# Report of the STUTI Programme organized by CRDSI, IIT Jodhpur from 8th to 14th August

**Prof. Mahesh Kumar,**

**Head of CRDSI, IIT Jodhpur**

# Flyer

One week

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

at

## Indian Institute of Technology Jodhpur

( 8-14 August 2022)

Supported by

Department of Science and Technology, Ministry of Science and Technology, Government of India, New Delhi

In collaboration with Shivaji University, Kolhapur

Department of Science & Technology, Government of India

### About IIT Jodhpur:

Indian Institute of Technology (IIT) Jodhpur is one of the eight new IITs established by Ministry of human Resource Development, Govt. of India in 2008. In 2017 IIT Jodhpur was moved to the permanent campus of 862 acres. From the very beginning of its establishment IIT Jodhpur is contributing significantly in the mulifaced area of basic science, Engineering and technology. IIT Jodhpur was ranked in 43rd place among engineering colleges by the NIRF in 2021. The various departments of IIT Jodhpur are well equipped with different sophisticated instruments and laboratory infrastructures procured using funds from various funding agencies such as SERB, DST-FIST, DBT, MEIT, DRDO, Ministry of Water, Ministry of Ayush, CSIR etc. Apart from departmental facility IIT Jodhpur eatsblished the Centre for Advanced Scientific Equipment (CASE) in 2018. This state-of-the-art central facility housing various latest and advanced instruments which is open to access for external users on a minimal chargeable basis.

### About STUTI:

STUTI stands for Synergistic Training program Utilizing the Scientific and Technological Infrastructure Program funded by the Department of Science & Technology (DST), Government of India. The Scheme is intended to human resource and its capacity building through open access to S & T Infrastructure across the country by organizing training program on DST supported R&D equipment targeting Scientists/Professors/PhDs and PDFs actively involved in research across various institutions in the country.

### Goal of STUTI Program:

- The participants will understand and familiarize with the various sophisticated instruments supported by DST, GoI and other funding agencies.
- The participants will get skill-based knowledge about the handling of various sophisticated instruments and characterization techniques and its analysis.
- The participants get acquainted with the sophisticated instruments and characterization tools to design and implement for appropriate strategies for research work.

### Course Content:

The main theme of this training program is to aware of the participants regarding the sophisticated instruments or characterization such as Morphological Characterization Technique (SEM and AFM), Compositional Characterization Technique (NMR, GC, HPLC, UV-vis Spectrophotometer, Fluorescence Spectrometer, Raman Spectrometer), Structural Characterization Technique (XRD), Thermal analysis (TGA , DSC) etc. The training program includes theory lectures as well as Demonstration/Hands on Training session on the sophisticated instruments.

### Eligibility:

- Ph.D, Master and Bachelor students who are actively involved in the field of basic or applied sciences or engineering.
- Industry professionals who are actively involved in R&D

### Registration Procedure:

- Registration: Free
- Hostel accommodation Fee: Free
- Travel : Limited participants may get 3rd AC train support
- Deadline of registration: 10th July 2022
- Online link: https://forms.gle/kfkePvMkui8ZRN9M9
- The confirmation of selection will be communicated to the selected candidates by email.

### Contact Us:


**Prof. Mahesh Kumar (Chairman)**

**Dr. Jayita Sarkar (Convener)**

Centre for Advanced Scientific Equipment (CASE)
Indian Institute of Technology Jodhpur
NH-62, Nagaur Road Karwar
Jodhpur-342030

Email: jsarkar@iitj.ac.in Phone: 0291-2801343

# Schedule

## Day 1: 8th August 2022

| | | |
|---|---|---|
| 8:30-9:15 | Registration | |
| 9:15-9:45 | Inaugural session | Welcome Address by Director |
| 9:45-10:00 | Tea Break | |
| 10:00-11:30 | LT 1: Prof.RajendraSonkawade | Morphological and Structural Characterization using Sophisticated Instruments |
| 11:30-13:00 | LT 2:Prof. Mahesh Kumar | Elements of X-Ray Diffraction |
| 13:00-14:00 | Lunch Break | |
| 14:00-15:30 | LT 3: Prof.RajendraSonkawade | Sophisticated Instruments at SAIF-DST-CFC center, Shivaji University, Kolhapur |
| 16:00-18:00 | Hands-on Training 1 | Demonstration on XRD |
| 20:00-21:00 | Dinner | |

## Day 2: 9th August 2022

| | | |
|---|---|---|
| 9:30-11:00 | LT 4: Prof.Samanwita Pal | NMR and its application |
| 11:00-11:30 | Tea Break | |
| 11:30-13:00 | LT 5: Dr.Suman Dhaka | Brain Imaging Techniques and Their Applications |
| 13:00-14:00 | Lunch Break | |
| 14:00-15:30 | LT 6: Prof.Ritu Gupta | Surface Characterization Techniques |
| 15:30-16:00 | Tea Break | |
| 16:00-18:00 | Hands-on Training 2 | Demonstration on NMR |
| 20:00-21:00 | Dinner | |

## Day 3: 10th August 2022

| | | |
|---|---|---|
| 9:30-11:00 | LT 7: Prof.Ritu Gupta | Electroanalytical Techniques |
| 11:00-11:30 | Tea Break | |
| 11:30-13:00 | LT 8: Prof. Nitin Sharma | Scanning Electron Microscopy |
| 13:00-14:00 | Lunch Break | |
| 14:00-15:30 | LT 9: Prof. KamaljitRangra | Optical Lithography |
| 15:30-16:00 | Tea Break | |
| 16:00-18:00 | Hands-on Training 3 | Demonstration on SEM |
| 20:00-21:00 | Dinner | |

## Day 4: 11th August 2022

| | | |
|---|---|---|
| 9:30-11:00 | LT 10: Prof. AmitavaMitra | Thermal Characterisation of Material |
| 11:00-11:30 | Tea Break | |
| 11:30-13:00 | LT 11: Prof. Nitin Sharma | Basics of Transmission Electron Microscopy (TEM) |
| 13:00-14:00 | Lunch Break | |
| 14:00-15:30 | LT 12: Prof.KamaljitRangra | E-beam and X-ray Lithography |
| 15:30-16:00 | Tea Break | |
| 16:00-18:00 | Hands-on Training 4 | Demonstration on FESEM and E-beam Lithography |
| 20:00-21:00 | Dinner | |

## Day 5: 12th August 2022

| | | |
|---|---|---|
| 9:30-11:00 | LT 13: Prof.AmitavaMitra | Magnetic Characterisation of Materials |
| 11:00-11:30 | Tea Break | |
| 11:30-13:00 | LT 14: Prof.Durgamadhab Mishra | Advanced Magnetic Characterization |

| | | |
|---|---|---|
| 13:00-14:00 | Lunch Break | |
| 14:00-15:30 | LT 15: Prof.Devendra S. Negi | TGA & DTA |
| 15:30-16:00 | Tea Break | |
| 16:00-18:00 | Hands-on Training 5 | Demonstration on TGA & DTA |
| 20:00-21:00 | Dinner | |

## Day 6: 13th August 2022

| | | |
|---|---|---|
| 9:30-11:00 | LT 16: Dr.Jayita Sarkar | Centre for Advanced Scientific Equipment (CASE): A state-of-the-Art central facility at IIT Jodhpur |
| 11:00-11:30 | Tea Break | |
| 11:30-13:00 | LT 17: Prof.SushmitaJha | Advanced techniques in immunology |
| 13:00-14:00 | Lunch Break | |
| 14:00-15:30 | LT 18:Prof.PranayRanjan | Atomic Force Microscopy |
| 15:30-16:00 | Tea Break | |
| 16:00-18:00 | Hands-on Training 6 | Demonstration on AFM |
| 20:00-21:00 | Dinner | |

## Day 7: 14th August 2022

| | | |
|---|---|---|
| 9:30-11:00 | LT 19: Prof.Devendra S. Negi | Advanced TEM characterization techniques |
| 11:00-11:30 | Tea Break | |
| 11:30-13:00 | LT 20: Prof.PranayRanjan | Characterization of 2D Materials by Optical spectroscopy |
| 13:00-14:00 | Lunch Break | |
| 14:00-15:30 | LT 21:Prof. Ram Prakash | Advanced Spectroscopic Diagnostic Techniques |
| 15:30-16:00 | Closing ceremony | Vote of Thanks and Feedback Collection |
| 20:00-21:00 | Dinner | |

# Inauguration

Inaugurated by Prof.SantanuChaudhury, Director, IIT Jodhpur

STUTI Chairman: Prof.Mahesh Kumar, IIT Jodhpur

and

Guest of Honor: Prof. RajendraSonkawade, Shivaji University


Indian Institute of Technology Jodhpur
Department of Science & Technology Government of India
Inaugural ceremony of
STUTI
A Scientific and Technological Infrastructure Program
Organizing by CASE, IIT Jodhpur
Inaugural address
by
Prof. Santanu Chaudhury
Director IIT Jodhpur
on 8th August, 2022, Time 9:15 AM
Chemistry Building Seminar Hall
IIT Jodhpur
Supported by
DST, Govt. of India


STUTI
Synergistic Training Program Utilizing the Scientific and Technological Infrastructure
Organizing by CENTRE FOR ADVANCED SCIENTIFIC EQUIPMENT (CASE)
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Inaugural ceremony of
STUTI
Chemistry Building Seminar Hall
IIT Jodhpur

# Lecture


Effect of Lattice Strain on Diffraction peak position and width
Peak Width : Strain
•Case 1 → No Strain → Peak at its natural position.
•Case 2 → Compressive Strain → Lattice size decreases 2θ increases.
•Case 3 → Tensile Strain → Lattice size increases 2θ decreases.
•Case 4 → Non-uniform Strain → Peak gets broader.


Features of electron gun


Advanced Spectroscopic Diagnostic Techniques
Ram Prakash
Associate Professor
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Indian Institute of Technology (IIT), Jodhpur
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Electrochemical elements
3) Inductors:- Inductors often need to be included in EIS models due to metallic contacts or leads being too close to one another.
$Z_L = j\omega L$
4) Constant Phase Elements:- Inhomogeneities in the surface of metal oxide electrodes result in non-ideal capacitance in the double-layer at the solid/electrolyte interface which is reason CPE used in place of capacitance
$Z_{CPE} = 1/((j\omega)^{\beta}) Q$

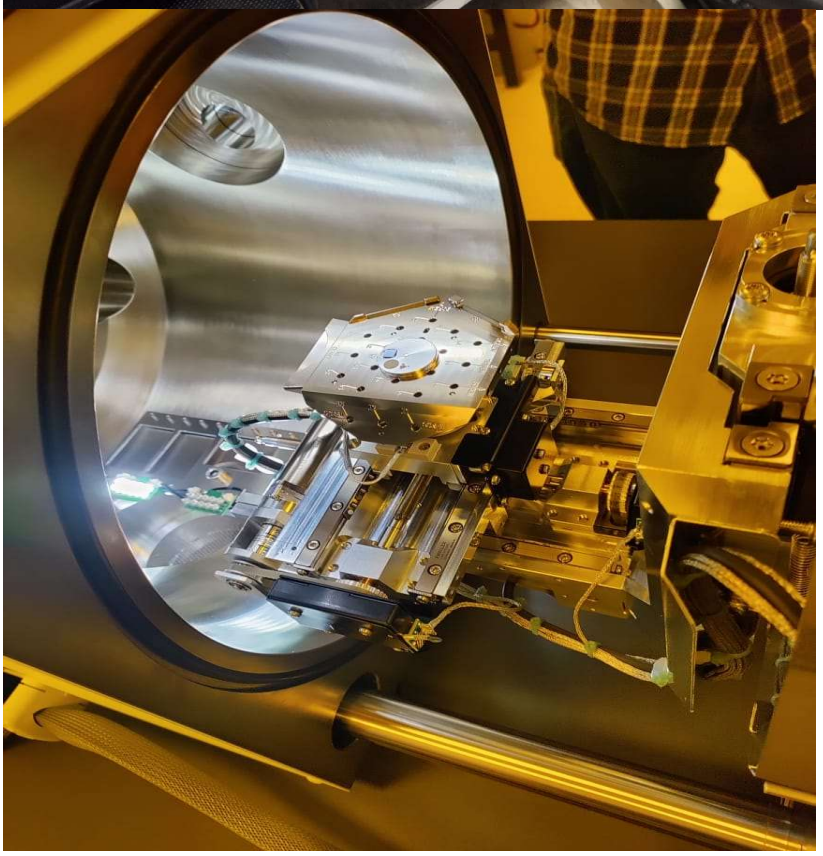

Immunobiology:
The Immune System in Health & Disease
Sixth Edition
Appendix 1
Immunologists' Toolbox


Mask to Wafer Alignment – 1
Visual alignment: Process of getting wafer coarsely centered under mask
For the first mask of the set, since no patterns on the wafer exist yet, alignment is accomplished by special windows on a dark field mask.
Mask
Wafer
Flat


Positron Emission Tomography (PET)
A tracer (radionuclide) emits a positron, which annihilates with an electron, emitting a pair of gamma rays in opposite directions
The detected lines can be grouped into projection images (sinograms) and reconstructed into tomographic images
Different tracers allow various properties to be measured
$^{15}O$ can measure blood flow relatively quickly (<1 min) but requires a cyclotron because of its short 2 minute half-life
$^{18}F$ Fluorodeoxyglucose (FDG) measures glucose metabolism, and has a half life of 110 minutes
Other tracers exist that bind to interesting receptors (e.g. dopamine, serotonin) or beta-amyloid plaques
Normal
Mild cognitive impairment
Alzheimer's disease

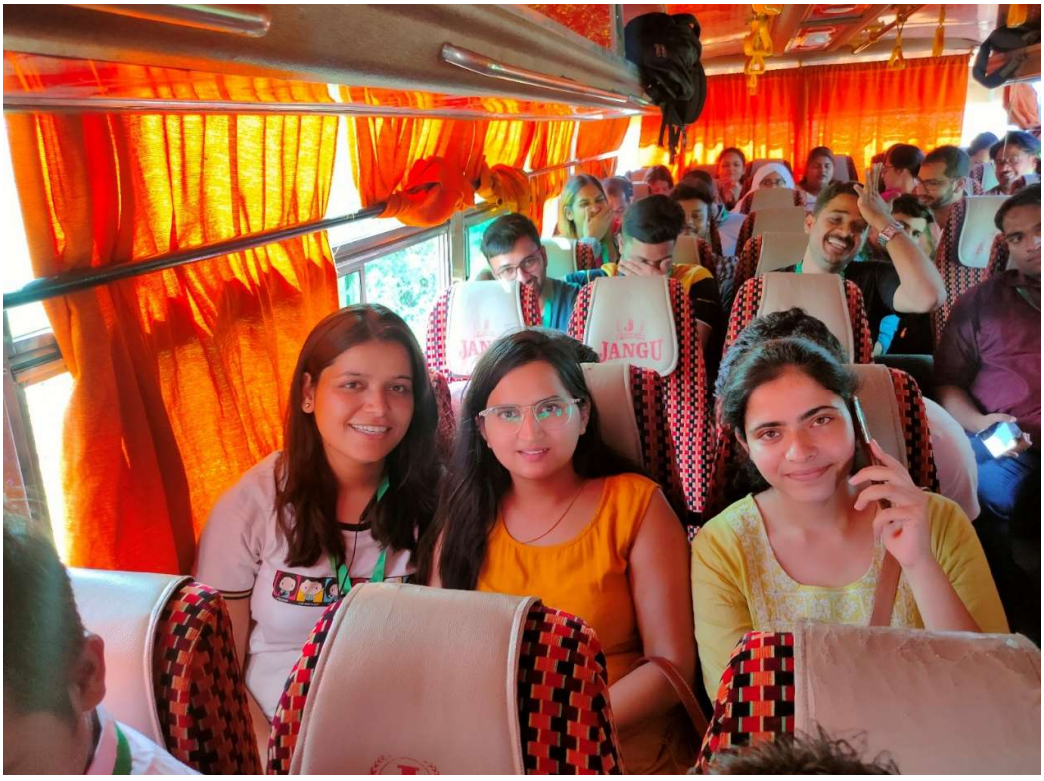

Outline
Introduction to SEM and its attachments

# Hands on Training



# Cultural Programme

# Excursion tour



# STUTI in Media