

It is our great pleasure to announce the online self-sponsored short-term training course on **"X-ray Diffraction: Theory, Methods and Workflow" (XRD 2021)** by the Department of Materials & Metallurgical Engineering (MME) in collaboration with the Physics, Maulana Azad National Institute of Technology, Bhopal, during **6 -15th September 2021**.

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Course Summary

- ▶ **Duration: 3 hours per day**
- ▶ **Experience level: Beginners and intermediate**
- ▶ **Course type: Virtual classroom training**
- ▶ **Teaching Method: online**
- ▶ **Registration fee: Rs 500/- for students, Rs 1000/- for teaching faculties, researchers and Industrialist**

What you will learn in this course

- ▶ Crystal Structure & X-Ray Powder Diffraction Basics
- ▶ Sample preparation and data acquisition
- ▶ Qualitative and Quantitative analysis
- ▶ Indexing the x-ray patterns
- ▶ Analyzing the peak shapes
- ▶ Determination of size and strain
- ▶ Structural Refinement using Rietveld Method
- ▶ Residual Stress Analysis
- ▶ Thin films and Texture Analysis
- ▶ Case Studies

Contents

- ▶ Basics of X-Ray Powder Diffraction, Principal and crystallography History of X-rays.
- ▶ Diffractometer: Theory and Instrumental Details (Tube design, Goniometer, Detector, sample holder)
- ▶ Demonstration of Equipments
- ▶ Sample preparation: Powders (grain size effects, packing/preferred orientation, sample height and width) Thin-films, Capillary/fibers, Single crystal and biological samples
- ▶ Data collection, optimization of scan parameters, scan optimization, Profile Fitting for Quantitative Analysis
- ▶ Acquisition of pattern, Peak indexing, Phase identification
- ▶ Scherrer Equation, Williamson -Hall Plot, Calculation of Crystallite size and Lattice strain
- ▶ X-ray Technique for Thin film Study and Fundamentals of Rietveld Refinement XRD Simulation

Who is this course for?

- ▶ Beginners: those who are new to x-ray diffraction
- ▶ Undergraduate and postgraduate students of science and engineering discipline looking for certified courses
- ▶ Research scholars looking for interpreting their xrd data
- ▶ Analysts or Technicians looking for refresher course
- ▶ Lab managers who are responsible for the instrument or generating data in production line
- ▶ Teaching faculty who are handling this course
- ▶ Researchers
- ▶ Service and Marketing Engineers of these instruments who need to update their understanding on structures

Note: Educational Institutes interested to conduct this course for their students may also contact the coordinators

How to register online XRD training course?

The link for the registration forms (online Google forms) is https://docs.google.com/forms/d/e/1FAIpQLSf6UhlVC1fvHTJc_QH_Q7NfwBJGSIsDf8B0hPU6Oeiz1PFB3Ww/viewform?usp=pp_url
The last date for the submission of application is 30th August, 2021.

Tests and attendance are compulsory for the certification.

Registration fee:

Students and Research Scholars Rs. 500/-

Teaching/Research Faculties, Industry experts Rs 1000/-

Online Short-Term Training Course on X-ray Diffraction: Theory, Methods and Workflow (XRD 2021) (6– 15th September, 2021)

Patron

Prof. N.S. Raghuwanshi
Director, MANIT Bhopal

Advisors

Prof. Sanjay Srivastava
Dr. Fozia Z. Haque

Program Coordinators

Dr. C. Sasikumar
Dr. Piyush K. Patel
Dr. Jyoti Rani



Organized by

Department of Materials and Metallurgical Engineering
in collaboration with Department of Physics
Maulana Azad National Institute of Technology
Bhopal – 462 003

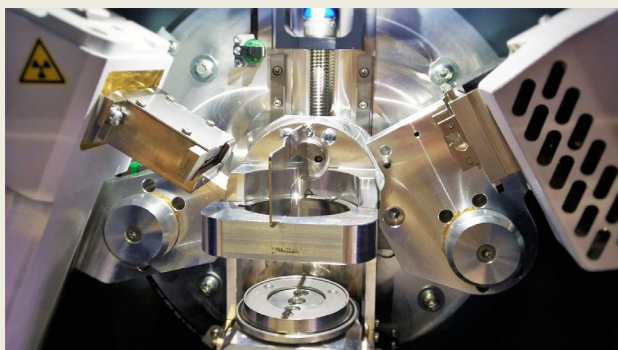
Website: www.manit.ac.in

About the institute

Maulana Azad National Institute of Technology (MANIT), an Institute of National Importance, is formerly known as Maulana Azad College of Technology (MACT). Institute is named after the great scholar and 1st Education Minister of Govt. of India, Maulana Abul Kalam Azad. The Govt. of India and Govt. of Madhya Pradesh jointly sponsored the Institute in 1960 to attract bright young engineering students across the country. Institute is successfully producing highest quality skilled manpower to cope up with challenges of modern technological advances with more than 200 faculties and 5500 students. The Institute offers 09 UG and 30 PG courses and also Ph. D. research programs. Currently, IIIT Bhopal is functioning inside the MANIT campus and MANIT Bhopal is the mentor institute of IIIT Bhopal.



About the 2-week Course



X-Ray diffraction (XRD) technique is an important non-destructive material characterization analytical tool for investigating condensed matter in powder, single crystal and thin film forms. From research to production, XRD is an indispensable technique for material characterization providing detailed information about the internal lattice of crystalline substances. Hence, the analysis of XRD diffraction data is of utmost importance. The technique began when von Laue discovered that crystals diffract x-rays in 1912. Since then, it has been applied to crystal structural analysis, stress and strain measurement, measurement of particle size etc.

The scope of this course is firstly to acquaint participants with a fundamental understanding of the theoretical basis as well as the practical applications of powder diffractometry followed by a demonstration of XRD analysis techniques. Secondly, to provide hands-on training to determine the crystal and molecular structure from the measured X-ray diffraction data. During the

course participant will learn about how to use crystallographic software for phase analysis as well as crystal structure analysis, Rietveld refinement, estimation of grain size, lattice parameters, lattice strain, substitution/doping analysis, etc. All the required software, sample data for analysis and other information will be provided during the training sessions. This school will also provide a platform to the participant to discuss their ideas and collaborate with renowned scientists of materials science

About the Department of MME

The Department of Materials and Metallurgical Engineering (MME) was established in the year 2007 with a vision of creating a world class environment for education and R&D in the field of Materials and Metallurgical Engineering. The department is working towards creating collaborative and supportive environment that ignites advances in materials research in India by developing fundamental understanding, adopting frontier technologies, providing education and enabling technological innovations. The department offers undergraduate program in Materials and Metallurgical Engineering, PG program in Materials Science and Technology and Ph.D. program. The Department has developed few state-of-art facilities in materials processing and characterization. These facilities includes Scanning Electron Microscope with EDX Facility, X-Ray Diffraction Facility, Thin Film Processing (PVD cum PECVD), Facilities for corrosion and electrochemical studies (Potentiostat/Galvanostat), Destructive and Non-Destructive Testing Facilities, Advanced Materials Processing Facilities (Planetary Bal Mills, High Temperature Furnaces, Microwave Processing)

About the Department of Physics

The department of Physics offers an M.Tech. course in Nanotechnology since 2006. A center of Nanoscience and Engineering is formed within the department in 2014. The Department and the centre are engaged in research leading to Ph.D. and teaching in the frontier areas of experimental sciences. It is well established laboratories at UG, PG and research level. Department has sophisticated instruments like AFM, BET, UV- visible spectroscopy.

REGISTRATION FORM

Online Short-Term Training Course on X-ray Diffraction: Theory, Methods and Workflow (XRD 2021) (6 - 15th September, 2021)

Name of the Candidate (Capital letters):

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Address:

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Phone: (R)..... (O)
(with STD code)

E-mail:

Qualification:

Present Position:

Relevant Experience:

Payment Details

Bank Name:

Amount:

Online Transaction ID/Reference Number:

Date of Transaction:

Signature of Applicant with date

Google link for Registration

https://docs.google.com/forms/d/e/1FAIpQLSf6UhiVC1fvHTJc_QH-Q7NfwBJGSIsDf8B0hPU6Oeiz1PFB3Ww/viewform?usp=pp_url

Details for online payments

Account Name: Director MANIT Bhopal

Bank Name: State Bank of India

Bank Address: MANIT (MACT) Bhopal, M.P., India

Account No : 10020150107

IFSC Code: SBIN001608

Note : In net banking money transfer clearly mention in the remark column as "Registration Fee for XRD 2021.

The link for the registration forms (online Google forms) is available on Institute website www.manit.ac.in.

The last date for the submission of application is 30th August, 2021.