



Skill development and Hands-on Training Program on Electrochemical Impedance Spectroscopy (EIS) - Model CHI6059E

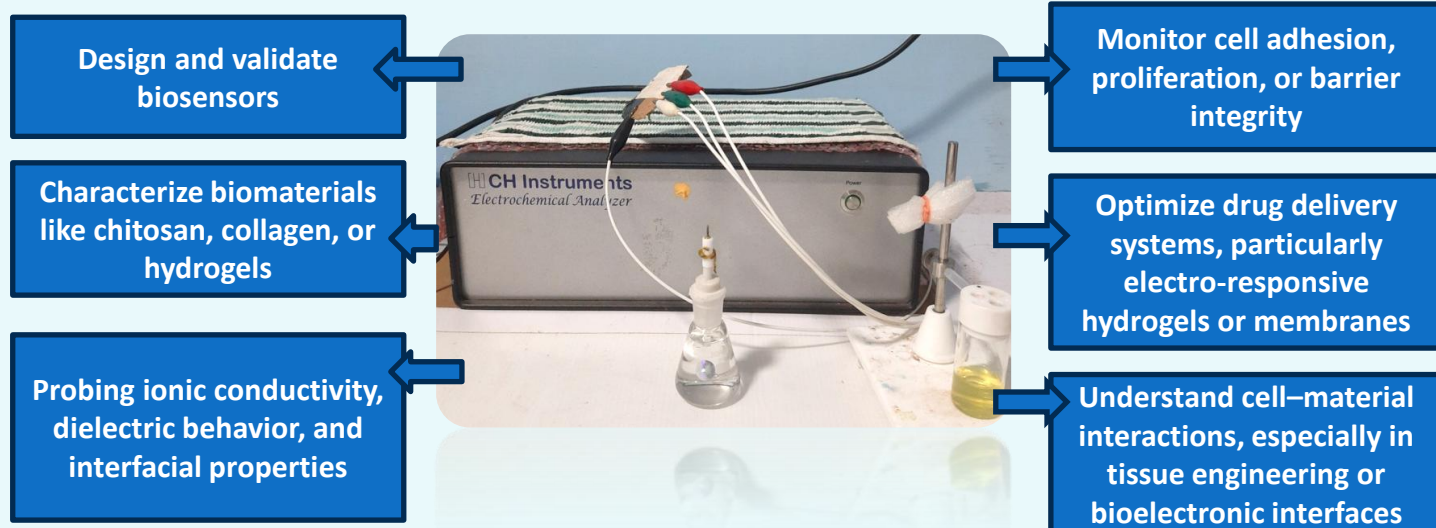
on 11th – 14th August, 2025



Organized by

Department of Marine and Coastal Studies, School of Energy, Environment and Natural Resources,
Madurai Kamaraj University, Madurai - 625021, Tamil Nadu, India

Sponsored by RUSA-MKU



About the programme

Electrochemical Impedance Spectroscopy (EIS), in which a sinusoidal test voltage or current is applied to the sample under test to measure its impedance over a suitable frequency range, is a powerful technique to investigate the electrical properties of a large variety of materials. In practice, the measured impedance spectra, usually fitted with an equivalent electrical model, represent an electrical fingerprint of the sample providing an insight into its properties and behavior. EIS is used in a broad range of applications as a quick and easily automated technique to characterize solid, liquid, semiliquid, organic as well as inorganic materials. Chitosan, a biopolymer derived from chitin, is widely used in coatings, sensors, and drug delivery systems due to its biocompatibility, film-forming ability, and charge-carrying properties. EIS is a powerful technique used to study the electrical properties of materials and interfaces, particularly in thin films and coatings.

Objective of the Hands-on Training Program on EIS is i) to enable the training participants to understand the principles, applications, and hands-on experience on EIS ii) to gain knowledge about the in-depth analysis of the samples and characterization using EIS and iii) to interact with EIS handling expert resource persons/ scientists/ industrial research personnel and to get equipped for research and industry manpower requirements towards prospective placement opportunity. Hands-on experience teaches more than just how to operate the instrument. Participants will learn how to: Choose the right frequency range and amplitude. Spot artifacts or noise in Nyquist and Bode plots and Fit equivalent circuits that actually make sense for biological systems.

Outcome of the training

At the end of the training programme, the participants will get equipped with basics of EIS and how to handle EIS for their own material characterization. Also, they will know, Chitosan preparation and parameter optimization for EIS analysis, generation of EIS data, analysis and interpretation using basic mathematical and statistical concepts.

Madurai Kamaraj University instituted a Centre for Marine and Coastal Studies (CMCS) in the year 1998 for the establishment of Marine Field Research facility at Pudumadam, Ramanathapuram District. The University has recognized the academic and research activities of the CMCS and elevated its status to Department of Marine and Coastal Studies (DMCS) from the academic year 2009-10 onwards.

Who can apply? Early career research scientists, Faculties, Post doctoral fellows, Research scholars and M.Sc. Students who are interested in EIS instrumentation can apply for this training programme.

- **There is no registration fee. The last date for registration is 04-Aug-2025. Only 25 seats are available. Selection list will be intimated by email on 06-Aug-2025. Working lunch will be provided. Participants must arrange their own accommodation. A certificate of participation will be provided.**



Registration can be done through google forms:

<https://forms.gle/qHbvZkvZyeSn2xBG6>

For further information please contact:

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Organizing Secretary

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Highlights of the programme

Electrochemical Impedance Spectroscopy (EIS) instruments are widely used in corrosion studies, battery research, fuel cell development, and sensor design. In the recent days, EIS instruments are becoming increasingly valuable in life science research due to their versatility in characterizing biological systems at various levels.

Key applications in life science research

Biosensors: EIS is widely used in the development of biosensors for detecting a range of targets, including pathogens, DNA, proteins, cells, and biomarkers for diseases like cancer and Alzheimer's.

Cellular Analysis:

- EIS helps characterize the electrical properties of cell membranes and cytoplasm, allowing researchers to study cell adhesion, differentiation, growth, and viability.
- It can be integrated with microfluidic devices to analyze single cells or small cell populations, offering high-throughput and label-free characterization.

Tissue Characterization: EIS can be used to study the structure of tissues and differentiate between normal and cancerous tissue, as well as to detect cellular changes associated with conditions like ischemia.

Drug Discovery and Development:

EIS assists in assessing drug delivery systems by monitoring drug release profiles.

It can also be employed in the development of biosensors for detecting drug residues or contaminants in environmental samples like water.

Key Applications in Marine Biology Research:

1. Studying biofilms and biofouling

Microbially Influenced Corrosion (MIC): EIS is used to study the impact of biofilms on corrosion, a significant problem for marine infrastructure and vessels.

Biofilm Development and Characterization: EIS helps to characterize the development, growth, and structure of marine bacterial biofilms on various surfaces, including metals and inert surfaces.

Antifouling Coatings: EIS can be used to evaluate the performance of antifouling coatings on marine surfaces, helping researchers to develop more effective coatings to prevent unwanted marine growth and corrosion.

2. Marine organism interactions

Impact of Organisms on Electrochemical Properties: EIS can reveal how marine organisms, such as bacteria in biofilms or other organisms that might attach to surfaces, influence the electrochemical properties of a system.

3. Assessing marine organism health

Salt Resistance: EIS can be used to investigate the response of halophytes (salt-tolerant plants) to salt stress, potentially serving as a non-damaging method for assessing salt resistance.

Spoilage Detection: EIS can be employed to monitor the spoilage of marine products like fish, indicating freshness levels based on changes in impedance, critical frequency, and phase shift.