Registration Seminar

Seminar Title	: AI-Driven IoT Framework for Fault Localization in Overhead Lines of DG-Integrated Distribution System
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Venue	: EE Department (New Seminar Room-EE 401)
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Abstract : Efficient fault location in electric power systems is necessary for ensuring grid reliability, minimizing downtime, and facilitating timely restoration efforts. The integration of Distributed Generation (DG) into modern power distribution systems has introduced significant challenges in fault detection and localization. Traditional fault localization methods are often inadequate in handling the complexities of bidirectional power flow, variable fault contributions from DG units, and the dynamic nature of these grids. This research work proposes a novel AI-driven IoT framework for fault localization in DG-integrated distribution systems, offering a solution to these challenges and addressing an important gap in existing research. A thorough review of current literature reveals that while IoT has been widely applied in various areas of power systems, its specific application for fault localization in overhead distribution lines has been largely overlooked. Furthermore, many existing IoT-based fault localization studies do not include the development of a user-friendly interface (UI) for monitoring and managing fault locations. This research aims to address both gaps by incorporating a UI into the proposed IoT framework, allowing real-time visualization of faults and enhancing grid operators' ability to make informed decisions quickly. The proposed framework will leverage IoT-enabled Intelligent Electronic Devices (IEDs) to monitor real-time electrical parameters, such as voltage and current, across the distribution network. Artificial Intelligence (AI) and Machine Learning (ML) models will be developed specifically for fault localization, utilizing techniques such as artificial neural networks (ANNs), support vector machines (SVMs), and deep learning. These AI models, which are currently under development, will enhance the framework&rsquos ability to quickly and accurately pinpoint fault locations within the network. IoT architecture will be implemented to provide seamless, real-time data acquisition and communication between IEDs and operators. This will enable faster response times and more precise fault localization, even in complex grids with multiple DG units. While initial simulation studies done in MATLAB/Simulink on the IEEE 33-bus system have validated some aspects of the methodology, future work will involve integrating the AI models with the IoT architecture and conducting extensive validation in DG-integrated environments. Overall, this research addresses a critical gap by applying IoT technology to fault localization in overhead distribution lines, an area that has been underexplored in the field. By combining IoT with AI for fault localization in DG-integrated distribution systems, this study contributes to the development of more resilient, reliable, and adaptive power grids, providing a foundation for future advancements.