

**Online STTP on
Electrochemical Impedance Spectroscopy:
Fundamentals and Applications**

26th Feb. – 02nd Mar., 2021

REGISTRATION FORM

Name:
Designation:
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Qualification:
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Amount
DD/NEFT/RTGS No.....
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Date: Place:

Signature of candidate.....

Note:
NEFT/RTGS should be made in favor of
Director, National Institute of Technology
Raipur, payable at Raipur (CG), SBI bank,
GCET Raipur branch.

For online Registration go through the following
link: <https://tinyurl.com/y3n49mv8>

Payment should be made to the following
Account No.: 38027633250
Name: Director, NIT Raipur IFSC: SBIN002852
Online registrations only shall be accepted.

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Dr. Manoj K. Chopkar
Dr. Manwendra K. Tripathi

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Ms. Harsha Verma (81090-61565)
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Organized by

**Department of Metallurgical and
Materials Engineering**



**National Institute of Technology –
Raipur
492 010 (Chhattisgarh)**

About the Institute

National Institute of Technology Raipur situated in the capital of Chhattisgarh, has proven to be *avant-garde* in the field of science and technology over past few decades. The foundation of the Institute was laid by the president Honorable Dr. Rajendra Prasad on 14th September 1956. Later the inauguration of the Institute building was done by the Prime Minister Honorable Pt. Jawahar Lal Nehru on 14th March 1963. The institute started with two departments, namely Metallurgical and Mining Engineering. From 1st December 2005, the Institute has become the National Institute of Technology. It is well connected with Mumbai, Delhi and all metro cities by regular flights and is on the main Howrah-Mumbai railway route. The institute is 5 km from the Raipur railways station and 18 km from airport on NH-6, the Great Eastern Road.

About Department

The Department of Metallurgical Engineering came into existence in the year 1956. It has recently rename as the Department of Metallurgical and Materials Engineering. The doctoral program started in 2012 and graduate program is expected to commence in near future. The department provides an outstanding research environment and offers academic program leading to the award of B.Tech. and PhD degree.

Organizer

Department of Metallurgical and Materials Engineering, NIT Raipur (CG) – 492 010, India

Objectives

This STTP intends to quickly introduce the essential fundamentals of the electrochemical impedance spectroscopy followed by experimental demonstrations. The renowned experts from the IITs, NITs and other institutes of repute will share their research experience of the applications of electrochemical impedance spectroscopy including data analysis and applications of softwares.

Topics to be covered

Electrode Double Layer Theory, Butler-Volmer equation, Activation and Concentration Polarization, Open Circuit Potential, Tafel's Extrapolation, Electrochemical Impedance Spectroscopy, Randle circuit, complex plane plot, Bode plot, Effect of coating on the electrode/electrolyte interface followed by experimental demonstration of 2 and 3 point connection and a typical EIS test on the potentiostat, Electrochemical Devices: An Introduction, Understanding the hardware and software interface of the potentiostat, The electronic aspect of the Galvanostatic and Potentiostatic Control modes of the Potentio/Galvanostat, Applications of Mott-Schottky Analysis, Different Models of Electrochemical Devices, Characterization of Electrochemical Devices using EIS, Application of EIS for Corrosion and Batteries, Extraction of Ion Dynamic information from Conductivity Power Law, Scaling of Conductivity Data, Equivalent Circuit Model and curve fitting analysis using EIS, Using EIS to understand reactions, Demonstration on ZSIMPWIN and Kramers-Kronig Transformation, Application of EIS to study multilayer coated AZ31B Mg Alloy.

Confirmed Speakers:

- Prof. S. Ramanathan, IIT Madras
- Prof. Neelam Srivastav, BHU Varanasi
- Dr. Supratik Roychowdhury, BARC, Mumbai
- Prof. Santosh K. Tripathi, Mahatma Gandhi Central University, Motihari
- Dr. Mohammad Umar Farooq Khan, North Carolina State University, USA
- Dr. A. S. Raghuvanshi, NIT Raipur
- Dr. Manivannan R., NIT Raipur
- Dr. M. K. Tripathi, NIT Raipur

Target Participants

The course is designed for research scholars applying electrochemical impedance spectroscopy as part of their research methodology. However, it will be equally useful for faculty members and participants from research laboratories and industry. Please note that the participants should have fairly good exposure to the theory of Electrochemistry and Corrosion Engineering.

Registration Fee Details (in INR)

Participants	Amount (in Rs) inclusive GST
PG, PhD Scholars	Rs 590/-
Faculty Member and Persons from Industry & Research Laboratories	Rs 826/-

Please note that the registration is open for **Indian national** only. Preference will be given to the participants having prior knowledge on the fundamentals of electrochemistry. Candidates should register online (<https://tinyurl.com/y3n49mv8>) along with scanned of NEFT/RTGS transaction on or before 22nd Feb., 2021. The registration confirmation will be mailed in the due course. Certificates will be issued to the registered participants after attending the complete course.



Tentative Program Schedule
Online Short Term Training Program
Electrochemical Impedance Spectroscopy: Fundamentals and Applications
Department of Metallurgical and Materials Engineering
National Institute of Technology Raipur

Day 01 (Friday) – 26th Feb., 2021

09:45-10:00 Inaugural

10:00-11:00 *Introduction to Electric Double Layers and Activation Polarization*

Dr. Manwendra K. Tripathi Assistant Professor, Metallurgical and Materials Engineering, NIT Raipur

11:15-12:15 *Brief introduction to DC Characterization Techniques and Concentration Polarization*

Dr. Manwendra K. Tripathi Assistant Professor, Metallurgical and Materials Engineering, NIT Raipur

12:30-13:30 *Introduction to AC Characterization Techniques*

Dr. Manwendra K. Tripathi Assistant Professor, Metallurgical and Materials Engineering, NIT Raipur

15:00-16:00 *Laboratory Session 1 Introduction to Potentiostat Hardware and Software: OCP, 2 point and 3 point connection, Tafel Extrapolation, EIS, Battery Charging-Discharging, CC-CV*

Dr. Manwendra K. Tripathi Assistant Professor, Metallurgical and Materials Engineering, NIT Raipur



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Day 02 (Saturday) – 27th Feb., 2021

10:00-11:00 *Basics of Electrochemical Impedance Spectroscopy*

Prof. Santosh Kumar Tripathi, Professor, Mahatma Gandhi Central University Motihari

11:15-12:15 *Electrochemical Devices: An Introduction*

Prof. Santosh Kumar Tripathi, Professor, Mahatma Gandhi Central University Motihari

12:30-13:30 *Understanding the hardware and software interface of the potentiostat*

Dr. A. S. Raghuvanshi Assistant Professor, NIT Raipur

15:00-16:00 *The electronic aspect of the Galvanostatic and Potentiostatic Control modes of the Potentio/Galvanostat*

Dr. A. S. Raghuvanshi Assistant Professor, NIT Raipur



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Day 03 (Sunday) – 28th Feb., 2021

10:00-11:00 *Applications of Mott-Schottky Analysis: Part-I*
Prof. S. Roychowdhury Scientist-H, BARC Mumbai

11:15-12:15 *Applications of Mott-Schottky Analysis: Part-II*
Prof. S. Roychowdhury Scientist-H, BARC Mumbai

12:30-13:30 *Different Models of Electrochemical Devices*
Prof. Santosh Kumar Tripathi, Professor, Mahatma Gandhi Central University Motihari

15:00-16:00 *Characterization of Electrochemical Devices using EIS*
Prof. Santosh Kumar Tripathi, Professor, Mahatma Gandhi Central University Motihari



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Day 04 (Monday) – 01st March, 2021

10:00-11:00 *Application of EIS for Corrosion and Batteries*

Prof. S. Ramanathan Professor, Chemical Engineering, IIT Madras

11:15-12:15 *Extraction of Ion Dynamic information from Conductivity Power Law*

Prof. Neelam Srivastava Professor, Banaras Hindu University, Varanasi

12:30-13:30 *Scaling of Conductivity Data*

Prof. Neelam Srivastava Professor, Banaras Hindu University, Varanasi

15:00-16:00 *Equivalent Circuit Model and curve fitting analysis using EIS*

Prof. Santosh Kumar Tripathi Mahatma Gandhi Central University Motihari

16:15-17:15 *Using EIS to understand reactions: Part I*

Prof. S. Ramanathan Professor, Chemical Engineering, IIT Madras



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Day 05 (Tuesday) – 02nd Jan., 2021

10:00-11:00 *Using EIS to understand reactions: Part II*

Prof. S. Ramanathan Professor, Chemical Engineering, IIT Madras

11:15-12:15 *Discussion and Demonstration on ZSIMPWIN*

Prof. R. Manivannan Assistant Professor, Chemical Engineering, NIT Raipur

12:30-13:30 *Discussion and Demonstration on Kramers-Kronig Transformation*

Prof. R. Manivannan Assistant Professor, Chemical Engineering, NIT Raipur

15:00-16:00 *Application of EIS to study multilayer coated AZ31B*

Mg Alloy

Dr. Mohammad Umar Farooq Khan, Visiting research Scholar, North Carolina State University, Raleigh, NC, United States

16:00-17:00 *Feedback Session and Closing*

Dr. Manwendra K. Tripathi and Dr. Manoj K. Chopkar