

Government of the people's Republic of Bangladesh Affiliated

# University of International Computer Administration Foundation Bangladesh

**SYLLABUS FOR THE SHORT COURSE**

**ON**

**Programmable Logic Controllers (PLC) and their Applications**



## **Maintenance by**

Department of Exam Control & Certificate Distribution. House:  
ICA Administrative Building. Road: 6 Haricharan Roy Road,  
Faridabad, Sutrapur, Dhaka. Registrar Coll Center: **01742364899**.  
E-mail: [icauniversitybd@gmail.com](mailto:icauniversitybd@gmail.com); [uicabinfo@gmail.com](mailto:uicabinfo@gmail.com)

**Total Duration: 360 hours**

## Name of the course

### **Programmable Logic Controllers (PLC) and their Applications**

#### Introduction:

“Programmable logic Controller (PLC) and it’s applications” trade course will provide fundamental knowledge of Electrical, Electronics and PLC’s applications in industries. PLC is a very flexible controlling device used in every type of industries for the automation. This course will help the trainee to develop their skill for work with PLC.

#### Objectives:

After completion the course the trainee will be able to:

- ™ Identify electrical components & Motors.
- ™ Identify electronic components.
- ™ Know detail function Of PLC.
- ™ Know input, output devices.
- ™ Show their skill to work with PLC.

#### Course outline

Name of Course	Duration of Course	Entry Qualification
Programmable logic Controllers and Applications	Total 360 hrs 5 day per week, per day 3hrs Theory= 1hr, per lesson Practical= 2hrs, per practice Total=3hrs, per working day	Minimum HSC(Science/ Vocational)

#### **List of Competencies:**

#### Basic Competencies:

- a) Receive & respond, Participate & Lead to workplace Communication:
  1. Work with others, Team Environment & Lead small Teams:
  2. Demonstrate work value, Practice career professionalism & Develop & Practice Negotiation skills.
  3. Practice housekeeping procedure. Occupational health and safety procedure and solve problems related to work Activities.
  4. Use Mathematical concepts & Techniques and use relevant Technology:
  5. Personal Manner.
- b) Efficiently communicate in English
  1. Speak in English with confidence.
  2. Communicate with target persons effectively.
  3. Understand the speech of English users.
  4. Achieve better professional performance.

### Common competencies:

1. Acquire knowledge on Electrical fundamentals.
2. Acquire knowledge on Electronics fundamentals.
3. Acquire knowledge on Computer fundamentals.
4. Acquire knowledge on basic PLC.
5. Acquire knowledge on application of PLC.

### Core competencies:

1. Identify Electrical & Electronics components.
2. Identify Electrical & Electronics machineries.
3. Identify faulty components.
4. Programming technique of PLC.
5. Perform the jobs.
6. Test and maintenance of PLC.

**Entry Qualification:** Minimum HSC (Science/Vocational)

### **Employment Opportunity:**

1. All types of automation industries.
2. Abroad
3. Self Employment

### **Physical facilities required for each group of 30 trainees.**

Classroom- 1 [20ft\*30ft]

Laboratory- 4 [each 20ft\*30ft]

- (a) 1 - Electrical Lab
- (b) 1 - Electronics Lab
- (c) 1 - Computer Lab
- (d) 1 - PLC's Lab

### **ELECTRIAL, ELECTRONICS & COMPUTER THEORY SYLLABUS**

SL No.	Competencies	Hours
1	Define: 1.1. Electricity. 1.2. Conductor. 1.3. Semiconductor. 1.4. Insulator. 1.5. Voltage. 1.6. Current. 1.7. Resistance. 1.8. Inductor. 1.9. Capacitor.	2
2.	State of Ohm's Law.	1
3.	Differentiate DC & AC.	
4.	Identify the use of different Electrical & Electronics switches.	1
5.	List with Electrical & Electronics symbols.	
6.	Describe Series, Parallel & Mixed grouping of resistance, capacitance & inductance.	2
7.	Describe function of Electromagnet.	2
8.	Describe 1- $\phi$ and 3- $\phi$ system.	
9.	Describe the function and use of: 1. DC motors. 2. AC motors. (1- $\phi$ and 3- $\phi$ ).	

	3. 1- $\phi$ and 3- $\phi$ Transformer. 4. Steeper motor. 5. Servo motor. 6. Star/Delta starter.	2+2
10.	Describe the function & use of: 1. Photo-transistor. 2. Photo-Diode. 3. LDR. 4. VDR. 5. LASER. 6. Opto-coupler. 7. IGBT. 8. SCR. 9. DIAC. 10. TRIAC. 11. UJT.	2
11.	Define relay with application	1
12.	Describe different fundamental logic gates.	1
13.	Describe different Number systems.	1
14.	Define: 1. Multiplexer. 2. Demultiplexer. 3. Flip-Flop. 4. Counter. 5. A/D & D/A converter.	2
15.	Describe different types semiconductor memories.	
16.	Describe OP-AMP with application.	
17.	Describe basic timer with circuit diagram.	
18.	Describe regulated power supply with application	
19.	Describe the function of Analog & Digital type: 1. Ammeter. 2. Voltmeter. 3. Watt meter. 4. Energy meter. 5. Multimeter. 6. Tachometer.	2
20.	Describe the method how to use transistor tester & IC tester.	
21.	Describe the operation & application of computer.	1
22.	Classify computers.	1
23.	Describe briefly major components required for pc.	
24.	Define: 1. Hardware. 2. Software. a) Utility software. b) Application software. 3. Operating System. 4. BIOS.	2

Total 30 hours

## THEORY SYLLABUS OF PLC

SL No.	Competencies	Hours
1.	<b>Introduction of PLC</b> 1.1 Define PLC. 1.2 Compare among PLC, Microcontroller & PC. 1.3 Mention the Fields of application of PLC. 1.4 Describe the Special features of PLC commercially available. 1.5 Mention the feature of PLC.	3
2.	<b>Switching function &amp; logic gates</b> 2.1 Boolean Algebra. 2.2 Laws of Boolean algebra. 2.3 Truth Table. 2.4 Logic Gates. 2.5 Types of Logic Gates 2.6 Logic Gate Technologies 2.7 Logic Gate interpretation of Ladder diagram programming 2.8 Truth Table and Ladder diagram.	3
3.	<b>Architecture and Operation PLC</b> Architecture. Central Processing Unit. Memory. Input device (module). Types of Input Components. Output device (module). Types of output components. Programmer unit (Console). Power supply. Peripheral devices.	3
4.	<b>Programming Methodology.</b> 4.1 Some programming features. 4.2 Graphical Languages: (a) Ladder diagram. (b) Function block diagram. 4.3 Conversion of ladder diagram in FBD and vice versa. 4.4 Examples.	3
5.	<b>Ladder Diagram Programming PLC.</b> Contacts. Coils. Registers. Jump functions. Data move functions. Mathematical functions. Conversions. Statistical functions. Comparison Values. Logical functions. Examples. Loading and executing of ladder diagram. (a) Computer Software for DELTA PLC. (b) Computer Software for SIEMENS PLC. (c) Computer Software for ALLEN BRADLEY PCL. (d) Computer Software for CUBLOC PLC. (e) Computer Software for LG PLC.	4

6.	<b>Transducers and its use in PLC.</b> Types of transducers. Classification of transducers on the basis of output signals. Analog transducers. Digital transducers.	2
7.	<b>Installation and Commissioning of PLC.</b> 7.1 Installation flowchart. 7.2 Practical aspect of installation of PLC. 7.3 Protection devices. 7.4 Control Components. 7.5 Injection brake module. 7.6 Safety Relays. 7.7 Wiring and Installation of PLC. 7.8 Communication between PLC and console/ personal computer. 7.9 Maintenance of PLC based machines.	3
8.	<b>Input, Output Components and devices.</b> 8.1 Limit switches. 8.2 Sensors: (a) Inductive proximity sensors. (b) Capacitive proximity sensors. (c) Ultrasonic proximity sensors. (d) Photoelectric proximity sensors. 8.3 Pressure Switches. 8.4 Temperature Switching. 8.5 Linear potentiometer. 8.6 Techogenerators. 8.7 Pneumatic Cylinder and Solenoid Valve. 8.8 Pressure regulating Valve. 8.9 Check Valve.	4
9.	<b>Construction and Principle of operation:</b> 9.1 SEMENS PLC. 9.2 DELTA PLC. 9.3 Allen-Bradley PLC. 9.4 Cubloc PLC. 9.5 LG PLC.	5

## PRACTICALS

### ELECTRICAL & ELECTRONIC PRACTICAL SYLLABUS

SL No.	Competencies	Hours
1.	Show skill of identifying electronics tools, hand tools, components and equipments (Such as Pliers, Wire stripper, Tweezers, Soldering iron, Tester, Screw driver, Multimeter, Resistor, Capacitor, Transistor, LDR, Thermistor, Diode, DIAC, TRIAC, UJT, SCR, Transformer, Relay and Different type of ICs).	2+2+2+2
2.	Show ability to measure Resistance, Voltage and Current with an Analog and Digital multimeter.	2+2
3.	Show skill in determining the value of different resistors & capacitors with the help of color code & AVO meter.	2+2
4.	Show skill of Assembling components wiring board, soldering & desoldering method.	2+2+2+2
5.	Verifications of Ohm's Law.	2+2
6.	Study the characteristic of Series & Parallel circuits.	2+2
7.	Measuring the line/phase voltage & current in 3-phase star & delta connected inductive load.	2+2
8.	Measuring the line/phase voltage & current in 3-phase star & delta connected capacitive load.	2+2
9.	Show skill in measuring power with a Watt meter of an Electric circuit.	2+2
10.	Show skill in studying the components/parts of a 3-phase Induction motor.	2+2+2
11.	Show skill in setting up proper controls of signal generator to produce specific wave form in the oscilloscope and measuring amplitude, time period, frequency & phase angle with oscilloscope.	2+2+2+2
12.	Show skill in testing different type of active & passive components.	2+2
13.	Construction of low voltage DC regulated, fixed & variable power supply.	2+2+2
14.	Use an OP-Amp (741) IC as adder, inverting & noninverting amplifier circuit.	2+2+2
15.	Prepare a timer circuit by using 555 timer and test it.	2+2+2

Total 80 hours

  
University of ICA

## PLC'S Oriented Practical

SL No.	Competencies	Hours
1.	Demonstration of PLC's.	2+2+2
2.	Simple application of PLC's	2+2+2+2
3.	Perform the AND & OR operation using register of PLC.	2+2+2
4.	Auto and Manual mode operation of machine.	2+2+2+2
5.	Auto star-delta connection of a 3- $\phi$ motor, using PLC.	2+2+2
6.	Draw the ladder diagram for a counter to count timing pulses up to 30 second and then operate an output O <sub>1</sub> and apply it.	2+2+2
7.	Draw the ladder diagram for controlling the traffic light apply it.	2+2+2
8.	Using a PLC Copy the content of one register to another register.	2+2+2
9.	Using a PLC addition of two numbers kept in resister R <sub>1</sub> and R <sub>2</sub> .	2+2+2
10.	Compare R <sub>1</sub> and R <sub>2</sub> , If content of R <sub>2</sub> > R <sub>1</sub> the output of PLC is operated (glow).	2+2+2
11.	Decode the number from the 0 to 9 on 7 segment display using PLC.	2+2+2
12.	Using a PLC, Run two motors M <sub>1</sub> and M <sub>2</sub> are required to ON one after other. First motor M <sub>1</sub> starts by pressing switch I <sub>2</sub> , and then by pressing the switch I <sub>3</sub> , M <sub>2</sub> should start. But condition is like that when M <sub>2</sub> starts M <sub>1</sub> remains off.	2+2+2
13.	Four Motors M <sub>1</sub> , M <sub>2</sub> , M <sub>3</sub> and M <sub>4</sub> are required to start one after other after some time intervals. Using timer of PLC & make it.	2+2+2
14.	Draw the ladder diagram for the four motors M <sub>1</sub> , M <sub>2</sub> , M <sub>3</sub> and M <sub>4</sub> are requires to ON in sequential way one after other, after some time interval. In this process, the sequence should not stop at M <sub>4</sub> but the motor M <sub>1</sub> start once again (after M <sub>4</sub> off) and sequence run continuously and apply it.	2+2+2
15.	Draw the ladder diagram for the Clock wise and Anti- clock wise rotation of stepper motor and apply it.	2+2+2
16.	Draw the ladder diagram for an automatic forward and reverse movement of a Lathe machine table continuously and apply it.	2+2+2
17.	Draw the ladder diagram for the sequence operation of 3 Pneumatic Cylinders and apply it.	2+2+2+2
18.	Using PLC find and checking a missing bottle cap from bottling plant.	2+2+2
19.	Draw the ladder diagram for the 3 floor building, having a elevator for up/down motion apply it.	2+2+2+2
20.	There are 4 car spaces in a parking car is to be detected and allowed to enter into the parking place it space is available. If on space, full indication lamp should be light other uses indication lamp should light to indicate protect space. Draw the ladder diagram and apply it.	2+2+2
21.	Using a PLC as an on-off controller for a heater in the control of temperature in some enclosure. The heater is to be switched on when the temperature falls below the required temperature and switched off when the temperature is at or above the required temperature.	2+2+2
22.	Construct and test the following circuit with helps of PLC. a) Fire indicator system. b) Water level controller. c) Speed control Circuit for DC & AC motors.	2+2+2+2
23.	Draw the ladder diagram for bank security system and apply it.	2+2+2
24.	Draw the ladder diagram for chemical plant and apply it.	2+2+2
25.	Demonstration of SCADA System.	2+2+2

Total 160 hours