A training session report on

Analytical Instrumental Techniques

Under STUTI program funded by DST

In association with

Indian Institute of Technology, Gandhinagar

(Project Management Unit)

Coordinated by

Dr Vijay Devra

Department of Chemistry

Janki Devi Bajaj Government Girls College

Kota, Rajasthan India

5th to 11th June, 2023

Acknowledgement

We convey gratitude for the encouragement and support received from multiple sources during the execution of this training since its beginning. First and foremost, we want to express our sincere appreciation to the IIT Gandhinagar (PMU) and Department of Science and Technology (DST) for entrusting us with this project. The workshop was coordinated by **Prof. (Mrs.) Vijay Devra (**Professor, Chemistry, JDB Girls Govt. College, Kota). The workshop was conducted on the '*Analytical Instrumental Techniques*' on the instrument funded by the FIST program (Sanction No.: SR/FST/CSI-172/2008. Organizing team acknowledge the contributions of the committee, in the implementation and the execution of the program to achieve the objectives of the project.

We also acknowledge all the teaching and non-teaching staff for their contributions, without which these could not have been possible.

Prof. (Mrs.) Vijay Devra

Coordinator

Summary

The goal of this training session is to provide a hands-on training on 'Analytical Instrumental Techniques' which involves various aspects of FTIR and Uv-Vis Spectrophotometer among students, faculty, scientists and industry professionals through a week-long training workshop. The workshop was conducted in the Department of Chemistry, Janki Devi Bajaj Government Girls College Kota from **5th to 11th June 2023** comprised of lectures and hands-on training sessions. This initiative is funded by Department of Science & Technology under the program STUTI (Synergistic Training Program Utilizing the Scientific and Technological Infrastructure). This training program was focused on '*providing an exposure towards aspects of analysing biological samples through the medium of hands-on session as well as provide an interactive session with eh expert of the subject*'.

Introduction

Department of Chemistry**,** Janki Devi Bajaj Government Girls College Kota conducted 7-day long hands-on training program on 'Analytical Instrumental Techniques' in its campus for participants from various backgrounds such as Post Graduates, Faculties, Scientists, Research Fellows, Ph.D. Fellows and Industry persons were invited (**Annex-1**). The following workshop's activities took place from **5th to 11th June 2023** (**Annex-2 & 3**). This report provides a quick overview of both the lecture and technical sessions.

- *Lecture Sessions:*

Prof. YK Vijay (Professor, Physics, IIS University, Ex. director of CDPE University of Rajasthan Jaipur) inaugurated the session through a brief introduction on DST STUTI program and its promotion of S&T infrastructure. On the day one, **Prof. YK Vijay** discussed various experimental/instrumental techniques to the participants that. In another session, **Dr. Manishkumar K Singh** (Sr. Project Associate, IIT Gandhinagar. STUTI PMU) gave a talk on various schemes offered by the DST for higher education, especially for the women's scientist. On the second day of the program, Prof. **Y K Vijay** delivered an interactive lecture on Quantum sciences followed by various topics such as, Vander wall force, dipole interaction, Bohr model, Raman Effect etc., through a demonstration models. **Dr. NK Acharya** (Assistant Professor, Physics, M.S. University Baroda) delivered session on Band Gap analysis through direct and indirect method using spectrophotometer. **Dr. N.K. Acharya** also delivered lecture on Advance Materials Characterization. **Mr. Sravan Vijay** and **Mr. Swapan Mohanty (**Lab India Pvt. Ltd.), gave a lecture on detailed lecture on spectroscopy and other advance techniques on the day four and five. On the day five, a lecture was delivered by **Ms. Princy Denis Varghese** (Technical Superintendent, SAIF/CRNTS Center, IIT Bombay) on co-relations to samples characterized by SEM-EDS and FTIR techniques. **Dr. A. R. Renjith** (Oxford Instruments, India) showed fundamental aspects of the SEM-EBSD techniques for critical analysis. On the sixth day, **Prof. Vibhuti Rai** (Professor, Geology, University of Lucknow and DST PURSE-Coordinator) discussed absorption and emission spectroscopy. **Prof. Rai** also mentioned few important case

studies that covers FTIR analysis on gemstones for determination of gemstone quality. **Dr. Gupta** led the session on Characterization Techniques by High power Liquid Chromatographic techniques followed by an interactive and problem solving session.

- *Technical Session*

Mr. Sravan Vijay and **Mr. Swapan Mohanty** (Lab India Pvt. Ltd.) demonstrated working principle of Uv visible spectroscopy and Fourier transform infrared spectroscopy (FTIR). The team from Lab India personnel's guided the women participants during the hands-on session. **Sachin Chugh** (Lab India Pvt. Ltd.) shared the concepts of basic instrumentation information regarding FTIR and NMR setup. **Nilesh Chauhan** (Sr. Manager, Lab India Pvt. Ltd.) demonstrated the operations of spectrophotometer and showed troubleshooting of the instruments. On the day five, all the participants were taken for a visit to an Agricultural Research Center, Umeddganj Kota, where they were shown different equipment related to Trichoderma and biochemistry laboratories for analysis of the samples. Seventh day was followed by an interactive and problem solving session followed by a valedictory session.

Outcomes of the Workshop

The STUTI workshop attracted participants from 18 different institutes (**Figure 1).** About 37 participants enrolled and attended the 'Analytical Instrumental Techniques'. The goal of this training event was to bring together participants from many disciplines and raise awareness of the institute's research facilities. Throughout the sessions, participants asked major questions regarding theoretical and practical aspects of FTIR, NMR, Uv-Visible Spectrophotometer, Relationship between SEM-EDS and EBSD techniques. Finally, the feedback from the participants was considered in the evaluation of the workshop (**Annex 4)**. The majority of the participants were pleased with the training session and suggested that more workshops be held in the future. Few participants suggested organizing such a workshop/training session on more troubleshooting techniques of data collection.

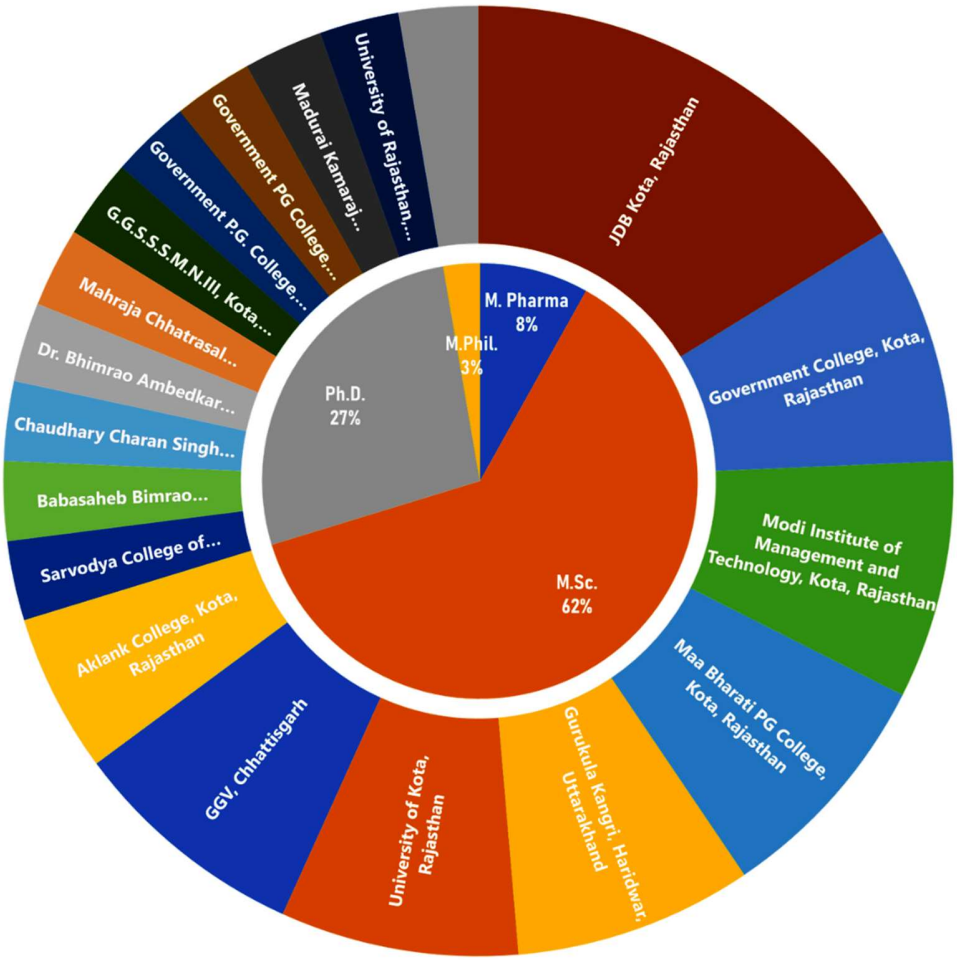


Figure 1. Participants registered workshop from different institutes.

Annexure 1: Brochure for the program.

Dr Sanjay Bhargava
Principal & Patron

Dr Raghuraj Parihar
Regional Assistant Director College Education, Kota

Dr Vijay Devra
STUTI Coordinator

Advisory Committee

Dr Pratima Shrivastava
Dr Fatima Sultana
Dr Renu Tyagi
Dr Shuchita Jain

Organizing Commitee

Dr Rekha Kalani
Dr Arti Shah
Dr Jaishree Daverey
Dr Sarita Khandelwal
Ms Rakhi Methi
Dr Saraswati Agarwal
Dr Chandresh Pareek
Dr Annu Banshiwal
Ms Kajal Kumawat

Organizing Secretaries

Dr Jagrati Meena
Nimish Kumar
Preeti Bairwa

Interested Participants must Register and only selected candidates would be invited for workshop. For selected candidates Registration fees, local travel, boarding & lodging will be covered by Janki Devi Bajaj Government Girls college Kota, Rajasthan.

Eligibility Criteria:

- Minimum qualification: Post Graduation (Science) or B. Tech. (Technology).
- Professor/Scientist/Post doc-fellows/Ph.D. fellows/Industry person who are actively involved in R & D.
- Not more than 3 participants from one institution.

7 days long hands-on training

supported by

Department of Science & Technology (DST)
under STUTI (Synergistic Training Program Utilizing the Scientific & Technological Infrastructure) program

In association with
Indian Institute of Technology, Gandhinagar, Project Management Unit (PMU)

Organized by
Janki Devi Bajaj Government Girls College Kota, Rajasthan

on

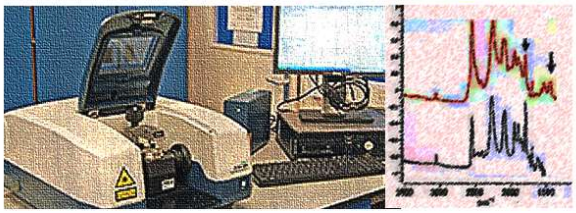
'Analytical Instrumental Techniques'

From 5th to 11th June 2023

- **Interested participants should register using the following link**

  https://forms.gle/RCRCyPCvTbsopyQVA

- **Registration deadline- 30th May 2023.**
- **Shortlisted candidates will be intimated by e-mail latest by 31st May 2023.**
- **For any queries: Contact: 7597747381 -OR- Mail:** jdbseminar@gmail.com



Eminent Speakers

Dr. Abhishek Chandra
Assistant Professor (Biotechnology and Bioengineering), IAR, Gandhinagar

Sravan Vijay
Sr Manager, Lab India, Delhi

Dr. Renjith A. R.
Technical Specialist
Oxford Instruments India Pvt Ltd. Mumbai

Dr. N. K. Acharya
Assistant Professor (Applied Physics)
M.S. University, Baroda, Vadodara

Yagnesh Kumar Gupta
Sr. Manager, DCM
Shri Ram LTD. Kota

Ms.Princy Denis Varghese
Technical Superintendent
SAIF/CRNTS, IIT Bombay

Swapan Mohanty
Gen Manager, Lab India, Delhi

Department of Science & Technology
Govt. of India

Contents of the workshop

Day 1 : session I &II
- **Inauguration, Introduction & Welcome note**
- **Lecture: Research support schemes for women researchers by DST**
- **Visit to Institute laboratory and other facilities**

Day 2 : session I &II
- **Lecture:** Basics of FTIR analysis and its working.
- **Hands on:** Sample Preparation for FTIR analysis.
- **Laboratory Visit**

Day 3 : session I &II
- **Lecture:** Related case studies involved in employment of SEM and FTIR samples as combined tool towards analysis of the samples.
- **Lecture:** Data Collection & Processing.
- **Hands on:** Instruction/operation to FTIR instrumentation.
- **Hands on:** System Check & Basic instructions.

Day 4: session I &II
- **Lecture:** Case studies utilizing FTIR and HR-TEM for analysis of the samples.
- **Lecture:** Structure refinement with FTIR analysis.
- **Hands on:** Participants samples testing.

Day 5 : session I &II
- **Lecture:** Basics of U.V. Visible Spectroscopy.
- **Lecture:** Applications in Chemistry & Nanotechnology.
- **Visit to:** Krishi Vighan Kendra.

Day 6: session I &II
- **Lecture:** Direct & Indirect bandgap analysis using spectrophotometer.
- **Hands on:** Pallet preparation & set up a measurement.
- **Hands on:** Fast scan Vs Matrix scan.

Day 7: session I &II
- **Interactive & Problem solving session.**
- **Valedictory.**

Overview of STUTI & Objectives of Workshop

DST welcomes to all participants for the workshop on" Analytical instrumental Techniques" organized under STUTI. STUTI program envisions hands on training & sensitization of the state of art equipment's as well as towards sharing while ensuring transparent access to S &T facilities. Department of Science & Technology has identified IIT Gandhinagar as the project management unit (PMU) & Janki Devi Bajaj Government Girls college Kota as Coordinator for the workshop.

This workshop is aimed to provide an insight into the basic principles and operations of spectroscopic techniques such as UV-Visible, IR spectroscopy are focused. Expert lectures are also arranged from the personnel's of industry and academics. Expert talk will provide our vision for the use of spectrophotometric techniques beyond simple structure determination. Participants would have an opportunity to interact and discuss their research problems and solutions Other techniques such as FTIR,NMR, Electron Microscopy techniques with case studies will also be discussed.

5th June 2023	8.30 am	Registration	6th June 2023	9.00 am	Session-I	7th June 2023	9.00 am	Session-I
	9.00 am	Inaugural Session		10.30 am	Tea Break		10.30 am	Tea Break
	10.30 am	Tea Break		11.00am	Expert Talk		11.00am	Expert Talk
	11.00am	Session-I		12.30 pm	Lunch		12.30 pm	Lunch
	12.30 pm	Lunck		14.00 pm	Session-II		14.00 pm	Session-II
	14.00 pm	Session-II		15.30 pm	Tea Break		15.30 pm	Tea Break
	15.30 pm	Tea Break		16.00 pm	Lab Visit		16.00 pm	Discussion
	16.00 pm	Campus Visit	9th June 2023	9.00 am	Session-I	10th June 2023	9.00 am	Session-I
8th June 2023	9.00 am	Session-I		10.30 am	Tea Break		10.30 am	Tea Break
	10.30 am	Tea Break		11.00am	Expert Talk		11.00am	Expert Talk
	11.00am	Expert Talk		12.30 pm	Lunch		12.30 pm	Lunch
	12.30 pm	Lunch		14.00 pm	Visit to Krishi Vigyan Kendra		14.00 pm	Session-II
	14.00 pm	Session-II		15.30 pm			15.30 pm	Tea Break
	15.30 pm	Tea Break		16.00 pm			16.00 pm	Discussion/ Hands-on
	16.00 pm	Discussion						
11thJune 2023		Expert Lecture						
		Valedictory						

To get more information on our upcoming/conducted STUTI training sessions: https://events.iitgn.ac.in/stuti/technical_workshops.htm

DST-STUTI (IIT Gandhinagar PMU) Training: https://www.dststuti@training.com/iit-gandhinagar/index

Annexure 2: List of registered participants for the workshop.

Sr. No.	Candidate Name	Gender	Educational Qualification	Email address	University/Institute
1	Aditi Soni	Female	M. Pharma (Pharmacognosy)	aditisoni3033@gmail.com	Guru Ghasidas Vishwavidyalaya Bialspur, Chhattisgarh
2	Anjli Sinha	Female	M. Pharma (Pharmacognosy)	anjlisinha112@gmail.com	
3	Janita Sahu	Female	M. Pharma (Pharmacognosy)	janitasahu99@gmail.com	
4	Annu	Female	M.Sc. (Chemistry)	annu12@gmail.com	University of Kota, Rajasthan
5	Rajni Meena	Female	M.Sc. (Chemistry)	rajanimeena9649@gmail.com	
6	Shikha Sharma	Female	M.Sc. (Chemistry)	shikshasharma210692@gmail.com	
7	Arti Kumari	Female	M.Sc. (Zoology)	artinandan95@gmail.com	Bhupendra Narayan Mandal University, Madhepura, Bihar
8	Arushi Aren	Female	M.Sc. (Microbiology)	aren.arushi5@gmail.com	Gurukula Kangri, Haridwar, Uttarakhand
9	Kanika Tomar	Female	M.Sc. (Botany)	tomarkanika456@gmail.com	
10	Ruchi	Female	M.Sc. (Microbiology)	ruchimm97@gmail.com	
11	Deepak Hada	Female	M.Sc. (Chemistry)	deepakhada1989@gmail.com	Maa Bharati PG College, Kota, Rajasthan
12	Renu	Female	Ph.D. (Chemistry)	rosenrenu@gmail.com	
13	Shanu Mathur	Female	Ph.D. (Chemistry)	mathurshanu09@gmail.com	
14	Divyanshi tailor	Female	M.Sc. (Chemistry)	divyanshit2204@gmail.com	Modi Institute of Management and Technology, Kota, Rajasthan
15	Gajala Tazwar	Female	Ph.D. (Chemistry)	tazwar.gajala786@gmail.com	
16	Manisha Nagar	Female	M.Sc. (Chemistry)	simmunagar123@gmail.com	
17	Divyashree Singh Panwar	Female	M.Sc. (Biotechnology)	divyashreepanwar@gmail.com	University of Rajasthan, Rajasthan
18	Kanchan Kumari	Female	M.Sc. (Chemistry)	kanchangpt2013@gmail.com	Janki Devi Bajaj Government Girls College, Kota, Rajasthan
19	Mosmee Meena	Female	M.Sc. (Zoology)	mosmeemeena100@gmail.com	
20	Pragya Dadhich	Female	M.Sc. (Botany)	pragyadadhich225@gmail.com	
21	Priyal Vijayvargiya	Female	M.Sc. (Botany)	priyalvijay3@gmail.com	
22	Ruksar Bano	Female	M.Sc. (Zoology)	rbano107@gmail.com	
23	Sanju Mahich	Female	M.Sc. (Physics)	smahich1997@gmail.com	
24	Koushika Mukherjee	Female	M.Sc. (Genomics)	mukherjeekoushika18@gmail.com	Madurai Kamaraj University, Nagpur, Maharastra
25	Leenta Arora	Female	Ph.D. (Botany)	drleentaaroroa.gcb@gmail.com	Government PG College, Baran, Rajasthan
26	Mahima Sharma	Female	M.Phil. (Chemistry)	mahima.sharma252@gmail.com	Government P.G. College, Bundi, Rajasthan
27	Maya Kaur	Female	Ph.D. (Physics)	kaurmaya90@gmail.com	G.G.S.S.S.M.N.III, Kota, Rajasthan
28	Neerja Shrivastava	Female	Ph.D. (Botany)	drnshrivastava@gmail.com	Government College, Kota, Rajasthan
29	Vivechana Rajpoot	Female	M.Sc. (Botany)	vivisonyru2017@gmail.com	
30	Pooja Sharma	Female	M.Sc. (Microbiology)	guddanpooja@gmail.com	
31	Nidhi	Female	M.Sc. (Botany)	thenidhiverma@gmail.com	Mahraja Chhatrasal Bundelkhand University, Chhatarpur, Madhya Pradesh
32	Nidhi Saini	Female	M.Sc. (Chemistry)	saininidhi@gmail.com	Dr. Bhimrao Ambedkar University, Agra, Uttar Pradesh
33	Niharika	Female	Ph.D. (Chemistry)	nnnagar@gmail.com	Aklank College, Kota, Rajasthan
34	Shiba Khan	Female	Ph.D. (Zoology)	shanshiba@gmail.com	
35	Priyanka	Female	Ph.D. (Botany)	pri03singh@gmail.com	Chaudhary Charan Singh University, Meerut, Uttar Pradesh
36	Sakshi	Female	Ph.D. (Pharmaceutics)	sakshi22@gmail.com	Babasaheb Bimrao Ambedkar University, Lucknow, Uttar Pradesh
37	Vishnu Priya Singh	Female	M.Sc. (Chemistry)	vishpriyasingh0@gmail.com	Sarvodya College of Nursing and Paramedical, Kota, Rajasthan

Annexure 3: Schedule date and activities during the workshop.

5th June 2023, Day 1
Inauguration, Introduction & Welcome note
Lecture: Research support schemes for women researchers by DST
Visit to Institute laboratory and other facilities
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Lecture: Basics of FTIR analysis and its working.
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Lecture: Basics of U.V. Visible Spectroscopy.
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10th June 2023, Day 6
Lecture: Direct & Indirect bandgap analysis using spectrophotometer.
Hands on: Pallet preparation & set up a measurement.
Hands on: Fast scan Vs Matrix scan.
11th June 2023, Day 7
Interactive & Problem solving session.
Valedictory.

Annexure 4: Feedback summary

S.No.	Content	Rating
1	Overall grading of the Programme with reference to relevance of course, module/content etc.	100% rated above 8 points
2	Overall grading of the facilities provided by the institute, i.e., Hostel, Mess, Class Rooms, Transport/infrastructure etc.	96% rated above 8 points
3	Overall grading of the faculty members conducting the training	94% rated above 8 points
4	How do you rate the overall training methodology	97% rated above 8 points
5	How far the field visit is relevant and related to your research study	89% rated above 8 points
6	Usefulness of this training in your current role	90% rated above 8 points
7	Usefulness of this training in future work/job you may handle	92% rated above 8 points
8	How far have you benefitted from interaction with the fellow participants of the training	97% rated above 8 points
9	How far the course material supplied relevant and related to the training curriculum	92% rated above 8 points
10	Overall grading of the process of training	95% rated above 8 points
11	Your recommendation to your peers/ colleagues for the training Programme	98% rated above 8 points