

National Level Training Program
on
CHROMATOGRAPHY, SPECTROSCOPY AND
MICROSCOPY

BRIEF REPORT
NOVEMBER 28th – DECEMBER 4th, 2022

Jointly Organized by

Sophisticated Analytical Instrument Facility (DST-SAIF)

Mahatma Gandhi University, Kottayam

And

Department of Botany and Department of Chemistry

St. Dominic's College, Kanjirapally

In Association with

JSS Academy of Higher Education and Research, Mysuru



National Level Training Program

on

CHROMATOGRAPHY, SPECTROSCOPY AND MICROSCOPY

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

NOVEMBER 28th – DECEMBER 4th, 2022

Jointly Organized by

Sophisticated Analytical Instrument Facility (DST-SAIF)

Mahatma Gandhi University, Kottayam

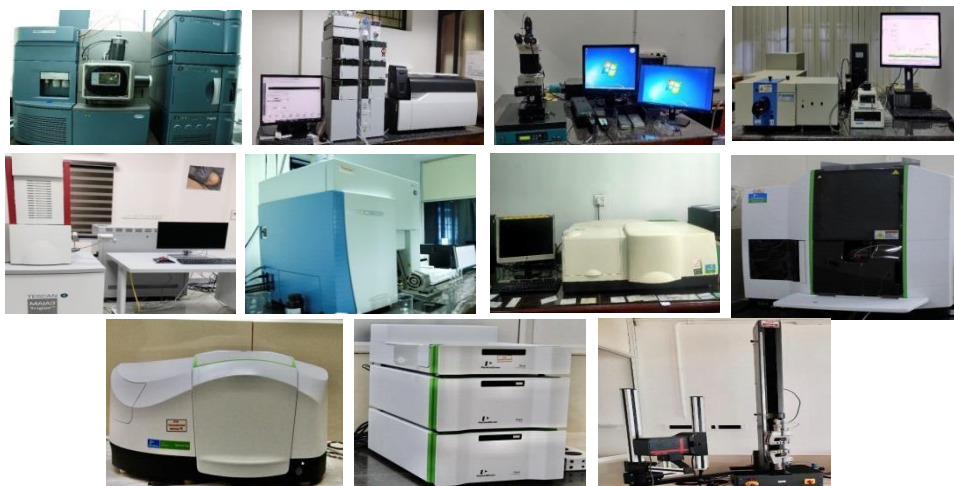
And

Department of Botany and Department of Chemistry

St. Dominic's College, Kanjirapally

In Association with

JSS Academy of Higher Education and Research, Mysuru



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, centres, 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.

MAHATMA GANDHI UNIVERSITY, KOTTAYAM, KERALA

Mahatma Gandhi University, one of the major Universities in Kerala, is a premier education institution that strives to fulfil the higher educational needs of the people from Central part of Kerala. The University was established on 2nd October 1983 and has a jurisdiction over the revenue districts of Kottayam, Ernakulam and parts of Pathanamthitta and Alappuzha. It offers a large number of programs through its 17 University departments, 18 Centres, around 300 affiliated Colleges and 199 recognised Research Centres. It imparts education in the interdisciplinary as well as conventional disciplines of Science, Social Science and Humanities. The University is a member of the AIU (Association of Indian Universities) and the ACU (Association of Commonwealth Universities).

Mahatma Gandhi University holds 30th position among University category and 51st position in overall category of NIRF 2022. Also, M.G.U holds 702nd position in Times Higher Education World University Ranking.



SAIF, MAHATMA GANDHI UNIVERSITY, KOTTAYAM



Sophisticated analytical instruments are vital for pursuing research in many areas of modern science and technology. Many institutions in the country do not have such instruments. These instruments are expensive and cannot be provided through individual project mechanism. The Department of Science & Technology has set up Sophisticated Analytical Instrument Facilities (SAIFs) in different parts of the country to provide the facilities of sophisticated analytical instruments to the research workers in general and especially to the institutions which do not have access to such instruments. DST-SAIF centre at Mahatma Gandhi University is operational since 2013. Confocal Raman Microscope with AFM, Fluorescence Spectrometer with Lifetime Detector, LC-MS/MS and FESEM are the available instruments in the SAIF centre.



LC-MS/MS



Confocal Raman Microscope with AFM



Fluorescence Spectrometer with Lifetime Detector



FESEM

St.Dominic's College Kanjirappally

St. Dominic's College was started in 1965 includes in its purview the academic aspirations of all communities of the area and is committed in imparting education to all who seek higher learning. The College, affiliated to the Mahatma Gandhi University, was upgraded into a degree college in 1976 and into a post graduate college in 1981. Accredited with „A“ grade by the National Assessment and Accreditation Council (NAAC) and supported by FIST-0 level Grant of the Department of Science and Technology (DST), the college is on its course of academic diversification and growth in accordance with its goals and objectives, in tune with the changes in the field of higher education. The Department of Chemistry started functioning with the very inception of the college in the year 1965 and was elevated into to the status of a post graduate department in 2001. The main emphasis of the department is to enable the students with deep knowledge and awareness of advanced developments in the field of chemistry. The focus area of research includes Polymer composites, rubber nanocomposites, 2D materials, graphene-based composites, Plastic Recycling, Electrochemical Sensors etc. The Department of Botany was established in the year 1999 with Model II Horticulture and Nursery Management and was uplifted to M.Sc Botany with specialization Biotechnology in 2014 with the vision of teaching and innovative research in the field of biology. A well-equipped research laboratory was set up to carry out the cutting-edge research activities in all important areas in chemistry and Botany for sharing technical expertise with the surrounding community and the state.



JSS Academy of Higher Education & Research, Mysuru

JSS Academy of Higher Education & Research (JSS AHER), formerly known as JSS University, was established in the year 2008 with four constituent colleges - JSS Medical College and Hospital, JSS Dental College and Hospital, JSS College of Pharmacy, Mysuru, and JSS College of Pharmacy, Ooty. In addition, JSS AHER has taken initiatives to enhance community health education and outreach activities by establishing departments of Water and Health (2011) and Health System Management Studies (2012). To expand our horizons in the field of Basic Health Science, the Faculty of Life Sciences with many basic and applied science departments were also initiated in the year 2013. JSS Mahavidyapeetha has been a guiding force providing support and encouragement to the JSS AHER and its initiatives. JSS AHER has embarked on the international path through strategic initiatives and collaborations. These globalization efforts over the years have provided the students of JSS AHER and the healthcare professionals with an 1800-beds super-specialty tertiary care hospital, Mysuru. The hospital caters to a population of 3-million people from all over Karnataka and India. This rich clinical environment along with dedicated faculty and physicians enables students and trainees to enhance their experience and professional development.



PROGRAM HIGHLIGHTS

To get the insights and hands on training on LC-MS/MS, ICP-MS, LC-QToF-MS, HPLC, FESEM, UV-Visible Spectrophotometer, Fluorescence Spectrometer with Lifetime Detector, UTM, AAS, ATR-FTIR and Confocal Raman Microscope with AFM. During the training program the participants will get the opportunity to visit SAIF, St. Dominic's college Kanjirappally and field visit to get glimpse of state-of-the-art instrumentation. The participants will get the golden opportunity to interact with eminent researchers from different fields.

LEARNING OUTCOMES

The up gradation of knowledge and hands on expertise of students, researchers and faculty members on the variety of characterisation techniques to gain deeper understanding of sophisticated techniques, develop data analysis, interpretation skills and gain the ability to apply their theoretical knowledge to practice.

TECHNICAL EXPERTS

1. **Ms. Dilshad Pullancheri,**
Manager-Marketing, Southern Region,
Waters India, Pvt. Ltd.



2. **Dr. Devendiran M.**
Field Application Specialist, Perkin Elmer



3. **Dr. C. S. Rajesh**
Application Scientist, Horiba



4. **Mr. A. Rajagopal**
Senior Product Manager,
Thermo Fisher Scientific India



5. **Mr. Chandragiri Rambabu**
Application Manager-TEA,
Thermo Fisher Scientific India



6. **Mr. Satheesh Kumar**
Manager - Applications & Aftersales Support,
India & Middle East Oxford WITec



7. **Mr. Subhag K Suresh**
Executive application support
Spinobiotech Pvt Ltd



8. **Mr. Suman**
Product Specialist AAS,
Perkin Elmer India Private limited



9. **Mr. Pradeep Kumar P. Joy**
Technical Assistant,
National Institute for Rubber Training (NIRT),
Rubber Board, Kottayam



10. **Mr. Mallesh**
Field Application Specialist,
Perkin Elmer India Pvt. Ltd.



TRAINING PROGRAM
CHROMATOGRAPHY, SPECTROSCOPY & MICROSCOPY
(28th November-4th December, 2022)
Training Schedule

Venue	Main Seminar Hall, School of Environmental Sciences, Mahatma Gandhi University, Kottayam
<u>INAUGURAL FUNCTION</u>	
28 th November 2022 9.30am – 10.30am	Welcome speech and introduction Ms. Shiny Thomas Training Convener
	Briefing on DST SAIF Centre & STUTI MGU program Prof. Dr. C.T.Aravindakumar Pro Vice-Chancellor & Coordinator-SAIF Centre, Mahatma Gandhi University, Kottayam
	Lighting of Lamp & Inaugural address Prof. Dr. Sabu Thomas Hon. Vice Chancellor, Mahatma Gandhi University, Kottayam
	Unveiling of Training Manual & Felicitation Prof. Shajila Beevi S. Member Syndicate, Mahatma Gandhi University, Kottayam
	Introduction-DST STUTI Scheme Dr.Prashant M. Viswanath Dean (Research), JSS Academy of Higher Education & Research, Mysuru
	Felicitation message Dr. Seemon Thomas Principal, St. Dominic's College, Kanjirappally
	Vote of Thanks Dr. Dhanya B.E. Training Convenor, JSS AHER, Mysuru
	10.30am to 11am

PHOTOS



Welcome speech by Ms.Shiny Thomas, Training Convenor



Lamp lighting & Inaugural address by Hon.Vice Chancellor , Mahatma Gandhi University, Kottayam



Briefing on DST SAIF Centre & STUTI MGU program
Prof. Dr. C.T.Aravindakumar, Pro Vice-Chancellor & Coordinator-SAIF Centre,
Mahatma Gandhi University, Kottayam



Unveiling of Training Manual & Felicitation
Dr. Seemon Thomas
Principal, St. Dominic's College, Kanjirappally



Introduction-DST STUTI Scheme

Dr.Prashant M. Viswanath

Dean (Research), JSS Academy of Higher Education & Research, Mysuru



Felicitation message

Dr. Seemon Thomas

Principal, St. Dominic's College, Kanjirappally



Vote of Thanks
Dr. Dhanya B.E.
Training Convenor, JSS AHER, Mysuru



DAY 1: Lecture 1

UV-Visible Spectroscopy

Dr. Devendiran M., Field Application Specialist, Perkin Elmer



Technical session of the training started with theoretical session of UV-Visible spectroscopy by Dr. Devendiran M., Field Application Specialist, Perkin Elmer. The session covered of all the basics of UV-Visible spectroscopy along with principle and various research and industrial applications. Different types of spectrophotometers depending on the nature of analysis were discussed. The hands-on session included detailed explanation on different components of spectrophotometer, sample preparation methods, and familiarisation of software. All these was demonstrated by phenol and methyl orange.

Day 1: Lecture 2

Inductively Coupled Plasma Mass Spectrometry

Mr.Chandragiri Rambabu, Application Manager, Thermo Fisher Scientific



Second theoretical session of day was about Inductively Coupled Plasma Mass Spectrometry by Mr.Chandragiri Rambabu, Application Manager, Thermo Fisher Scientific. The session on ICPMS covered basics of ICPMS and metal analysis, instrumentation, sample preparation and data interpretation. During the practical demonstration hands-on training was given to the participants on plasma ignition, tuning of the instrument, calibration curve plotting and monitoring different metals in a given water sample. Explained the software and trouble shooting.



Day 2: Lecture1

Atomic absorption Spectrometry

Mr.Suman, Product Specialist, Perkin Elmer India Pvt. Ltd.



Mr. Suman, AAS specialist, PerkinElmer, led a morning technical session on AAS on November 29th at St. Dominic's College Kanjirapally. The technical aspects and applications of the instrument were thoroughly described. Following the morning session, the afternoon session included hands-on training with the AAS instrument. The operation of AAS, software handling and various troubleshooting techniques were taught. A digested soil sample was used for analysis, and the copper content of the sample was determined. The session was interactive and informative, with delegates, particularly research scholars, taking advantage of the opportunity to analyse their samples.

Day2: Lecture2

FTIR : Dr. Devendiran M., Field Application Specialist, Perkin Elmer India Pvt. Ltd.



The afternoon session was started with the theoretical session on FTIR Spectrophotometer. The areas of focus were, basic understanding of infrared spectroscopy in identification and characterization of materials and conceptual understanding of acquiring the FTIR spectrum of various functional groups. Hands-on training on FTIR spectrum and interpretation of characteristic peaks were done. The hands-on session included detailed explanation on different components of spectrophotometer, sample preparation methods, and familiarisation of software.

Day3: Lecture1

HPLC: Mr.Mallesh, Field Application Specialist, Perkin Elmer India Pvt. Ltd.



Dr. Devendran Mani, HPLC specialist, PerkinElmer, led the morning session on 30th November. Dr. Devendran Mani delivered talk on basics of HPLC system and application of HPLC in Pharma field. Later, Mr. Arun provided hands-on training in the afternoon session.

Day3: Lecture2

UTM: Mr. Pradeep Kumar P. Joy Technical Assistant, National Institute for Rubber Training (NIRT), Rubber Board



Mr. Pradeep Kumar Joy from the Rubber Research Institute Kottayam spoke about and illustrated the usage of the universal testing machine (UTM) in material science in the afternoon. A thorough comprehension of a UTM's capabilities and its use in testing natural rubber goods was exhibited. The participants learned how tensile testing may be carried out using UTM and how these tests can be used to assess a material's compatibility for a specific application.



Day4: Lecture1

AFM: Mr. Satheesh Kumar, Manager, Applications & After sales Support, WITec, India



The first session of Day4 of training consisted of detailed theory classes on Raman spectroscopy and Atomic Force Microscopy and its applications by Mr.Satheesh Kumar, Country Manager & Aftersales Support, WITec.

In the hands on session the technical expert explain different parts of a Raman spectrometer ie; laser, detector, spectrometer etc. Collected one Raman spectra of graphite sample and explained different properties of the sample like crystallinity and peak shift from the collected Raman spectra. For AFM analysis a standard polysulfone membrane was used. From image obtained, surface properties like roughness, particle size were explained.



Day4: Lecture2

LCMSMS: Mr. Subhag K. Suresh, Executive Application Support, Spinco Biotech, Chennai



Second session of Day 4 was the theory of Liquid Chromatography tandem mass spectrometer by Mr. Subhag K. Suresh, Executive Application Support, Spinco Biotech, Chennai..The theoretical session covered all the basics of mass spectrometry and in depth details of triple quadrupole mass spectrometer. Different kinds of ionization techniques (ESI, APCI, MALDI etc.) were discussed. Different modes of analysis like Scan, SIM, MRM were explained. Details of application of the equipment in research and industry were shared. In the practical session the front end and mass part were shown and each part was explained in detail. Selection and preparation of mobile phase, column selection were explained. Scan, SIM, MRM modes were demonstrated by injecting drug standard (Lenvatinib). Method development for new compounds were detailed. Instrument trouble shooting and remedies were also discussed.



Day 5: Field visit

**RUBBER RESEARCH INSTITUTE OF INDIA, KOTTAYAM
&
St. MARY'S RUBBER'S PRIVATE LIMITED, KANJIRAPPALLY**







Day6: Lecture1

FESEM: Mr. A. Rajagopal, Senior Product Manager, LABINDIA



First lecture of Day 6 was on FESEM by Mr.A. Rajagopal, Senior Product Manager, LABINDIA. He explained the basic principle, working and analysis methods along with the relevance of this highly equipped instrument for high-end research. New advancements in this field were also discussed. The hands-on session covered the functioning of different parts of FESEM. Imaging procedures at different modes with different voltages explained using both conducting sample Ag₃PO₄ and non-conducting (gold coated samples) like polymer fibres and bone bio char.



Day6: Lecture2

Fluorescence Spectroscopy: Dr. C. S. Rajesh, Application Scientist, Horiba



Second theoretical session was on Fluorescence Spectroscopy by Dr. C. S. Rajesh, Application Scientist, Horiba. The basics of steady state measurement were detailed. Main components of the instruments were familiarized. Detailed about sample preparation and applications of fluorescence measurements.

In the hands-on session calibration of fluorescence instrument was demonstrated. In vivo measurements, emission- excitation matrix (EEM) analysis is also demonstrated. Analysis was performed using Rhodamine 6G and Eu doped glass.



Day 7: Lecture 1

*Liquid Chromatography Mass Spectrometry with Time-of-Flight Mass Analyzer
Ms. Dilshad Punnacheril, Manager-Marketing, Waters India Pvt. Ltd*



Day 7 of the training program started with theoretical talk on LC-QToF MS by Ms. Dilshad Punnacheril, Manager-Marketing, Waters India Pvt. Ltd. Details of High Resolution mass spec instruments were discussed and explained the scope of non-target analysis using the HRMS. In the practical session, detailed and demonstrated each part of HPLC and mass spectrometer of LC-Q-TOF ms. Differentiated the high pressure and low pressure gradient pump and its applications. Detailed about the resolution of m/z ratio, isotopic pattern and its importance in non-target analysis. Explained and showed the importance of tuning the instrument using the internal standard leucine enkephalin before doing analysis. Done full scan analysis and ms/ms analysis of the standard caffeine. Assigning of elemental composition, structures of fragments of the parent ion using masslynx and mass fragment software was also explained in the session.



VALEDICTORY SESSION

Valedictory Session started by 4pm at the Main Seminar Hall of School of Environmental Sciences, M.G.University, Kottayam. Prof. (Dr.) E.K.Radhakrishnan, Director, Buisness Innovation & Incubation Centre, Assistant Professor, School of Biosciences, Mahatma Gandhi University, Kottayam presided over the meeting. Candidates expressed their gratitude for selecting them for the training and shared their one-week experience during the training. All the delegates gave good feedback about the training program and were enthusiastic to participate in further workshops at Mahatma Gandhi University, Kottayam. Dr. Radhadrishnan gave his message, and the session was concluded by distributing training certificates to the delegates.



List of Participants

Sl. No.	Name	Institute/Department
1	Ali Akbar	Mahatma Gandhi University, Kottayam
2	Aadil Ahmad Bhat	Jiwaji University Gwalior
3	Gokul P A	CMS Collage, Kottayam
4	Jenat P J	Mahatma Gandhi University, Kottayam
5	Chandan Kumar Sahoo	Bharathiar University, Coimbatore
6	Nihita Linson	ST Thomas college Palai
7	Naveen S Lal	Cochin University Of Science And Technology, Kochi
8	Greeshma Thankachan	Cochin University Of Science And Technology, Kochi
9	Manish Pant	DIT University, Dehradun
10	Md Tanwir Alam	Bhupendra Narayan Mandal University, Madhepura, Bihar
11	Kota Chakrapani	Central Agricultural University, Imphal
12	Sunny Rathee	Dr. Harisingh Gour Central University, Sagar, Madhya Pradesh, 470003.
13	Mahendra M	JSS Academy of Higher Education & Research, Mysuru

14	M Saranya Devi	Anna University
15	Sreeshma P S	University of Calicut
16	Reshma Rajan	University of Calicut
17	Juhi Rani Verma	VNIT, NAGPUR
18	Chellakumar R	University of Madras
19	Aparna Raj	Mahatma Gandhi University, Kottayam
20	Gnanasing Jesumaharaja. L	Uttar Banga Krishi Vishwavidyalaya
21	K. Swarna Kumari	Yogi Vemana University
22	Tenzin Thinley	JSS Academy of Higher Education & Research, Mysuru
23	Dr. Charukesi R	JSS Academy of Higher Education & Research, Mysuru
24	Dr. Rajeena K B	Cochin University of Science And Technology, Kochi
25	Minu Mary Sebastian	Mahatma Gandhi University, Kottayam
26	Nithya Jayan	University of Calicut
27	Sujitha. A. S	CRDC, HLL Lifecare Limited
28	Elsa Susan Zachariah	Christian College Chengannur
29	Reshma Sara Johnson	Rubber Resarch Institute Kottayam
30	R Anandha Krishnan	SSN College of Engineering, Kalavakkam.
31	Ms. Prerna	Mahatma Gandhi University, Kottayam

