Course Information Booklet for Bachelor Course on Electrical and Energy Engineering
At Institute of Technology of Cambodia
Type of recognition planned: HEI Degree
Level of the course: Bachelor 4th Year of Engineering Degree
Contributors: Department of Electrical and Energy Engineering
Planned Teachers: Ms. Eng Samphors
Title course: Power System Lab Part 4 - Power System Architecture

Course Objectives

The objective of this course is to study the architectural concept of power systems, providing students with fundamental knowledge and problem-solving skills related to the structure and automation of power system distribution. Additionally, the course covers the concept of operation and management of power systems, focusing on the application of automation systems. Feeder automation, which involves using automation technology to monitor, regulate, and improve distribution feeders, is a key topic in power system architecture. The goal is to enhance the network's responsiveness, efficiency, and dependability. Furthermore, the course incorporates practical elements such as simulations and experiments, bridging the gap between theory and practice in teaching.

Overall, this course equips students with a comprehensive understanding of power system architecture, automation, and the practical skills necessary to address real-world challenges in power system distribution.

Description of the Course (TOPICS/CHAPTERS), number of hours & type (Lecture or tutorial or laboratory works or Self-Learning)

Chapters	Topics	Number of hours	Type
Lab 1- Distribution System Reconfiguration	• Lab 1.0: Prelab Knowledge: Experiment (2h) - PLC setup - PLC simulation - PLC programming - PLC Configuration • Lab 1.1: Distribution System Reconfiguration: Simulation (2h) • Lab 1.2: Distribution System Reconfiguration: Experiment (2h)	6h (4h)	Laboratory (New)
Lab 2- Distribution System Restoration	• Lab 2.1: Distribution System Restoration: Simulation (2h) • Lab 2.2: Distribution System Restoration: Experiment (2h)	4h (2h)	Laboratory (New)
Lab 3- Voltage Control in Distribution System	• Lab 3.1: Voltage Control in Distribution System: Simulation (2h) • Lab 3.2: Voltage Control in Distribution System: Experiment (2h)	4h (2h)	Laboratory (New)
Lab 4- Contingency Analysis in Power Systems	• Lab 4.1: Contingency Analysis in Power Systems: Simulation (3h) • Lab 4.2: Contingency Analysis in Power Systems: Experiment (2h)	5h (2h)	Laboratory (New)
Lab 5- Fault Analysis in Power Systems	• Lab 5.1: Fault Analysis in Power Systems (3h) • Lab 5.2: Fault Analysis in Power Systems: Experiment (2h)	5h	Laboratory

Prerequisite: Power system analysis and optimization, 4th Year, Electrical and Energy Engineering, Option Electrical Energy

Learning Outcomes

Upon completion of this course, students will have the ability to identify various architectures and distribution automation system schemes. They will gain a comprehensive understanding of automation systems and their key elements, which are crucial for managing and monitoring electrical power systems. Furthermore, students will learn how to apply developed algorithms and optimization techniques to address distribution system management challenges, including voltage regulation, restoration, and reconfiguration. The course will enable students to effectively utilize multiple PLC programming languages to create and execute PLC programs for feeder automation in distribution management. Additionally, they will learn how to employ communication protocols, enabling them to remotely monitor and manage the feeder automation system using SCADA. By combining theoretical knowledge with practical skills, this course equips students with the necessary tools to analyze and address real-world challenges in distribution automation systems..

References:

[1] J. D. Glover, T. J. Overbye, and M. S. Sarma, “Power System Analysis and Design,” Cengage Learning, 6th Edition, 2017.
[2] J. M. Gers and E. J. Holmes, “Protection of Electricity Distribution Networks,” IET Power and Energy Series 47, 2nd Edition, 2004.
[3] H. A. Gabbar, “Smart Energy Grid Engineering,” Academic Press, 1st Edition, 2016.
[4] Petruzella, F. (2004). Programmable logic controllers. McGraw-Hill, Inc..

(*) The updated course content associated with automation systems is highlighted in red text.