TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

VSemester

Subject Code	SUBJECT	HOURS PER WEEK			
		Theory hours	Drawing hours	Practical hours	Total hours
4030510	Generation Transmission and Switchgear	5	-	-	5
4040520	Micro Controller and its Applications	5	-	-	5
Elective I Theory					
4030511	Control of Electrical Machines	5	-	-	5
4030512	Programmable Logic Controllers	5	-	-	
4030513	Renewable Energy Sources	5	-	-	
Elective I Practical					
4030514	Control of Electrical Machines Practical	-	-	5	5
4030515	Programmable Logic Controller Practical	-	-	5	
4030516	Renewable Energy Sources Practical	-	-	5	
4030540	Computer Aided Electrical Drawing Practical	-	-	4	4
4040550	Microcontroller and its Applications Practical	-	-	4	4
4040570	Entrepreneurship and Startups	-	-	4	4
		15	-	17	32
Extra / Co-Curricular activities					
Library		-	-	-	1
Physical Education		-	-	-	2
TOTAL					**35**

Common to all Departments

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

FIFTH SEMESTER

Subject Code	Subject	HOURS PERWEEK			
		Theory	Tutorial/ Drawing	Practical	Total
4030410	Electrical Machines -II	4	-	-	4
4030420	Measurements, Instruments and Transducers	3	-	-	3
4030510	Generation Transmission and Switchgear	4	-	-	4
4030450	Electrical Machines and Instrumentation Practical	-	-	4	4
4030370	Wiring & Winding Practical	-	-	3	3
TOTAL		**11**	**-**	**7**	**18**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030510

Semester : V Semester

Subject Title : GENERATION, TRANSMISSION AND SWITCH GEAR

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examinations	Total	
GENERATION, TRANSMISSION AND SWITCHGEAR	5	80	25	100*	100	3 Hrs.

Examinations will be conducted for 100 marks and it will be reduced to 75 Marks.

Topics and Allocation of Hours

Unit	Topic	Hours.
I	Generation of Electrical Power	16
II	A.C. And H.V.D.C Transmission	14
III	FACTS, Line Insulators and Underground Cables	14
IV	Circuit Breakers and Over Voltage Protection	14
V	Protective Relays and Grounding	15
Test & Model Exam		7
Total		**80**

RATIONALE

Energy is the basic necessity for the Economic Development of a Country and also there is a growing impulse towards green and reduction in the use of Fossil Fuels. As a matter of fact, there is a close relationship between the Energy used per person and his standard of living. The Modern Society is so much dependent upon the use of Electrical Energy that it has become a part of our life. So, to have adequate knowledge in Electrical Power Generation and Transmission, Switch Gear and efficiency associated with them, it becomes necessary to include this subject.

OBJECTIVES

To Understand

- Conventional Power Plants-Layout and choice of site
- Renewable Energy Sources and Power Generation
- A.C Transmission-Supports, Conductors, Effects, Regulation and Efficiency
- H.V.D.C Transmission
- FACTS, Line Insulators and Underground Cables
- Circuit Breakers, Protective Relay and Lightning Arresters

DETAILED SYLLABUS

Contents: Theory

UNIT	NAME OF THE TOPICS	HOURS
I	**GENERATION OF ELECTRICAL POWER** Introduction- Conventional methods of power generations – schematic arrangement and choice of site for Hydro, Thermal, Nuclear power plants-Advantages and Disadvantages-comparison of these power plants - Principle and types of co-generation. Schematic arrangement of Diesel, Gas, Pumped storage schemes-Advantages and Disadvantages-Grid or Inter connected system-Advantages of Inter connected systems- Load Transfer through Inter connector-Load curves and Load duration curves-connected load-Average load-Maximum Demand Factor- Plant capacity factor-Load factor and its significance-Diversity factor-Simple problems- Load sharing between base load and peak load plants. Renewable Energy sources- Basic principle of Solar Energy, Wind Power Generation-Hybrid Renewable Energy Systems.	4 10 2

II	**A.C. AND H.V.D.C TRANSMISSION** **A.C. Transmission:** Introduction-Typical Layout of A.C. Power supply scheme -Advantages and Disadvantages of A.C Transmission- High Transmission Voltage-Advantages-Economic choice of Transmission voltage-Elements of a Transmission Line-over Head Line-Conductor materials and their properties-Line supports-its properties-Types of supports and their applications-spacing between conductors-length of span-Sag in overhead lines-Calculation of Sag-When the supports are at equal and unequal levels- Problems- Effect of wind and ice loading over the line conductor (Qualitative treatment only) - constants of a Transmission line- Transposition of Transmission lines-Skin Effect- Ferranti Effect-Corona formation and corona loss-Factors affecting corona-Advantages and Disadvantages –Classification of O.H Transmission lines-Performance of single phase short transmission line-voltage regulation and Transmission Efficiency-Problems. **H.V.D.C Transmission:** Advantages and Disadvantages of D.C Transmission- Layout Scheme and principle of High Voltage D.C Transmission-D.C link configurations (Monopolar, Bipolar and Homopolar)-HVDC convertor Station (Schematic diagram only).	10 4

III	**FACTS, LINE INSULATORS AND UNDERGROUND CABLES:** Definition-Need for FACTS controllers- types of FACTS controllers-SVS-STATCOM-UPFC (block diagram explanation only) **Line Insulators:** Introduction - Line Insulator Materials-Properties of Insulators- Types & causes of failure of Insulators-Testing of Insulators-Potential Distribution over suspension Insulator String-String Efficiency - Methods of improving string efficiency- problems. **Underground cables:** Introduction-Advantages and requirement of cables-construction of a three-core cable-Insulating materials for cables- properties of Insulating materials used in cables-classification of cables- cables for three phase service-construction of Belted cable, screened cable, pressure cables-Laying of underground cables-Direct laying, Drawing system, Advantages and Disadvantages.	7 7
IV	**CIRCUIT BREAKERS AND OVER VOLTAGE PROTECTION** Switch gear-Essential features of Switch gear-faults in a Power system (definition only). **CIRCUIT BREAKERS:** Basic principle of circuit Breaker -Arc Phenomenon- methods of Arc Extinction-Arc voltage -Re-striking voltage and recovery voltage-Rate of rise of re-striking voltage C.B ratings – Breaking capacity, making capacity, short time rating - Auto reclosing in circuit Breakers - Classification of Circuit Breakers – Construction and Working principle of Air Circuit Breakers, E.L.C.B, Residual current circuit breaker SF6 and vacuum Circuit Breaker Maintenance of Circuit Breakers – Rupturing capacity of circuit breaker-conditions to trip – Auto reclose breaker – Fault clearance time – Inverse time overload relay – Maintenance Requirement for oil circuit breakers – SF6 Circuit Breakers. **FUSES**- L.V fuses- Re-wirable fuse, HRC fuse-H.V. fuses & Cartridge Type, Liquid Type and Metal Clad-Fuses. **OVER VOLTAGE PROTECTION:** Voltage surge- causes of over voltage-Lightning-Types of lightning strokes -	7 3 4

	Direct stroke, indirect stroke-Harmful Effects of lightning Protection against lightning- Earthing screen, overhead ground Wires, Lightning arresters- Expulsion type, Gapless arrester.	
V	**PROTECTIVE RELAYS AND GROUNDING** **PROTECTIVE RELAYS:** Basic principle-Fundamental requirements of protective relaying- Primary and back up Protection-relay characteristics-relay timing - Instantaneous relay -Inverse time relay and Definite time lag relay- Inverse definite minimum time relay -classification of relays-Construction, Principle of operation and applications of Induction type over current relay (Directional and Non-directional), Differential relay.	10
	Static relays- Basic elements of static relay-Over Current-Distance relay (Block diagram explanation only). **GROUNDING:** Introduction-Equipment grounding- system grounding- ungrounded neutral system-Necessity of Neutral grounding — Methods- solid grounding Resistance grounding, Reactance grounding, Resonant grounding.	5

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040520

Semester : V

Subject Title : MICROCONTROLLER AND ITS APPLICATIONS

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
MICROCONTROLLER AND ITS APPLICATIONS	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

UNIT	Topic	Hrs.
I	Architecture of 8051 Microcontroller	15
II	8051 Instruction set and Programming	16
III	Peripherals of 8051	15
IV	Interfacing techniques	16
V	Advanced Microcontrollers	11
Test & Model Exam		7
Total		**80**

RATIONALE:

The introduction of this subject will enable the students to learn about microcontroller 8051 architecture, Pin details, Instruction sets, Programming and interfacing. This subject enables the students to do the project effectively. It also helps the students to choose the field of interest. If the student is aiming for higher studies, this subject is foundation.

OBJECTIVES:

On completion of the syllabus, the students must be able to

-> Know the difference between microprocessor and microcontroller.

-> Understand the architecture of 8051.

-> Write programs using 8051 ALP.

-> Understand the programming of I/O ports, Timer, Interrupt and Serial Programming.

-> Use the interfacing techniques

-> Know the types of microcontrollers

-> Explain IoT.

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DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Architecture Of 8051 Microcontroller** **1.1 : Architecture** Microprocessor-Microcontroller-Comparison of microprocessor and microcontroller-Architecture diagram of microcontroller 8051-Functions of each block-Pin details of 8051-ALU- ROM-RAM-Memory organization of 8051- Special function registers-Program counter-PSW register-Stack-I/O ports-Timer-Interrupt-serial port-External memory- Oscillator and Clock-Reset-Power on reset-Clock cycle-machine cycle-Instruction cycle-Overview of 8051 family.	15
II	**8051 Instruction set and programming** **2.1: Instruction Set Of 8051** Instruction set of 8051-Classification of 8051 instructions-data transfer instructions - Arithmetic Instructions-Logical Instructions-Branching Instructions-Bit manipulation instructions- Assembling and running an 8051 program-Structure of Assembly Language-Assembler Directives-Different Addressing modes of 8051-Time delay routines. **2.2: Assembly language programs** 16-bit addition and 16-bit subtraction-8-bit multiplication and 8 bit division-BCD to HEX code conversion-HEX to BCD code conversion. - Smallest number/ Biggest number.	8 8
III	**Peripherals of 8051** **: I/O Ports** Bit addresses for I/O ports-I/O port programming-I/O bit manipulation programming. **: Timer/Counter** SFRS for Timer- Modes of Timers/counters- Programming 8051 Timer (Simple programs). **: Serial Communication** Basics of serial communication-SFRs for serial communication-RS232 standard-8051 connection to RS 232-8051 serial port programming.	3 4 4

	3.4: Interrupts 8051 interrupts-SFRs for interrupt-Interrupt priority.	4
IV	**Interfacing Techniques** **4.1: IC 8255** IC 8255-Block Diagram-Modes of 8255-8051 interfacing with 8255 **4.2: Interfacing** Interfacing external memory to 8051-Relay interfacing- Sensor interfacing -Seven segment LED display interfacing-Keyboard Interfacing-Stepper motor interfacing-ADC interfacing- DAC interfacing-DC motor interfacing using PWM-LCD interfacing.	3 13
V	**Advanced Microcontrollers** **5.1: Types of microcontrollers** PIC microcontroller-General Block diagram-Features-Applications-Arduino- General Block diagram-Variants-Features-Applications-Raspberry pi-General Block diagram-Features-Applications-Comparison of microcontrollers. **5.2: IoT** Introduction to IoT-Block diagram of home automation using IoT.	8 3

TEXT BOOKS:

1. "Ajit pal" "Microcontrollers, Principles and Applications ",PHI Ltd,-2011.
2. "Mazidi,Mazidi and D.MacKinlay" "8051 Microcontroller and Embedded Systems using Assembly and C",2006 Pearson Education Low Price Edition.

REFERENCE BOOKS:

1. "R. Theagarajan" "Microprocessor and Microcontroller", Sci Tech Publication, Chennai.
2. www.microchip.com, www.raspberrypi.org,www.arduino.org.
3. "J.B. Peatman" "Design with PIC microcontrollers".
4. "Michael McRoberts", "beginning Arduino.
5. "Matt Richardson", "Getting started with Raspberry Pi".
6. 8."Samuel Greengard", "The Internet of Things".

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Diploma in Electrical and Electronics Engineering
Subject Code : 4030511
Semester : V
Subject Title : CONTROL OF ELECTRICAL MACHINES

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
CONTROL OF ELECTRICAL MACHINES	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Control Circuit Components	16
II	Motor Control Circuits	15
III	Industrial Control Circuits	14
IV	Programmable Logic Controller	14
V	PLC Programming and SCADA	14
	Test & Model Exam	7
	Total	**80**

RATIONALE

The Energy Conversion between Electrical and Mechanical Systems is performed by the Control of Electrical Machines in both directions.

Various Control Operations are to be performed on the Electrical Machines to meet the Industrial requirements. Especially Technicians are 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 fulfills the requirement.

OBJECTIVES

At the end of the Semester the Students must be able to understand theconcepts of:

1. Electrical Control Circuit Elements including Various Types of Industrial Switches, Relays, Timers, Solenoids, Contactors and Interlocking arrangements.
2. DC Motor and AC Motor Control Circuits for Acceleration Control, Speed Control, Direction Control, Braking Control and jogging using Contactors.
3. Different Control Circuits for Industrial Applications.
4. Basics of Programmable Logic Controllers.
5. PLC Programming and SCADA.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	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.	10 6
II	**MOTOR CONTROL CIRCUITS** **CHAPTER: 2.1: DC MOTOR CONTROL CIRCUITS** Series Relay and Counter EMF Starters – Field Failure Protection – Jogging Control, Dynamic Braking **CHAPTER: 2.2: AC MOTOR CONTROL CIRCUITS** 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.	3 12
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 Battery-Operated Truck – 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 WiringDiagram) – 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.	7 7
V	**PLC PROGRAMMING AND SCADA** 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 Change over System. Supervisory Control Data Acquisition System (SCADA) – Block Diagram of SCADA, Features and Functions of SCADA – Introduction to DCS.	7 7

TEXT BOOKS:

1. "S.K.Battacharya" "Control of Electrical Machines", New Age International Publishers, New Delhi

REFERENCE BOOKS:

1. "Pradeep Kumar, Srivastava" Exposing Programmable Logic Controllers with Application", BPB Publications
2. "Stephen Herman" Industrial Motor Control", 6th Edition, Cengage Learning
3. "David Bailey, Edwin Wright" "Practical SCADA for Industry", Newnes Publishers

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030512

Semester V

Subject Title : PROGRAMMABLE LOGIC CONTROLLER

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
PROGRAMMABLE LOGIC CONTROLLER	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Introduction to PLC	16
II	**I**nput / Output Modules	15
III	PLC Programming	14
IV	Networking	14
V	Data Acquisition Systems	14
Test & Model Exam		7
Total		80

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.

DETAILED SYLLABUS

Contents: Theory

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 System – 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.	**10** **6**
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.	7 8

III	**PLC PROGRAMMING** Types of Programming Methods - Types of Programming Devices - Logic Functions – AND Logic – OR Logic – NOT Logic - Relay Typeinstructions -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 -DOL Starter- Automatic Star-Delta Starter – Traffic Light Control.	**4** **5** **5**
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 — Device Net — Control Net — Ethernet — Modbus -Fieldbus - Profibus- Sub Netting – Subnet mask - File transfer protocol.	**7** **7**
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.	**7** **7**

TEXT BOOK:

S.No	Name of the Book	Author	Publisher	Edition
1	Introduction to Programmable Logic Controllers	Gary Dunning	Cengage Learning India PvtLtd — Third Edition 2011	
2	Technician‟s Guide to Programmable Logic Controllers	Richard A. Cox	Delmer — Sixth Edition 2011	
3	Programmable Logic Controllers – Principle andApplications	John W. Webb	Prentice Hall	
4	Programmable Logic Controllers – ProgrammingMethods and Applications	John R Hackworth and Fredrick D. Hackworth	Pearson Education	
5	Programmable Logic Controllers	W. Bolton	Newness	
6	Programmable Controller Theory and Implementation	L.A.Bryan E.A.Bryan	An Industrial Text Company Publication – Second Edition 1997	

REFERENCE BOOKS:

S.No	Name of the Book	Author	Publisher	Edition
1	Programmable Logic Controllers	Frank D.Petruzella	Tata McGraw Hill Edition-Fourth Edition 2011	
2	Practical SCADA for industry	David Bailey Edwin Wright	Newnes	

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030513

Semester : V

Subject Title : **Elective Theory I:** RENEWABLE ENERGY SOURCES

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
RENEWABLE ENERGY SOURCES	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 marks, and it will be reduced to 75 marks.**

Topics and Allocation of Hours

Unit	Topic	Hours
I	Fundamentals of Energy Systems and Solar Radiation	16
II	Solar Thermal Conversion and Solar PV Systems	15
III	Wind, Tidal and Wave Energy	14
IV	Bio – Energy	14
V	Geothermal and Oceanic Energy	14
Test & Model Exam		7
Total		80

RATIONALE

Electrical Energy requirement is the major crisis and hence any saving in Electrical energy is equivalent to production of Electrical Energy. Saving can be achieved by the utilization of Renewable Energy Sources.

OBJECTIVES

- Study about the fundamentals of Energy.
- Study the applications of solar energy for thermal and powergeneration.
- Understand the concept of wind, tidal and wave energies and theirapplications.
- Understand the Bio energy sources and energy conversion technologies.
- Understand the development of geothermal energy and OTEC principle.

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF ENERGY SYSTEMS AND SOLAR RADIATION** 1.1. FUNDAMENTALS OF ENERGY SYSTEMS: Introduction to Energy - Energy consumption and standard of living - classification of Energy Resources-consumption trend of Primary Energy Resources-importance of Renewable Energy Sources- Energy for Sustainable Development. - Various Forms of Renewable Energy 1.2 SOLAR RADIATION: Outside Earth‟s Atmosphere – Earth Surface —Analysis of Solar Radiation Data — Geometry — Measurement of Solar Radiation – Solar Radiation Data in India.	**8** **8**
II	**SOLAR THERMAL CONVERSION AND SOLAR PV SYSTEMS** 2.1 SOLAR THERMAL APPLICATIONS: Solar Collectors - Flat Plate Collectors- Concentrating Collectors - Comparison of Collectors - Selection of Collector for Various Applications - Solar Water Heaters - Solar Industrial Heating System — Solar Cookers - Solar Pond Electric Power Plant. 2.2. SOLAR PV SYSTEMS: A Brief History of PV, PV in Silicon: Basic Principle, Classification of PV Cells - Equivalent Circuit and Electrical Characteristics of Silicon PV Cells — Series Parallel Connections of Solar Cells - Solar PV Array and Solar Panel - Solar Panel Applications - Grid Connected PV System – Stand Alone Solar PV Power Plant – Hybrid Solar PV System.	**7** **8**

III	**WIND, TIDAL & WAVE ENERGY** **WIND ENERGY**: Introduction-Basic Principles of Wind Energy Conversion: Nature of the Wind, Power in the Wind, Forces on the Blades and Wind Energy Conversion-Wind Data and Energy Estimation-Site Selection-Classification of Wind Energy Conversion Systems - Types of Wind Machines-Horizontal Axis Wind Turbine(HAWT) -Vertical Axis Wind Turbine(VAWT) — Comparison Between HAWT & VAWT - Generating System - Energy Storage — Applications of Wind Energy — Power Generation – Pumping Station -Safety and Environmental Aspects. **TIDAL & WAVE ENERGY:** Basic Principle of Tidal Power – Components and Operation of Tidal Power Plant – Wave Energy- Wave Energy Conversion Devices.	**10** **4**
IV	**BIO – ENERGY** **BIOMASS RESOURCES**: Introduction – Photo Synthesis – Usable Forms of Bio Mass, Their Composition and Fuel Properties - Biomass Resources. **BIOMASS ENERGY CONVERSION**: Biomass Conversion Technologies – Urban Waste to Energy Conversion – Biomass Gasification — Biomass Liquification — Biomass to Ethanol Production – Biogas Production from Waste Biomass – Types of Bio Gas Plants - Applications – Bio Diesel Production – Biomass Energy Scenario in India.	**6** **8**
V	**GEOTHERMAL AND OCEANIC ENERGY** **GEO THERMAL ENERGY**: Energy inside the Earth – Uses of Geothermal Energy – Geothermal Wells — Potential in India - Types of Geothermal Heat Pump Systems - Types of Geothermal Power Plants. **OCEANIC ENERGY**: Ocean Energy Resources – Principle of Ocean Thermal Energy Conversion (OTEC) – Method of Ocean Thermal Electric Power Generation.	**7** **7**

TEXT BOOK

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources	G.D. Rai	Khanna Publishers, New Delhi	1999

REFERENCE BOOKS

S.No	Name of the Book	Author	Publisher	Edition
1	Non-Conventional Energy Sources and Utilization	R.K. Rajput	S.Chand & Company Ltd.	2012
2	Renewable Energy Sources	Twidell J.W. and Weir A	EFN Spon Ltd.	1986
3	Non-Conventional Energy Resources	B.H.Khan	Tata Mc Graw Hill., New Delhi.	2nd Edn, 2009

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Diploma in Electrical and Electronics Engineering

Subject Code : 4030514

Semester : V

Subject Title : CONTROL OF ELECTRICAL MACHINES PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
CONTROL OF ELECTRICAL MACHINES PRACTICAL	**5**	**80**	**25**	**100***	**100**	**3 Hrs.**

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

The controlling techniques of various types of AC and DC Electrical Machines are to be practically learned to meet the present industrial requirements. The Controlling Process is mainly to be known to Diploma Engineer and become a successful Employee or Technician. This Subject will make our students with knowledge of application-oriented skills in Industrially Operated Machines.

OBJECTIVES

On completion of this practical subject the students will be able to:

- Make use of various types of control circuit elements like industrial switches, relays, timers, solenoids, contactors and inter locking arrangement.
- Construct various types of automatic starters for electrical motors.
- Construct control circuits for braking, jogging, reversing operations.
- To make use of PLCs for control applications.
- To program PLCs for controlling the motor.

DETAILED SYLLABUS

Contents: Practical

Name of the Topics:

Exercise

1. Wire and Test the Control Circuit for Jogging in Cage Induction Motor.
2. Wire and Test the Control Circuit for Semi-Automatic Star –Delta Starter.
3. Wire and Test the Control Circuit for Automatic Star –Delta Starter.
4. Wire and Test the Control Circuit for Dynamic Braking of Cage Motor.
5. Wire and Test the Control Circuit for Two Speed Pole Changing Motor.
6. Wire and Test the Control Circuit for Forward and Reverse Operation.
7. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter.
8. Wire and Test the DOL Starter with Single Phase Preventer using PLC.
9. Wire and Test the Star –Delta Starter using PLC.
10. Wire and Test the Control Circuit for Automatic Rotor Resistance Starter using PLC.
11. Develop and execute the Ladder Logic Diagram in PLC for 3 Stage Lift Operation.
12. Wire and Test the Sequential Operation of Solenoid Valve and a Motor for Tank FillingOperation using PLC.

13. Develop and execute the Ladder Logic to Interface PLC with Conveyor Model for countingthe object moving in the Conveyer.
14. Wire and Test the Control Circuit for Jog Forward, Jog Reverse, Forward and ReverseOperations using PLC.

Note: The performance of control circuit is to be verified with Induction motor for the experiments 1 to 10.

DETAILED ALLOCATION OF MARKS

S.No	NAME OF ACTIVITY	MARK ALLOCATION
1.	Drawing Connection/Ladder Diagram and Writing Details of the Components/Equipment/Machines used	25
2.	Making the correct circuit connections	20
3.	Conducting the Experiment - Following the correct procedure - Verifying the operation / appropriate readings - Following the appropriate safety procedure	30
4.	Tabulation of Readings / Interpretation of Results Graphical Representation (If required)	20
5.	Viva-voce	05
	Total Marks	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S. No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	Transformer oil Tester Kit, Acidity Test kit	Each 1
2	Thermal Overload Relay	3
3	AC Contactor 230v/440v, 16A	26
4	Push Button With NO/NC Elements	30
5	Induction Motor 440 V, 1440 rpm, any HP rating (apart fromEM-II lab)	3
6	Proximity Switch	2
7	PLC (any brand) suitable for above experiments	5
8	Solenoid Valve	2
9.	Three Stage Lift Model, Conveyor Model	Each 1
10.	Forward, Reverse and Jogging (Forward and Reverse) Operation Model	1

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N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Diploma in Electrical and Electronics

Subject Code : 4030515

Semester : V Semester

Subject Title : PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
PROGRAMMABLE LOGIC CONTROLLER PRACTICAL	5	80	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

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 train our students on handling of programmable controllers this practical subject is introduced.

OBJECTIVE

On completion of this practical subject the students will be able to

- Develop ladder logic for different types of starters.
- Develop ladder logic for EB to Generator changeover.
- Develop ladder logic for Automatic load transfer.
- Develop ladder logic for sequential control process like water filling, fire alarm and conveyor sorting etc.,
- To program PLCs for controlling Heater and motors.

DETAILED SYLLABUS

PROGRAMMABLE LOGIC CONTROLLER PRACTICAL

LIST OF EXPERIMENTS

1. Interfacing of Limit switch, Reed switch and Proximity switch with PLC.
2. DOL starter with single phase prevention.
3. EB to Generator Change over switch implementation with interlocking
4. Star Delta starter
    a. Single phasing prevention
    b. Adjustable star-delta transfer time
    c. Pre-settable overload trip time
5. Automatic load transfer
    a. Transfers load from one phase to another when one phase in a three-phase system fails
    b. Automatically restores when power is resumed
    c. Time delays are affected to prevent action during short time failure
6. Fill the water in water tank and maintain the water level.
    a. When water level comes below lower-level switch ON the pump
    b. When water level reaches the high level switch OFF the pump
    c. Include manual switch to operate the pump at any level of water.

7. Fire alarm
    a. Multiple alarms
    b. Sound alarm
    c. If not acknowledged, Sound alarms 1 and 2
    d. Similarly go up to 4 alarm conveyor belt sorting
8. Three floor Lift control
9. Traffic light control
10. Automatic operation of double acting pneumatic cylinder – Multi cycle
11. Sequential operation of two Double Acting Cylinders for the sequence A+,B+,B-,A-
12. Analog input to PLC as a set of valves for a comparator function block
    -The input is multilevel illumination control. The input is setting is by means of a potentiometer in an analog input to the PLC. The outputs turn on several groups of lamps to obtain desired level illumination.
13. Heater control with PID function of the PLC
    - A 1000 W water heater is controlled using the PID function of the PLC. The temperature transducer is a temperature transmitter with 4 to 20 mA output and Pt 100 Probe.
14. Round table liquid filling system
    - Dropping of Reagents into test tubes. The feedback is from potentiometer. The program must ensure that the end limits of the pot are never reached by carefully balancing the clockwise and anti- clockwise revolution.
15. Slow speed motor control using PWM function of the PLC
    - Slow speed 12V DC 18W permanent magnet motor with fly wheel is controlled with the PWM output and feedback from a low-resolution encoder.

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	LIST OF EQUIPMENTS	QUANTITY REQUIRED
1	PLCs suitable to conduct above Experiments	3
2	Limit Switch	1
3	Reed Switch	1
4	Inductive Proximity Sensor	1
5	Capacitive Proximity Sensor	1
6	PC (or) Laptop	3

DETAILED ALLOCATION OF MARKS

S.No.	NAME OF THE ACTIVITY	MARKS ALLOCATED
1.	Drawing Connection/Ladder Diagram and Writing Details of the Components/Equipments/Machines used	20
2.	Making the correct circuit connections	25
3.	Conducting the Experiment - Following the correct procedure - Verifying the operation / appropriate readings - Following the appropriate safety procedure	30
4.	Tabulation of Readings / Interpretation of Results Graphical Representation (If required)	20
5.	Viva-Voce	05
	Total Marks	**100**

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N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Electrical and Electronics Engineering
Subject Code : 4030516
Semester : V
Subject Title : Elective Practical – I: Renewable Energy Sources Practical

TEACHING AND SCHEME OF EXAMINATION

No of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	M			Duration
			Internal Assessment	End Semester Examinations	Total	
RENEWABLE ENERGY SOURCES PRACTICAL	5	80	25	100*	100	3 Hrs.

*** Examinations will be conducted for 100 M and it will be reduced to 75 M.**

RATIONALE

Modern world aims to tap and utilize the Renewable Energy Sources as they are available almost at free of cost and eco-friendly nature. Our government also promotes the utilization of Renewable Energy Sources in full mind.

OBJECTIVES

- To measure the Solar Radiation
- To study the I-V and P-V Characteristics of PV Modules
- To measure Power flow of standalone PV System
- To study the Solar Thermal Equipments

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DETAILED SYLLABUS

Contents: Practical

Name of the topic	Exp. No	Experiment
Solar PV Module	1	Measurement of Solar Radiation
	2	I-V and P-V Characteristics of PV Module
	3	I-V and P-V Characteristics of PV Modules in Series
	4	I-V and P-V Characteristics of PV Modules in Parallel
	5	Effect of Tilt Angle on PV Module power
	6	Effect of shading on output of Solar Panel
	7	Working of Blocking Diode
Power flow calculation	8	Power flow calculation of standalone PV System for AC Load
	9	Power flow calculation of standalone PV system for DC Load
	10	Calculation of Maximum Power Point
Solar Thermal conversion	11	Direct type Solar Dryer
	12	Indirect type Solar Dryer
	13	Solar Water Heater
	14	Solar Cooker
	15	Solar Air Heater
Wind mill	16	Demo model of Wind Mill

DETAILED ALLOCATION OF MARKS

S.No.	Name of the Activity	Marks Allocation
1	Procedure	**25**
2	Sketches/Circuit diagram	**25**
3	Tabulation	**15**
4	Calculation/graph	**15**
5	Result	**15**
6	Viva – voce	**05**
	TOTAL	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

Ex. No	Equipments	Quantity
1	Solar panel PV Training Kit	6
2	Infra-red Thermometer	1
3	Lux Meter	2
4	Solar Power Meter	1
5	Solar Panel 100 Watts (Mono -1, Poly – 2)	3
6	Inverter (PWM, MPPT – 1 no. Each)	2
7	Battery 12V, 13 AH	1
8	Charge Controller 12V/10A	2
9	MC Voltmeter (0 – 100V)	6
10	MC Ammeter (0 – 15A)	6
11	AC/DC Digital Tong Tester	2
12	Rheostat 50 Ohm	1

13	Direct type Solar Dryer Kit	1
14	Indirect type Solar Dryer Kit	1
15	Solar Water Heater Kit	1
16	Solar Cooker Kit	1
17	Solar Air Heater Kit	1
18	Model Wind Mill	1

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N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : Diploma in Electrical and Electronics Engineering
Subject Code 4030540
Semester : V Semester
Subject Title : COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	**End Semester** Examination	Total	
COMPUTER AIDED ELECTRICAL DRAWING PRACTICAL	4	64	25	100*	100	3 Hrs

*** Examinations will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE

This subject is introduced in order to impart skill of making Computer Aided Electrical Drawing.

OBJECTIVES

At the end of the semester the students must be able to draw:

- 2D Diagrams using Auto CAD
- Symbols widely used in Electrical and Electronics Circuits
- Single Line Diagram of different types of Panels.
- Single Line Diagrams of Substation Layout.
- Winding Diagrams
- Line Diagram of Distribution Panels

DETAILED SYLLABUS

PART-A

ELECTRICAL SYMBOLS-DRAWING (5*2=10)

1. Draw the symbols for Components: Resistor, Capacitor, Inductor, Diode, Transistor, FET, SCR, UJT, TRIAC, DIAC, and Gates AND, OR, NOT, NAND, NOR, EXOR.
2. Draw the Symbols used in Electrical Wiring: Relays, Contactors, Fuses, Main Switch, Electric Bell, Earth, DPST, DPDT, TPST, and Neutral Link.
3. Draw the Symbols for Instruments: Ammeter, Voltmeter, Wattmeter, Energy Meter, Frequency Meter, Power Factor Meter, Timer and Buzzers.
4. Draw the Symbols for Machines: Armatures, Alternators, Field winding (Shunt, Series and Compound) Transformer and Autotransformer.

PART-B

(1*60=60)

ELECTRICAL CONNECTION DIAGRAMS- DRAWING

1. Draw the Single Line Diagram of Single Phase MCB Distribution Board.
2. Draw the Single Line Diagram of Three Phase MCB Distribution Board.
3. Draw the Single Line Diagram of typical MV Panel.
4. Draw the Single Line Diagram of Motor Control Centre (MCC) Panel.
5. Draw the Single Line Diagram of Fire Alarm Riser Arrangement in Multi-Storey Building.
6. Draw the Single Line Diagram of Intercom Arrangement in Multi Storey Building.
7. Draw the Front-End Schematic Diagram of typical Sub Switch Board (SSB).
8. Draw the Winding Diagram of Lap Connected DC Armature withCommutators Connections and Brush Positions.
9. Draw the Control and Main Circuit of Automatic Star Delta Starter.
10. Draw the Mush Winding Diagram of a Three Phase Induction Motor.
11. Draw the Concentric Winding Diagram of a Single-Phase Induction Motor.

NOTE FOR EXAMINERS

1. Five symbols should be asked from part A exercise 1to 4 with at least onefrom each.
2. One sketch should be asked from part B exercise 1 to 13.
3. Printed output of the given symbols and sketch is to be evaluated

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No	NAME OF THE EQUIPMENT	QUANTITY REQUIRED
1.	PC – Pentium Dual Core	30
2.	Electrical CAD Software multi user	01
3.	UPS – 5KVA with half an hour batterybackup	01

ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1.	SYMBOLS IN CAD	20
2.	MANUAL DRAWING OF ELECTRICAL CONNECTIONDIAGRAM	20
3.	ELECTRICAL CONNECTION DIAGRAM IN CAD	40
4.	PRINT OUT	15
5.	VIVA VOCE	05
	Total	**100**

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N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : All Branches of Diploma in Engineering and Technology

Subject Code : 4040550

Semester : V

Subject Title : MICROCONTROLLER PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
MICROCONTROLLER PRACTICAL	**4**	**64**	**25**	**100***	**100**	**3 Hrs.**

*** Examination will be conducted for 100 marks and it will be reduced to 75 marks.**

RATIONALE:

The introduction of this subject will enable the students to have hands on experience in using 8051 trainer kits. The students are exposed to learn simple programs using assembly language. They can also get familiar with the C compiler platform. They also gain knowledge by using application specific interfacing boards.

OBJECTIVES:

The students are able to

-> Understand the use of instruction set by writing and executing simple ALP.

-> Know the connection details between microcontroller and peripherals.

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DETAILED SYLLABUS

Contents: Practical

Exercises

Part A

The following experiments should be written using 8051 assembly language program and should be executed in the 8051-Microcontroller trainer kit.

1. 8 / 16 bit addition
2. 8 / 16 bit subtraction
3. 8 bit multiplication
4. 8 bit division
5. BCD to Hex code conversion
6. Hex to BCD code conversion
7. Smallest / Biggest number
8. Time delay routine (Demonstrate by Blinking LEDS).
9. Using Timer/ counter of 8051

Part B (Interfacing Application Boards)

The following experiments can be written using C compiler or 8051 assembly language and to be executed.

10. Interfacing Digital I/O board
11. Interfacing DAC
12. Interfacing Stepper motor
13. Interfacing Seven segment LED display or LCD
14. Sending data through the serial port between microcontroller kits
15. Interfacing DC motor using PWM.

AUTONOMOUS EXAMINATION

Note:

1. Students are provided with Hex code sheet for manual hand assembly.

DETAILED ALLOCATION OF MARKS

S.NO	NAME OF THE ACTIVITY	MARK ALLOCATION
1.	ALGORITHM OR FLOW CHART	20
2.	PROGRAM	30
3.	EXECUTION	30
4.	RESULT	10
5.	VIVA VOCE	10
	Total	**100**

LIST OF EQUIPMENTS (FOR A BATCH OF 30 STUDENTS)

S.No.	Name of the Equipments	Required No.s
1	8051 Microcontroller Kit	14
2	Digital I/O Interface Board	2
3	Seven Segment LED Display Interface Board	2
4	8 Bit DAC Interface Board	2
5	Stepper Motor Control Interface Board	2
6	DC Motor Control Interface Board	2
7	RS 232 Serial Port Cable	2
8	LCD Interface Board	2
9	Laptop / Desktop Computer	6

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N - 20 SCHEME

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : All Branches of Diploma in Engineering and Technology and Special Programs

Subject Code 4040570

Semester : V

Subject Title : ENTREPRENERUSHIP AND STARTUPS

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instruction		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	End Semester Examinations	Total	
ENTREPRENEURSHIP AND STARTUPS	**4**	**64**	**25**	**75**	**100**	**3 Hrs**

Topics and Allocation of Hours

UNIT	Topic	Hours
I	Entrepreneurship – Introduction and Process	10
II	Business Idea and Banking	10
III	Startups, E-cell and Success Stories	10
IV	Pricing and Cost Analysis	10
V	Business Plan Preparation	10
Revision, Field visit and Preparation of case study report		14
Total		64

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and startups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of the study of 5th semester the students will be able to

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spirit and resourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turnover
- Familiarization of various financial and non-financial schemes
- Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
I	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** ● Concept, Functions and Importance ● Myths about Entrepreneurship ● Pros and Cons of Entrepreneurship ● Process of Entrepreneurship ● Benefits of Entrepreneur ● Competencies and Characteristics ● Ethical Entrepreneurship ● Entrepreneurial Values and Attitudes ● Motivation ● Creativity ● Innovation ● Entrepreneurs - as problem solvers ● Mindset of an employee and an entrepreneur ● Business Failure – causes and remedies ● Role of Networking in entrepreneurship	**10**
II	**BUSINESS IDEA AND BANKING** ● Types of Business: Manufacturing, Trading and Services ● Stakeholders: Sellers, Vendors and Consumers ● E- Commerce Business Models ● Types of Resources - Human, Capital and Entrepreneurial tools ● Goals of Business and Goal Setting ● Patent, copyright and Intellectual Property Rights ● Negotiations - Importance and methods ● Customer Relations and Vendor Management ● Size and Capital based classification of business enterprises ● Role of Financial Institutions ● Role of Government policy ● Entrepreneurial support systems	**10**

	● Incentive schemes for State Government ● Incentive schemes for Central Government	
III	**STARTUPS, E-CELL AND SUCCESS STORIES** ● Concept of Incubation center‟s ● Activities of DIC, financial institutions and other relevance institutions ● Success stories of Indian and global business legends ● Field Visit to MSME‟s ● Various sources of Information ● Learn to earn ● Startup and its stages ● Role of Technology – E-commerce and social media ● Role of E-Cell ● E-Cell to Entrepreneurship	**10**
IV	**PRICING AND COST ANALYSIS** ● Calculation of Unit of Sale, Unit Price and Unit Cost ● Types of Costs - Variable and Fixed, Operational Costs ● Break Even Analysis ● Understand the meaning and concept of the term Cash Inflow and Cash Outflow ● Prepare a Cash Flow Projection ● Pricing and Factors affecting pricing ● Understand the importance and preparation of Income Statement ● Launch Strategies after pricing and proof of concept ● Branding - Business name, logo, tag line ● Promotion strategy	**10**
V	**BUSINESS PLAN PREPARATION** ● Generation of Ideas, ● Business Ideas vs. Business Opportunities ● Selecting the Right Opportunity ● Product selection ● New product development and analysis	**10**

	• Feasibility Study Report – Technical analysis, financial analysis and commercial analysis • Market Research - Concept, Importance and Process • Marketing and Sales strategy • Digital marketing • Social Entrepreneurship • Risk Taking-Concept • Types of business risks	

TEXT BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework, Sahitya Bhawan Publications, Agra – 282002

REFERNCE BOOKS:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
2. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
3. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
4. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
5. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
6. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
7. I. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
8. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
9. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioner‟s guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.