Congratulations for seeking Govt. Sponsored Project

Name: Dr. Aniruddha Deb (Principal Investigator)

Department: Chemical Engineering

Project Title: Development of an affordable portable non-invasive Electrochemical Impedimetric Biosensor for Rapid detection of Thyroid-Stimulating Hormone (TSH) in Resource-constrained areas.

Funding Agency: Department of Health Research (DHR), Ministry of Health and Family Welfare (MoHFW))

Sanction Amount: 38.25 Lakhs

Fund Utilised.: 20720+45890= 66610 (+864800 indent in process)

Tenure: 3 Years

Abstract:

Rapid and affordable screening of Thyroid-Stimulating Hormone (TSH) is essential for early diagnosis of thyroid disorders, especially in resource-constrained regions where laboratory infrastructure and trained personnel are limited. This work presents the development of a portable, low-cost, non-invasive electrochemical impedimetric biosensor integrated with a smartphone-based readout platform for rapid TSH detection. The proposed system employs a nanostructured electrode surface functionalized with TSH-specific antibodies/aptamer, enabling highly sensitive label-free detection through changes in interfacial impedance upon antigen binding. A compact potentiostat module based on an optimized transimpedance amplifier, low-noise analog front-end, and wireless microcontroller is engineered to perform impedance spectroscopy at multiple frequencies. A user-friendly mobile application processes the impedance spectra, extracts features, and predicts TSH levels using calibration models, providing results within minutes. The biosensor demonstrates excellent reproducibility, high sensitivity in the clinically relevant range, and strong correlation with standard laboratory immunoassays. Owing to its low fabrication cost, minimal sample requirement, and robust field usability, this portable impedimetric biosensing system has strong potential for population-level thyroid screening and decentralized endocrine health monitoring in low-resource settings.