI Program.

Prof. Masoodi in his presidential address, impressed upon the optimal use of high-end scientific equipment, calling its improper usage and care as a great disservice and injustice to the scientific community. He added that the training programmes like STUTI can facilitate collaborations and promote academic and intellectual growth of the participants. Dean research, Prof. Irshad A Nawchoo called for possessing “right knowledge and skills” on use of scientific equipment, even as he underscored the need for scholars and faculty to maintain the “equipment use register”. Registrar, Dr. Nisar impressed upon young faculty members to formulate project proposals keeping in view their societal viability with clear-cut society-oriented deliverables. He also called for proper upkeep of the equipment. The Head, Department of Chemistry Prof. Syed W A Shah welcomed and introduced the STUTI scheme to the audience and also talked about the

FIST and PURSE-assistance of the department of chemistry making it eligible to host the hands-on training programme, being held under the banner of 'Azadi ka Amrit Mahotsav'. He also thanked SAIF for collaborating with the department of Chemistry for the programme which offers both theoretical and practical insights to the participants.

The STUTI Program was attended by the Ph. D. scholars and assistant professors from different disciplines of science from various universities and colleges across India which include, institutions from Himachal Pradesh, Chandigarh, New Delhi, Uttar Pradesh, Gurugram, Bihar, and Jammu and Kashmir. During the whole program, a number of eminent speakers from different Universities and Institutions were invited to speak on various instrumentation techniques followed by the hands-on-training.

Here are few glimpses of the inaugural session on Day 1



The inaugural session was followed by the short tea break and after that first lecture of the day 1 and also of the STUTI program.

The first lecture was delivered by Prof. Bikram Singh Bali, Department of Earth Sciences who highlighted and emphasized *the importance of Ground Penetrating Radar (GPR) for geophysical and environmental applications*. He explained GPR as a geophysical survey method that uses pulses of radiation to image the subsurface. Later after his lecture his research students further demonstrated the real time working of GPR in the lawns of department of Chemistry.



The lecture by Prof. Bikram Singh Bali marked the end of the first session of the Day-1.

In the second session, the hands-on training was conducted on various instrumentation techniques in the Department of Chemistry. The participants were divided into different groups with a maximum of 6 participants in one group. During the session the participants learned operation and running experiments on different instruments such as, FT-IR, Microwave

Synthesizer, Rheometer, HPLC, CV Potentiostat, SECM, DLS, Densitometry, UV-Visible spectrophotometer and Spectrophotofluorometer. The protocol for each experiment was handed over to each participant prior to the experiment. The participants were made to do the experiment on their own under the guidance of the expert of the instrument.

Here are given some glimpses of different hands on sessions held on Day 1 where different groups can be seen performing different techniques. The hands on session marked the end of the day 1 of the one week program.



## DAY-02

The first session of the Day-2 of STUTI program held in departments of botany and zoology started with the lecture of Dr. Masood Ahmad Rizvi, senior Assistant professor department of Chemistry, University of Kashmir. Dr. Masood talked about *analytical monitoring of chemico-biological interactions*, in which he discussed the pH sensing of Harmol, characterization of the structural changes in BSA proteins and conformation of their complexation with drug molecules along with the detection of major binding sites by making use of the simplest instruments like UV-Visible Spectrophotometer and Spectrofluorometer. Dr. Masood in his lecture explained how in general, these simple and basic equipments can be utilized for the identification and characterization of minute structural changes at molecular level.



The second and final lecture after tea break of the session 1<sup>st</sup> on day 2 was delivered by Dr. Imtiaz Ahmad Khan, Assistant Professor, Department of Zoology, University of Kashmir. He talked about *the analytical techniques in food chemistry with special emphasis on protein, fat and energy content of major feed ingredient*. In his lecture shed light on the importance of analyzing the food stuffs for food industry, which assesses the quality of the original raw materials and its maintenance during the processing, transportation and storage. He discussed

some of the modern food content analyzing techniques employed in food chemistry such as Protein analysis by Kjeldhal method (Kjeltec), fat by soxlet extraction method (Soxtec) and energy estimation by Bomb calorimetric method. In his lecture, he explained the principle, construction, working and applications of these techniques in detail.



The lecture was followed by the usual lunch break a glimpse of which is given here.



In the 2<sup>nd</sup> session of the day, the participants performed hands on training on Kjeltec, Soxtec and Bomb Calorimeter in the department of zoology by Dr. Imtiaz Ahmad Khan, and, Microbial Identification System and Carbon Analyzer in the department of botany by Professor Manzoor Ahmad Shah. Dr. Khan along with his team of experts, demonstrated to the participants that how the sample can be prepared for the determination of protein, fats and energy content by using modern equipments like Kjeltec 8400, Soxtec 2050 and Bomb calorimeter 6400. In addition, the participants were also familiarized with the usage of Spectroscopy based NIR system used in feed industry for the analysis of major nutrients from the feed in one go without involving any wet-method. In the department of Botany, team of Prof. Manzoor demonstrated the working and functional attributes of the equipment used in microbial identification and carbon analyzer.



### **DAY-03**

The first session of the Day-3 of STUTI program held in department of Physics and Bio-resources commenced with the speech of Dr Manzoor Ahmad Mir, Assistant Professor department of bio-resources who spoke about “Enzyme Linked Immunosorbent Assay (ELISA) as a Diagnostic Technique for the Detection of Diseases”. Dr. Manzoor talked about Hepatitis as the global health problem , in particular the huge increase in chronic hepatitis cases in India due to Blood borne –Hepatitis B & C with an approx. in his informative lecture Dr. Manzoor said, Hepatitis Infection is caused by five hepatitis viruses – A, B, C, D, and E (HAV, HBV, HCV, HDV, and HEV). Hepatitis B and C are responsible for 96% of overall hepatitis mortality. According to regional studies, there are 6-12 million people with Hepatitis C in India. As per WHO data, in 2019, 58 million people lived with chronic hepatitis C infection, resulting in about 400,000 deaths each year. As per studies, Chronic HCV infection accounts for 12-32% of HCC and 12-20% of cirrhosis in India.

The majority of Chronic HCV infections remain undiagnosed as persons suffering from HCV usually do not have any symptoms. However, these patients develop symptoms later, i.e., advanced liver disease. Such untreated infections can lead to life-threatening complications; Cirrhosis and Hepatocellular Carcinoma (HCC) account for increased death rates. Considering the disease burden, the WHO global health sector strategy on viral hepatitis has now set an ambitious goal to eliminate this as a public health threat by 2030. Since there is no vaccine for hepatitis C, the best way to prevent & reduce the spread of hepatitis C is to get tested for HCV and take timely treatment, as it takes 8 -12 weeks to cure the patient having HCV infection. Nucleic Acid Amplification Testing (NAT) remains the gold standard for confirming HCV infection. However, due to limitations of NAT and technological innovation, 4th generation HCV tests based on simultaneous detection of Core Antigen and anti – HCV (core and non-structural) are found to be the best alternative as a diagnostic method for early detection of recent HCV infection. HCV core Antigen can be detected between 12-15 days after infection and hence 4<sup>th</sup> generation HCV test become positive as early as the HCV RNA assay and thus reducing the window period by 5-7 weeks for HCV acute infection in comparison to 3rd generation HCV test based on only antibody detection. The fourth generation ELISA test based on core antigen and anti-HCV detection is the best diagnostic screening method with higher sensitivity and



specificity. In addition, batch processing of Samples can result in a quick turnaround (less than 3 hours) when working with the ELISA method.



The 2<sup>nd</sup> lecture of the 3<sup>rd</sup> day was presented by Prof. Basharat Ahmad Want, department of Physics. He talked about *The First order reversal curves: A novel method for characterization of magnetic system*. In his lecture he gave introduction about vibrating sample magnetometer (VSM) for studying magnetic properties of materials. He gave some insight on measuring and construction and characteristic of FORC diagrams. He discussed about M-H loops also. The M-H loops are referred to as the key characteristic tool that determine how external perturbations like electrical or magnetic fields influence the magnetic character of a material. The parameters such as coercivity, saturation magnetization etc, derived from these M-H loops present bulk averages of the magnetic properties of all particles in a sample. However, to seek information beyond the scope of hysteresis loop measurements such as interaction or coercivity distribution, another technique becomes necessary. A more sophisticated approach for investigating the deep insight of the magnetic material is the First Order Reversal Curves (FORC). The First Order Reversal Curves (FORC) method is a novel approach for characterizing the magnetic materials. FORC method provides a way for evaluating the coercivity distribution, interaction fields between magnetic particles, irreversible magnetization components and for differentiating between magnetic mixtures in composite materials, which contain more than one magnetic phase. The FORC method was presented and discussed. FORC diagrams of some magnetic systems such as spinel ferrites and some iron oxide systems were also displayed.



The lecture of both speakers were followed by question answer sessions, in which the speakers cleared the doubts of the audience.

The second lecture was followed by the usual lunch break after which second session i.e. the hands on session started.

In the second half of the day 3<sup>rd</sup>, hands-on training was conducted on Immunological ELISA reader for the detection of Antigen- Antibody in the department of Bio-resources by Dr. Manzoor Ahmad Mir along with his team and the other VSM for studying magnetic properties of materials by and Prof. Basharat Ahmad Want and his team in the department of Physics.

Dr. Manzoor demonstrated the assay based upon the two- step indirect method. In the first step, sample and recombinant HCV coated microwells are combined. During the incubation, the Anti-HCV present in sample binds to the antigen coated on the wells. After the washing, in the second step, enzyme conjugate is added to the reaction mixture during incubation, the Anti-HCV present in the sample reacts with mouse Anti-human IgG within enzyme conjugate. Then a complex is generated between the solid phase, the Anti-HCV within the sample and mouse Anti-human IgG in the enzyme conjugate by immunological reactions. After a second washing, substrate A and substrate B are then added and catalyzed by this complex, resulting in a chromogenic reaction. The resulting chromogenic reaction is measured as absorbance. The color intensity is proportional to the amount of Anti-HCV in the sample.

Prof Basharat gave a detailed demonstration to the participants on the working principle of VSM wherein he showed the dependence of magnetic behavior of a sample on the applied voltage.





## DAY-04

The 4<sup>th</sup> day of STUTI program started with the expert talk on "Importance of Patents in Designing and Conducting Scientific Research" by Dr. Yogesh Nagpal, head of operations and co-founder of Patent Research and Analytical Business Winsome Intellectual property Solutions LLP. . The speaker discussed the fundamental notion while stressing the importance of Intellectual Property Rights in scientific research and its different forms. Dr. Nagpal emphasized that intellectual property (IP) relates to mental creations such as discoveries, inventions, literary and artistic works, designs, and commercially exploited symbols, names, and pictures. IP is legally protected by means such as patents, copyright, and trademarks, which enable individuals to get recognition or financial gain for their inventions or creations. The objective of the IP system is to establish an environment where creativity and innovation can flourish by finding a balance between the interests of innovators and the broader public interest. The speaker also educated the audience on the significance of establishing research projects to target specific applications so that the results can be patented. He described the many stages of the patenting process and the precautions that must be followed before and after patenting a work. He presented several case studies of innovative job design that can lead to a patent. The speaker also covered several aspects of innovations in IPR in relation to the chemical sector, elaborating that the innovation aspect can generate Intellectual Property (IP) - intangible assets that can be utilized to create value by a company.





The second lecture of the session 1 was delivered by Dr. Mohsin Ahmad Bhat, Associate Professor, Department of Chemistry, on “*Analytical application of Dynamic Electrochemistry*”. Dr. Mohsin demonstrated the research interests linked to classical dynamic electrochemistry which is helpful in analytical Chemistry. Challenges, future prospects of the area were given thrust. The speaker introduced cyclic voltammetry as a dynamic technique for characterization of various materials and correlated it with other fields of science like Microbiology for cell count, Biochemistry and Biotechnology (Sensing of Biomarkers), Environmental sciences etc. The speaker also explained the aspects of innovations that can be custom designed for these sorts of analytical experiments so as to maintain cost effectiveness and affordable versions. Later, the speaker also discussed the aspects of high-end electrochemistry vis a viz SECM employed in imaging of electro-active and electro-catalytic systems, a modern tool for analytical chemistry.

In the 2<sup>nd</sup> session of the day-4, Hands-on training was conducted in the department of Chemistry on turn on various techniques- - FT-IR, Microwave Synthesizer, Rheometry, HPLC, SECM, DLS, Densitometry, UV-Visible spectrophotometry and Fluorometry.



## DAY-05

The first lecture on the 5<sup>th</sup> Day of STUTI was delivered by Dr. Aijaz Ahmad Dar, Associate Professor, Department of Chemistry on the “basics of rheology and its multidisciplinary applications”. Dr. Aijaz focused on the viscoelastic behavior of the materials by discussing the three models like Dashpot model for Viscosity, spring model for Elasticity, and Maxwell and Voigt model for viscoelastic behavior. The speaker spoke about the significance of rheology in multiphase systems (dispersions, sols, emulsions and gels and macromolecular systems -polymer melts and solutions). He spoke about the rheometer equipment and explained how its oscillatory and rotational modes can be employed to know the material's viscoelastic behavior. Dr. Aijaz described oscillatory rheological tests, highlighted the amplitude sweep, frequency sweep, time sweep, temperature sweep, and oscillatory thixotropy tests and also highlighted their importance. The speaker spoke about thixotropic and rheopectic fluids and explained how their flow behavior is time-dependent. He also talked about how storage modulus ( $G'$ ) and loss modulus ( $G''$ ) changes over time, which provides information about the material's recovery. Dr. Aijaz talked on rheology's numerous terminologies, such as Magneto-Rheology, Electro-Rheology, and Hyphenated Rheology methods. The speaker also informed the participants about the applications of rheology in biomaterials, such as dentures, bone fillers, 3D-printed organs, Hydrogel wound dressings, and soft tissue engineering, among others.

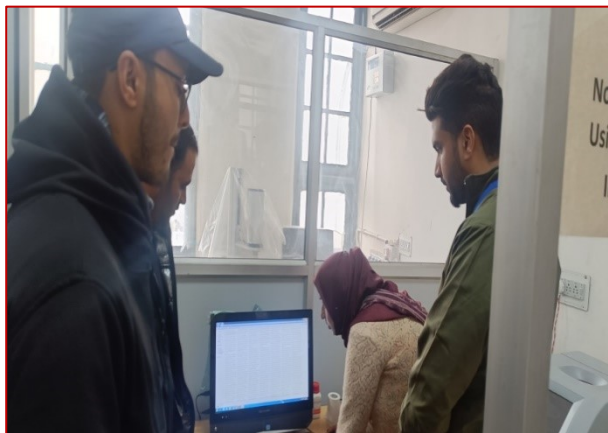
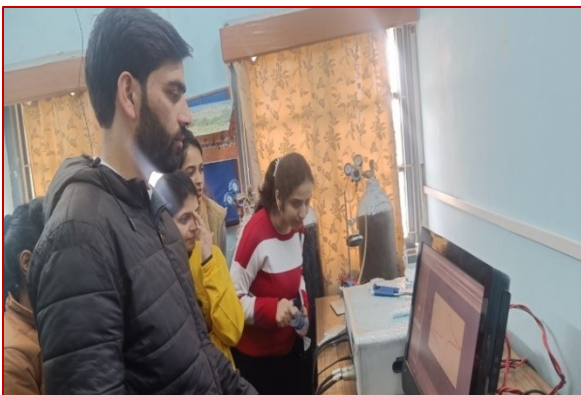




The lecture second Day-5 was delivered by Prof Syed Wajaht Amin Shah, HOD, Department of Chemistry who discussed the chromatographic technique, as a way to separate a mixture into its individual components through equilibrium distribution between two phases. It is essentially based on the disparity in the rates at which the components of the mixture move through a porous medium (SP) under the influence of a gas or liquid (MP). The speaker explained to the audience how chromatography is classified based on a number of factors, including gas, liquid, and supercritical fluid chromatography (based on geometry), adsorption, affinity, partition, and ion exchange chromatography, as well as molecular exclusion chromatography (based on stationary phase). Prof. Wajaht also spoke about HPLC instrumentation, covering topics including the instrument's pump, injector auto-sampler, HPLC column, detector, and waste. Additionally, he discussed HPLC in reverse and normal phases, as well as the proper employment of stationary and mobile phases and their component parts. Prof. Wajaht talked on the uses of HPLC, such as in the pharmaceuticals, in forensic testing, and in the analysis of environmental contamination.



Hands-on training was conducted in the Department of Chemistry in the second session of the Day -5 on various techniques- - FT-IR, Microwave Synthesizer, Rheometry, HPLC, SECM, DLS, Densitometry, UV-Visible spectrophotometry and Fluorometry. The groups did their experiments as per their schedule.



## DAY 6

The day-6 of the STUTI program started with the expert talk on Design and synthesis of chemosensors for environmental analysis by Prof. Narinder Singh, Department of Chemistry, IIT Ropar. Dr. Singh laid emphasis on the sensing of different pollutants like mercury ( $\text{Hg}^{2+}$ ) and other industrial pollutants. Dr. Singh demonstrated different instruments that he and his research group developed in his lab to detect the pollutants. This real time application of his work was wonderful and eye-catching. Also, the solid-state synthesis of various fluorophores from organic wastes by ball milling technique, hence turning waste to wealth was one of his greatest achievements in the field of environmental chemistry. Dr. Singh also highlighted the importance of collaboration in the research.



The lecture 2<sup>nd</sup> of the session was delivered by Dr. Ramesh K. Sharma, SAIF/CIL, Panjab University, Chandigarh. He delivered the lecture entitled “**Basics and Applications of Mass Spectrometry**”. He enlightened the participants about the core concepts of Mass Spectroscopy in which he discussed about the hardware, software, and operation of mass spectrometer. Dr. Ramesh discussed various applications of this instrument in various fields of research like chemistry, physics, biology etc..



In  
the

second half of the 6<sup>th</sup> day, the hands-on session commenced as usual in the department of Chemistry on Fluorometry, HPLC, Rheometry, FT-IR, Microwave Synthesizer, SECM, DLS, Densitometry, and UV-Visible spectrophotometry. The participants learned how to handle the aforementioned instruments and performed the experiments on their own.



## DAY-07

The day-7 of the STUTI commenced with the lecture of Director SAIF/CIL Prof. Ganga Ram Chaudhary, the Coordinator of STUTI Program, Panjab University. He threw light on the importance of conducting STUTI programs all over the country and how researchers and other students get benefitted with these programs by acquiring skills of handling and operating multifarious instruments applicative in the distinct research areas. Later on, he continued his lecture on “Nanoparticles” in which he emphasized their significance and how to synthesize them. The speaker also mentioned some of his prominent works from his research lab on nanoparticles. He also talked about the Patents he has filed. The speaker concluded his talk by expressing his gratitude to the Organizer STUTI, Aijaz Ahmad Dar for organizing such an event in the University of Kashmir and other eminent speakers from different Universities and Institutions.



After the short tea break which followed the lecture of Prof. G R Chaudhary, valedictory function was organized.

During the valediction ceremony, concluding remarks about the STUTI Program were given by the Dean Research Prof. Irshad A. Nawchoo, and HOD Chemistry department Syed Wajaht Amin Shah in which they appreciated the DST-STUTI Coordinator and the Organizers for organizing such event all over the country.

A highly positive feedback was received from the participants. The participants were highly gratified for attending such a program and admired the efforts of organizing committee of the Department of Chemistry, University of Kashmir for training and hands-on experience.

All the participants were highly thankful to the DST, Government of India, for opening a new gateway to scientific knowledge and bringing forth such a platform to access the instruments easily through hands-on training.

Dr. Aijaz Ahmad Dar, Organizer STUTI Program expressed his gratitude towards the DST (Government of India), Prof. Ganga Ram Chaudhary, the Coordinator STUTI, Vice-Chancellor, Prof. Nelofar Khan, Prof. Farooq Ahmad Masoodi, Dean Academic Affairs, Dr. Nisar Ahmad Mir, the Registrar and Prof Irshad A. Nawchoo, Dean Research of University for providing all the support for successful organization of the event. Dr. Aijaz acknowledged all the speakers for delivering highly enlightening and informative talks and for conducting hands-on session related to physical and biological sciences

The “Certificates of Participation” and the “Certificates of Appreciation” were given to the participants and the volunteers respectively.

Some of the Glimpses of the valedictory session are given..

1. Participants filling feedback form.



## 2. The on-stage feedback by participants



3. The certificate distribution.





#### 4. The group Photographs





## List of Participants

S.No.	Name	Designation	Email Address	Name of College/Department/Institute	State/UT	Gender
1	Md Tanwir Alam	Ph.D. Student	<a href="mailto:tanwiralamphd@gmail.com">tanwiralamphd@gmail.com</a>	Bhupendra Narayan Mandal University, Madhepura, Bihar	Bihar	Male
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