DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

PROGRAMMABLE LOGIC CONTROLLER

CURRICULUM DEVELOPMENT CENTRE

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

M - SCHEME

Course Name   : Diploma in Electrical and Electronics Engineering

Subject Code   : 33072

Semester   : V Semester

Subject Title   : **PROGRAMMABLE LOGIC CONTROLLER**

TEACHING AND SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
PROGRAMMABLE LOGIC CONTROLLER			Internal Assessment	Board Examination	Total	
	5	75	25	75	100	3 hrs

TOPICS AND ALLOCATION OF HOURS:

UNIT	TOPIC	TIME (Hrs)
I	Introduction To Plc	12
II	Input / Output Modules	13
III	Plc Programming	14
IV	Networking	12
V	Data Acquisition Systems	12
	Revision And Tests	12
	TOTAL	**75**

RATIONALE

Various control operations are to be performed automatically and sequentially on the electrical machines to suit the industrial requirements. Programmable controllers are mainly employed to control the process in industries. In order to impart knowledge on programmable Logic Controller this theory subject is introduced.

OBJECTIVES:

Unit: 1
After completing this chapter, students should able to:
- ✓ Explain the meaning of automation and List the types of automation
- ✓ Define PLC and Explain why their use is valuable
- ✓ Explain what PLC can do
- ✓ Compare fixed and modular PLC
- ✓ Explain the advantages of PLC
- ✓ Explain the functions of various elements of power supply unit

Unit: 2
After completing this chapter, students should able to:
- ✓ Know the difference between digital and analog input and output signals
- ✓ Observe how digital field device information gets into a PLC
- ✓ Observe how analog field device information gets into a PLC
- ✓ Understand I/O addresses and how they are used in a PLC

Unit: 3
After completing this chapter, students should able to:
- ✓ Describe PLC timer instruction and differentiate between a non-retentive and retentive timer
- ✓ Program the control of outputs using the timer instruction
- ✓ List and describe the functions of PLC counter instructions
- ✓ Create PLC programs involving program control instructions, math instructions

Unit: 4
After completing this chapter, students should able to:
- ✓ Explain the functionality of different levels of industrial network
- ✓ Explain the concept of network topology and network protocols
- ✓ Explain the concept of I/O bus networks etc.,

Unit: 5
After completing this chapter, students should able to:
- ✓ Describe the computer control of process
- ✓ Explain the operation of SCADA
- ✓ Explain the functions of the major components of a process control system
- ✓ Explain how on/off control and PID control work.

CONTENTS

UNIT	NAME OF THE TOPIC	HOURS
I	**INTRODUCTION TO PLC:** Automation – Types of Automation (manufacturing and Non-Manufacturing) – Advantages of automation - PLC Introduction - Definition – Block diagram of PLC – Principle of operation –Modes of operating – PLC Scan - Hardwire control system compared with PLC system - Advantages and Disadvantages of PLCs – Criteria for selection of suitable PLC –Memory organization – Input Types – Discrete input – Analog in/out - Elements of Power supply unit - PLC Types (Fixed I/O and Modular I/O) - List of various PLCs available – Applications of PLC.	13
II	**INPUT/OUTPUT MODULES** The I/O Section - Discrete I/O modules(DC and AC) – Analog I/O modules - Special I/O Modules– I/O Module Specification - Typical Discrete and Analog I/O field Devices –Sensors – Limit switch – Reed switch – Proximity sensor (Inductive and Capacitive) – Types of Photo Electric Sensor - Sinking and Sourcing I/O modules–TTL output module – Relay output module –Isolated output module - Input/output Addressing scheme in important commercial PLCs.	14
III	**PLC PROGRAMMING** Types of programming methods – Types of programming devices – Logic Functions – AND Logic – OR Logic – NOT Logic - Relay type instructions –Timer Instructions – ON Delay and OFF Delay Timer – Retentive Timer Instruction – Cascading Timers – Counter Instruction – UP Counter – DOWN Counter – UP/DOWN Counter – Cascading Counters – Program Control Instructions –Data Manipulation Instruction – Data Compare Instructions – Math Instructions - Sequencer Instructions - PID Instruction – PWM Function – Simple programs using above instructions. Develop ladder logic for: Bottle filling system – Automatic car parking system - EB to Generator Changeover system – Batch process – Elevator system - Automatic Star-Delta Starter – Traffic light control.	15
IV	**NETWORKING** Levels of industrial network – Network Topology –Network Protocol – OSI Reference Model - Networking with TCP / IP Protocol - I/O Bus networks – Block diagram of I/O Bus networks – Types of I/O Bus networks - Protocol standards – Advantages of I/O Bus networks - Gateway – Token passing – Data Highway – Serial Communication – DeviceNet – ControlNet – EtherNet – Modbus – Fieldbus – Profibus- Subnetting – Subnet mask - File transfer protocol.	13

V	**DATA ACQUISITION SYSTEMS** Computers in Process control – Types of processes - Structure of control system – ON/OFF Control – Closed loop control - PID Control – Motion Control –Block diagram of Direct Digital Control - Supervisory Control and Data Acquisition (SCADA)–Block diagram of SCADA – Features of SCADA – Functions of SCADA - SCADA software - Data Loggers – Tags – Alarms - landlines for SCADA – use of modems in SCADA.	13

TEXT BOOK

Sl.No.	Title	Author(s)	Publishers
1	Introduction to Programmable Logic Controllers	Gary Dunning	CengageLearning India Pvt Ltd – Third Edition 2011
2	Technician's Guide to Programmable Logic Controllers	Richard A. Cox	Delmer – Sixth Edition 2011
3	Programmable Logic Controllers – Principle and Applications	John W. Webb	Prentice Hall
4	Programmable Logic Controllers – Programming Methods and Applications	John R Hackworth and Fredrick D. Hackworth	Pearson Education
5	Programmable Logic Controllers	W. Bolton	Newness
	Programmable Controller Theory and Implementation	L.A.Bryan E.A.Bryan	An Industrial Text Company Publication – Second Edition 1997

REFERENCE BOOK

SL.NO.	TITLE	AUTHOR(S)	PUBLISHERS
1.	Programmable Logic Controllers	Frank D.Petruzella	Tata McGraw Hill Edition-Fourth Edition 2011
2.	Practical SCADA for industry	David Bailey Edwin Wright	Newnes