DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

III YEAR

M SCHEME

V SEMESTER

2015 – 2016 onwards

CONTROL OF ELECTRICAL MACHINES

CURRICULUM DEVELOPMENT CENTRE

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

M - SCHEME

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 33071

Semester   : V Semester

Subject Title : **CONTROL OF ELECTRICAL MACHINES**

TEACHING AND SCHEME OF EXAMINATION:

No. of weeks per Semester: 15 Weeks

Subject	Instruction		Examination				
CONTROL OF ELECTRICAL MACHINES	Hours/ Week	Hours/ Semester	Marks				Duration
			Internal Assessment	Board Examination	Total		
	5	75	25	75	100		3 hrs

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME (Hours)
I	Control circuit components	13
II	AC motor control circuits	12
III	Industrial control circuits	13
IV	Programmable Logic Controller	13
V	PLC Programming	12
	Revision and test	12
	Total	**75**

RATIONALE

Various control operations are to be performed on the electrical machines to suit the industrial requirements. Technician is mainly employed to look after the control panels. To make our students employable, they have to be trained in using various control components and circuits. This subject fulfils that requirement.

OBJECTIVES

To understand

- Electrical control circuit elements including various types of industrial switches, relays, timers, solenoids, contactors and interlocking arrangement.
- AC motor control circuits for acceleration control, speed control, direction control, braking control and jogging using contactors.
- Different control circuits for industrial applications.
- Basics of programmable logic controller.
- PLC Programming.

CONTENTS

UNIT	NAME OF THE TOPIC	HOURS
I	**Control circuit components** Switches – Push button, selector, drum, limit, pressure, temperature (Thermostat), float, zero speed and proximity switches. Relays – Voltage relay, DC series current relay, frequency response relay, latching relay and phase failure relay (single phasing preventer). Over current relay – Bimetallic thermal over load relay and Magnetic dash pot oil filled relay. Timer – Thermal Pneumatic and Electronic timer. Solenoid Valve, Solenoid type contactor (Air break contactor), Solid state relay, Simple ON-OFF motor control circuit, Remote control operation and interlocking of drives.	14
II	**AC motor control circuits** Motor current at start and during acceleration – No load speed and final speed of motor – DOL starter – Automatic auto transformer starter (open circuit and closed circuit transition) – Star/Delta starter (semi automatic and automatic) – Starter for two speed two winding motor – Reversing the direction of rotation of induction motor – Dynamic Braking – Three step rotor resistance starter for wound induction motor – Secondary frequency acceleration starter.	13
III	**Industrial control circuits** Planner machine control – Skip hoist control – Automatic control of a water pump – Control of electric oven – Control of air compressor – Control of over head crane – control of conveyor system – Control of elevator - Trouble spots in control circuits – General procedure for trouble shooting.	14
IV	**Programmable Logic Controller** Automation – Types of automation (manufacturing and non-manufacturing) – advantages of automation –PLC Introduction – Block diagram of PLC – principle of operation – modes of operation – PLC scan – memory organization – input module (schematic and wiring	14

	diagram) – output module (schematic and wiring diagram) – Types of Programming Devices – Comparison between hardwire control system and PLC System –PLC Types (Fixed and Modular) – Input Types – Output Types – Criteria for selection of suitable PLC – List of various PLCs available.	
V	**PLC PROGRAMMING** Different programming languages – ladder diagram – Relay type instruction – Timer instruction – ON delay and OFF delay Timer – Retentive Timer Instruction – Cascading Timers – Counter Instruction – UP Counter – Down Counter – UP/DOWN Counter - ladder logic diagram for DOL Starter, Automatic STAR-DELTA Starter -rotor resistance starter and EB to Generator changeover system.	**13**

TEXT BOOK

S.No.	Name of the Book	Author	Publisher
1.	Control of Electrical Machines.	S.K. Bhattacharya	New Age International Publishers, New Delhi
2.	Explosing Programmable Logic controllers with Application.	Pradeep Kumar Srivastava.	BPB Publications

REFERENCE BOOK

S.No.	Name of the Book	Author	Publisher
1.	Industrial motor control.	Stephen Herman	6th Edition, Cengage Learning.