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: Dr. KIM Bunthern
Title course: Control and automation lab Part 5: Industrial Network Protocol

Course Objectives
This course aims to provide practical knowledge in communication protocols employed in industrial automation. In complement to the course work, this lab works provide opportunities for students to work with actual problems using simulation and experiment.

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 I: Modbus RTU protocol.	- Lab 1-1: Serial communication protocol - Lab 1-2: Modbus RTU protocol analysis - Lab 1-3: Protocol analysis using Wireshark.	6 h	Laboratory
2) Lab II: Internet Protocol and network routing.	- Lab 2-1: IP addresses and subnetting - Lab 2-2: IP routing - Lab 2-3: Testing connection using PLC simulator and virtual network. - Lab 2-4: TCP and UDP protocol analysis using Wireshark. - Lab 2-5: Analyzing common network protocols using Wireshark.	10 h	Laboratory
3) Lab III: Modbus TCP for PLC and HMI communication.	- Lab 3-1: Industrial process control using PLC (Ecostruxure Control Expert software). - Lab 3-2: HMI programming (using Vijeo Designer software). - Lab 3-3: Connection of PLC and HMI. Tags and variable link. - Lab 3-4: Modbus TCP protocol analysis using Wireshark.	8 h	Laboratory

Prerequisite: Digital Electronics, Programmable Logic Controller and Signals and Systems

Learning Outcomes
Upon completion of this course, students should be able to:
- To know and identify the structure and type of network topologies.

- To identify the different varieties of network protocols employed in the industrial automation.
- To identify the advantage and inconvenient of common network protocols.
- To identify in an industrial system the different levels of a hierarchical automation and network.
- To know and choose for each level the most appropriate control and network communication strategies.

References:

[1] Michael J. Hamill, P.E « Industrial Communications and Control Protocols ». 2016 PDH Online.
[2] Chanchal Dey and Sunit Kumar Sen "Industrial Automation Technologies" 2020 Taylor & Francis Group, LLC.