HANDS-ON TRAINING AND WORKSHOP ON UTILIZATION OF HIGH-END ANALYTICAL INSTRUMENTS

'KARYASHALA' COURSE UNDER MISSION 'ABHYAAS'

Duly Sponsored by DST-SERB under Accelerate Vigyan Scheme


Thermal Evaporation Technique


Fourier Infrared spectrophotometer (FT-IR)


Thermal Analyzer- DSC/TGA


X-Ray Fluoresence (XRF) spectrophotometer


Laser particle size analyzer


Electrochemical Workstation


Gas Chromatography (GC)


High energy ball mill


High performance liquid chromatography (HPLC)

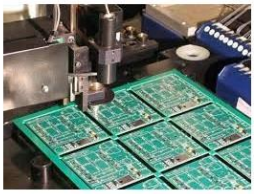

BET-Surface area analyzer


Atomic absorption spectrophotometer (AAS)


Spin Coater


X-Ray Diffractometer (XRD)


Scanning Electron Microscopy (SEM)


PCB Printer-MEMS/NEMS

UV-Visible Spectrophotometer

29th January - 04th February, 2024

Department of Chemical Engineering

Visvesvaraya National Institute of Technology (VNIT), Nagpur

Maharashtra- 440010,

www.vnit.ac.in

High-End Workshop (KARYASHALA)
on
Hands-On Training and Workshop On Utilization of High-End Analytical Instruments

Timeline: **29th January - 04th February, 2024**

ABOUT THE KARYASHALA SCHEME: KARYASHALA scheme is an effort by the Science and Engineering Research Board (SERB), Government of India via Accelerate Vigyan scheme to provide hands-on experience to the students primarily from universities, colleges, private academic institutions, and newly established institutes in handling/troubleshooting of high-end scientific instruments and such skill development on themes required for research work.

ABOUT THE INSTITUTE: Visvesvaraya National Institute of Technology, Nagpur (VNIT Nagpur) is one of the thirty National Institutes of Technology in the country. It is an Institute of National Importance, named after Bharat Ratna Sir M. Visvesvaraya. Earlier, the Institute was known as Visvesvaraya Regional College of Engineering (VRCE). It was established in the year 1960 under the scheme sponsored by Govt. of India and Govt. of Maharashtra. The vision of the institute is to contribute effectively to the national endeavor of producing quality human re-source of world-class standards by developing a sustainable technical education system to meet the changing needs of the country incorporating relevant social concerns and building an environment to create innovative technologies for the development of the nation.

ABOUT THE DEPARTMENT: The Department of Chemical Engineering is one of the premiers and the youngest department of VNIT Nagpur started in 2006. It offers B.Tech., M.Tech., & Ph.D. programs in Chemical Engineering. At present, the department is going at a full pace toward a bright future with the strength of 17 full-time faculties, 450 undergraduate students, 15 postgraduate students, and more than 25 Ph.D. research scholars. It has a dynamic and goal-oriented group consisting of highly qualified, young, and experienced faculties working in emerging research areas such as process control and instrumentation, nanotechnology, biotechnology, energy and environment, modeling and simulation, separation processes, green chemistry, catalysis, polymers, biomass gasification, etc. The department consists of eight undergraduate and sophisticated research laboratories equipped with modern instruments like HPLC, GC, GCMS, BET surface area analyzer, UV-Vis, FT-IR, high-pressure reactors, particle size analyzer, XRF, TGA/DTA, etc., and software such as MATLAB, COMSOL, Aspen Plus, etc. The Department has been consistently receiving R&D project funds from private industries and various organizations in India like DST, SERB, DBT, CSIR, UGC-DAE, BRNS, BARC, DRDO, etc, and abroad.

BRIEF OVERVIEW OF THE WORKSHOP: As desired by DST-SERB '**KARYASHALA**', the workshop is intended for the "Abhyaas" mission, under **Accelerate Vigyan Scheme**.

The workshop incites the participants (PG students, Ph.D. research scholars, and 4th-year undergraduate students) from the universities/institutes/colleges with exposure and state-of-the-art training in various advanced research instrumentation techniques. The program provides the basic principles, sample preparation techniques, demonstration, selection of instruments with merits and demerits, and hands-on training on several advanced analytical instrumentation (microscopy, spectroscopy, electroanalytical, chromatography, deposition, calorimeter, material analyses) techniques, with data analysis using software's available at VNIT Nagpur for the participants to build and strengthen their confidence in using high-end instruments for their research work. The week-long workshop will be an ideal platform for all those participants pursuing/intending to pursue research in diverse fields to come together, discuss, and disseminate their ideas/interests with the lead resource persons at VNIT Nagpur.

Overall, the workshop provides lectures and hands-on training on several high-end research instruments. Hands-on training on the include

- Electrochemical Measurements [ECM]-cyclic voltammetry, linear sweep voltammetry, chronoamperometry, impedance spectroscopy, charge-discharge characteristics
- Thin film deposition techniques: - Electron beam evaporation (EBV)/Thermal evaporation (TE)
- High energy ball mill (HEBM)
- Powder X-ray diffraction (XRD)
- Scanning Electron Microscopy (SEM)
- Fourier-transform infrared spectrophotometer (FTIR)
- UV-Visible Spectrophotometer (UV-vis)
- X-ray fluorescence (XRF) Spectrometer
- Atomic absorption spectrophotometer (AAS)
- High-Performance Liquid Chromatography (HPLC)
- Gas Chromatography (GC)
- Laser Particle Size Analyzer (PSA)
- Brunauer-Emmett-Teller (BET) Surface Area Analyzer
- Microelectromechanical systems (MEMS)
- High-temperature melting point apparatus(MPA)
- Differential Scanning Calorimeter/Thermogravimetry analysis) (DSC/TGA)
- Spin coating and dip coating techniques (SC/DC)

COURSE OBJECTIVES

The main objective of the workshop is to provide the participants an advanced knowledge and hands-on training in various analytical techniques. This includes a detailed theoretical background (principles, operation, and limitations), practical training, data analysis, and a critical understanding of various state-of-the-art techniques they will use during their research work. The course will deliver an in-depth understanding of the several analytical techniques with the selection of an instrument for a particular analysis with its merits and demerits, relevant to their research projects.

COURSE OUTCOMES

After successful completion, the participants will have the knowledge and skills to:

- Describe the theoretical aspects of several analytical instrumentation techniques including microscopy, spectroscopy, electroanalytical, chromatography, deposition, calorimeter, and material analyses.
- Critically plan analytical techniques to apply to different types of samples (powder, liquid, suspensions, gel, film, etc.), including the selection of the most appropriate technique/instrumentation and easy interpretation of the results.
- Engage in appropriate sample preparation, and characterization prior to analysis by the chosen instruments.
- Prepare and design an analytical workflow to acquire data and achieve desired objectives.
- Load samples, operate and troubleshoot the instruments.
- Extract the raw data from the instruments, process the data using software, and justify the approach taken for the data processing with its limitations and validation of the data.
- Plot the data and write a concise description of the analytical technique used as per the requirement for publication in a scientific journal.

RESOURCE PERSONS: Lectures and hands-on training on the above instruments will be delivered by the leading experts from VNIT Nagpur.

Experts:

- Dr. Rajesh Khatirkar, MME Dept., VNIT Nagpur
- Dr. Ravindra V. Taiwade, MME Dept., VNIT Nagpur
- Dr. Ajeet K. Srivastav MME Dept., VNIT Nagpur
- Dr. Dilip. R. Peshwe MME Dept., VNIT Nagpur
- Dr. Jatin Bhatt MME Dept., VNIT Nagpur
- Dr. Rajendra Patrikar, Centre for VLSI and Nanotechnology, VNIT Nagpur
- Dr. Ganesh C. Patil, Centre for VLSI and Nanotechnology, VNIT Nagpur
- Dr. Mahesh N. Varma, Chemical Dept., VNIT Nagpur
- Dr. C. Ravikumar, Chemical Dept., VNIT Nagpur
- Dr. Kailas L. Wasewar, Chemical Dept., VNIT Nagpur
- Dr. Diwakar Z. Shende, Chemical Dept., VNIT Nagpur

ELIGIBILITY: PG students, Ph.D. research scholars, and 4th-year undergraduate students from the universities/institutes/colleges who are having a strong willingness to get exposure and familiarize themselves with the advanced research instruments as defined under the Scheme 'Accelerate Vigyan' by DST-SERB.

REGISTRATION DETAILS

- The course is completely **free of cost** for all shortlisted participants. Participants will be provided with daily necessary expenses such as stationery, consumable items, food, etc (through the SERB fund) for the entire duration of the workshop.

- Traveling expenditure of 3AC railway journey fare will be reimbursed to all selected participants upon submission of valid train tickets by the shortest route to and from Nagpur.

- Accommodation will be provided **free of cost** to all selected candidates by VNIT during the course in the hostels on sharing basis subject to availability.

- The number of participants is limited to 25 candidates only. Interested participants can register at the earliest through the Google form link https://forms.gle/BJStye4Pf8jD955p8.

- Registration form duly signed by Recommending Authority/Head of the Department/ Institute to be mailed to nanosttpvnitnagpur@gmail.com, and reach on or before **15th Jan 2024**.

- Shortlisted participants will be informed by email/phone on **17th Jan 2024**. A valid E-mail ID and a mobile number should be provided during registration. Participants will have to acknowledge and accept the offer for participating in the workshop through a return email, failing which the waitlisted candidates may be called for the workshop. Participants will get complete instructions to deposit Rs. 1,000/- as a caution deposit ("Fully Refundable" after successful completion of the workshop), and submit a No-Objection Certificate (NOC) duly signed by their respective Head of the Department by **22nd Jan 2024.**

EVENT ORGANIZERS

Chief Patron

Prof. Pramod M. Padole
Director & Professor
VNIT Nagpur

Chairman

Prof. Sachin A. Mandavgane
Head, Chemical Engineering
VNIT Nagpur

Event Organizer

Dr. C. Ravikumar

Course Coordinators

Dr. C. Ravikumar
Dr. Diwakar Z. Shende
Prof. Kailas L. Wasewar

Course Assessment & Feedback:

- Active participation in lectures and hands-on training sessions along with basic level evaluation shall fetch KARYASHALA Course Completion Certificate.

- As per SERB guidelines, mandatory anonymous course feedback shall be taken in the stipulated format.

REGISTRATION FORM*

Visvesvaraya National Institute of Technology (VNIT), Nagpur

DEPARTMENT OF CHEMICAL ENGINEERING

High-End Workshop (KARYASHALA)

Hands-on Training and Workshop on Utilization of High-End Analytical Instruments

29th January - 04th February, 2024

1) Full Name:
2) Student Status (PG/Ph.D.):
3) Current Institution/Organization:
4) Department:
5) Educational Qualification:
6) Specialization:
7) Communication Address:

8) Mobile No:
9) Email ID:

Applicant's Signature with Date

Signature of HoD/Principal/Director (with Seal)

* Photocopy or print of this form can be used.

Registration form duly signed by Recommending Authority to be mailed to nanosttpvnitnagpur@gmail.com, and reach on or before **15th Jan 2024**.

All correspondence is to be addressed to:

Dr. C. Ravikumar
Assistant Professor
Department of Chemical Engineering
VNIT Nagpur - 440010
Phone: 0712 – 280-1785, Mobile: 7639461007, Email: nanosttpvnitnagpur@gmail.com

DST-SERB Accelerate Vigyan Sponsored

Hands-on Training and Workshop on Utilization of High-End Analytical Instruments

29th Jan -4th Feb 2024

Tentative Schedule

Day	Lecture 9.30 am - 11.00 am		Lecture 11.15 am - 12.45 pm	Hands-on Training 02.15 pm - 3.45 pm	Hands-on Training 4.00 pm- 5.30 pm
Jan 29, 2024 (Monday)	Scanning Electron Microscopy (SEM) **Dr. Rajesh Khatirkar,** VNIT Nagpur		Powder X-ray diffraction (XRD) **Dr. Rajesh Khatirkar,** VNIT Nagpur	SEM demonstration, sample preparation, and characterization, result analysis **Dr. Rajesh Khatirkar,** VNIT Nagpur	XRD demonstration,characterization of powder samples, and result analysis **Dr. Rajesh Khatirkar,** VNIT Nagpur
Jan 30, 2024 (Tuesday)	Electron Beam Evaporation (EBE) and Thermal evaporation (TE) **Dr. Ravindra V. Taiwade** VNIT Nagpur		Microelectromechanical systems (MEMS) **Dr. Rajendra Patrikar,** VNIT Nagpur	Training on EBE and TE deposition techniques **Dr. Ravindra V.Taiwade** VNIT Nagpur	MEMS characterization, data analysis **Dr. Rajendra Patrikar,** VNIT Nagpur
Jan 31, 2024 (Wednesday)	Electrochemical Measurements (ECM) **Dr. Ajeet K. Srivastav,** VNIT Nagpur		High energy ball mill (HEBM) **Dr. D. R. Peshwe** VNIT Nagpur	Sample preparation, and training on ECM workstation, result analysis **Dr. Ajeet K. Srivastav,** VNIT Nagpur	HEBM- demonstration and sample characterization **Dr. Ajeet K. Srivastav,** VNIT Nagpur
Feb 01, 2024 (Thursday)	High-temperature melting point apparatus (MPA) **Dr. Jatin Bhatt** VNIT Nagpur		Differential Scanning Calorimeter / Thermogravimetry analysis) (DSC/TGA) **Dr. Jatin Bhatt** VNIT Nagpur	Demonstration and training on MPA, DSC, and TGA with result analysis **Dr. Jatin Bhatt** VNIT Nagpur	Visit to V.R. Jamdar Siemens Centre of Excellence lab- Smart Factory, Automation, CNC, Robotics, design software, and instruments **Dr. C. Ravikumar,** VNIT Nagpur
Feb 02, 2024 (Friday)	UV-Visible Spectrophotometer (UV-vis) & BET Surface Area Analyzer- **Dr. Kailas L. Wasewar,** VNIT Nagpur		Fourier-transform infrared spectrophotometer (FT-IR)&Atomic absorption spectrophotometer (AAS) **Dr. C. Ravikumar,** VNIT Nagpur	Hands-on training on UV-Vis, BET surface Area Analyzer with data analysis **Dr. Kailas L. Wasewar,** VNIT Nagpur	Sample Characterization using FT-IR and AAS with data analysis **Dr. C. Ravikumar,** VNIT Nagpur
Feb 03, 2024 (Saturday)	Gas Chromatography (GC) & High-Performance Liquid Chromatography (HPLC) **Dr. Magesh N. Varma** VNIT Nagpur		X-rayfluorescence (XRF) Spectrometer **Dr. Diwakar Z. Shende,** VNIT Nagpur	XRF demonstration and sample characterization and result analysis **Dr. Diwakar Z. Shende,** VNIT Nagpur	GC, HPLC training, and data interpretation **Dr. Kailas L. Wasewar,** VNIT Nagpur
Feb 04, 2024 (Sunday)	Spin coating and dip coating techniques (SC/DC) **Dr. Ganesh C. Patil,** VNIT Nagpur		Training and demonstration on Spin coating and dip coating techniques (SC/DC) **Dr. Ganesh C. Patil,** VNIT Nagpur	Laser Particle Size Analyzer- Lecture and demonstration and analysis **Dr. Diwakar Z. Shende,** VNIT Nagpur	Valedictory function- Brainstorming, feedback & certificate distribution

TEA BREAK

Important Dates:

- Last date for registration: **15th Jan' 24**
- Notification to selected participants: **17th Jan' 24**
- Workshop Dates: **29th Jan - 4th Feb' 24**

- **NO REGISTRATION FEE**
- **TRAVEL REIMBURSEMENT**
- **FREE FOOD & ACCOMMODATION**