

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 5th Year of Engineering Degree

Contributors: Department of Electrical and Energy Engineering

Planned Teachers: Dr. KIM Bunthern

Title course: Advanced control and automation lab Part 4: Industrial Automation

Course Objectives

The objective of this course is to provide practical knowledge in automation system employed in the industry. In complement to the theoretical course, this lab aims to introduce students to solve practical problem using the real hardware employed in the Industrial Automation. The students will be assigned to design a SCADA system using actual hardware and system. The students will also be asked to study and implement an Industrial Internet of Thing (IIoT) system. The concept of Cybersecurity will also be explored based on the actual problem.

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
1) Lab 1: PLC programming	<ul style="list-style-type: none"> ▪ PLC programming in simulation. ▪ Setup connection to actual PLC. 	2h	Laboratory
2) Lab 2: Modbus protocol	<ul style="list-style-type: none"> ▪ Setup Modbus TCP server and client. ▪ Modbus TCP protocol analysis using Wireshark. 	4h	Laboratory
3) Lab 3: TCP IP network	<ul style="list-style-type: none"> ▪ IP and IP routing ▪ Analyzing common network protocols using Wireshark. 	4h	Laboratory
4) Lab 4: SCADA	<ul style="list-style-type: none"> ▪ Setup and network configuration ▪ SCADA's HMI design using Citect SCADA software. ▪ PLC and SCADA communication. ▪ Alarms and trends. 	8h	Laboratory
5) Lab 5: Cybersecurity using industrial firewall	<ul style="list-style-type: none"> ▪ Stormshields configuration ▪ Networks filtering using firewall. ▪ Intrusion prevention testing. 	6h	Laboratory

Prerequisite: Digital Electronics, Notion of programming language (C/C++ or Python), PLC Fundamentals, Network protocols.

Learning Outcomes

Upon completion of this course, students should be able to:

- explain the principle of industrial control system.
- design an industrial control system using PLCs and its components.
- design a SCADA system based on HMI software and PLC programming software.
- explain and analyse network security of an industrial control network.

References:

- [1] Chanchal Dey and Sunit Kumar Sen “Industrial Automation Technologies” 2020 Taylor & Francis Group, LLC.
- [2] Karl-Heinz John · Michael Tiegelkamp “IEC 61131-3: Programming Industrial Automation Systems” Springer-Verlag Berlin Heidelberg 2001, 2010.