

CHE-817 Bioelectrochemical Systems

Credit Hours: 3

Pre-requisites: Nil

Course Contents:

- Introduction to bioelectrochemical Systems (BESs), types, and their applications
- Essential parts of BESs and fundamental principles of microbiology, electrochemistry, and materials science in the context of BESs
- Mechanisms of extracellular electron transfer (EET)
- Evaluation methods for BES performance: monitoring parameters and quantifying metrics with examples and case studies
- Strategies to increase BES performance.
- BESs for bioelectricity generation and waste remediation: principles and practical challenges.
- BESs for biofuel and chemical production: underlying principles and implementation challenges
- BESs in bio-electro-refineries
- BES-based biosensors
- Introduction to weak electrons and their biomedical applications
- EET- Microbiologically induced corrosion

Course Outcomes

- Students will gain a thorough understanding of bioelectrochemical systems (BESs) and their applications, encompassing microbiology, electrochemistry, and materials science (electrode materials).
- Students will develop expertise in analyzing the mechanisms of extracellular electron transfer (EET) and microbe-electrode interactions, enabling them to address environmental and energy challenges using BESs.
- Students will acquire the skills to evaluate BES performance, including monitoring key parameters and quantifying metrics, enabling them to assess the effectiveness of BESs in real-world applications.

Recommended Reading (including Textbooks and Reference books):

- Bioelectrochemical Systems: From Extracellular Electron Transfer to Biotechnological Application (2010) Eds. K. Rabaey, L. Angenent, U. Schroder and J. Keller, IWA Publishing, London, United Kingdom.
- Biofilms in Bioelectrochemical Systems: From Laboratory Practice to Data Interpretation (2015) Eds. H. Beyenal and J.T. Babauta, John Wiley & Sons.
- Microbial Fuel Cells (2008) Bruce E. Logan, Wiley.
- Electrochemical Methods: Fundamentals and Applications (2000). Bard, Allen J., and Larry R. Faulkner, Wiley, ISBN: 9780471043720.
- Microbial Electrochemical and Fuel Cells: Fundamentals and Applications (2016) Eds. Keith Scott, Eileen Hao Yu,