Congratulations for seeking Govt. Sponsored Project

Name: **Dr. Aniruddha Deb (Principal Investigator)**

Department: **Chemical Engineering**

Project Title: **Development of a Non-invasive, smartphone Integrated, Machine Learning assisted multiplexed electrochemical biosensor for urinary NGAL and cystatin C detection to enable early chronic kidney disease (CKD) monitoring.**

Funding Agency: **Anusandhan National Research Foundation – Prime Minister Early Career Research Grant (ANRF-PMECRG)**

Sanction Amount: **61.452 Lakhs**

Fund Utilised.: 0

Tenure: **3 Years (Date of Start of Project: 13.05.2026-12.05.2029)**

Abstract:

Project Summary: **Chronic Kidney Disease (CKD) remains a major global health burden, with delayed diagnosis often resulting in irreversible renal damage and progression to end-stage kidney failure. Conventional biomarkers such as serum creatinine and estimated glomerular filtration rate (eGFR) lack sensitivity for early detection, as they rise only after significant nephron loss has occurred. In contrast, Neutrophil Gelatinase–Associated Lipocalin (NGAL) and Cystatin C are promising early urinary biomarkers that reflect kidney tubular injury and glomerular filtration efficiency, respectively. However, current clinical assays for these biomarkers require centralized laboratory infrastructure, trained personnel, and are time-intensive and cost-inefficient, limiting their applicability in decentralized and resource-constrained settings. This project aims to develop a smartphone-integrated, machine learning–assisted multiplexed electrochemical biosensor for the simultaneous detection of urinary NGAL and Cystatin C to facilitate early CKD monitoring. A custom portable potentiostat will be integrated with a smartphone application for real-time data acquisition, processing, and display. Machine learning algorithms will be trained using validated biomarker datasets to improve signal interpretation, reduce interference effects, and enable predictive risk assessment for CKD staging. Clinical validation will be conducted in collaboration with Rajendra Institute of Medical Sciences (RIMS), Ranchi, Jharkhand using de-identified urine samples from patients across various CKD stages and comorbid conditions.**

This technology has strong translation potential for community health center's, telemedicine networks, and government health initiatives such as the National Health Mission of India and PRADHAN MANTRI NATIONAL DIALYSIS PROGRAM.