DIPLOMA PROGRAMME COURSE STRUCTURE [3RD YEAR ONWARD COURSES]							
Based on CBCS system & OBE model Recommended scheme of study (For Diploma in Electrical & Electronics Engineering)							
Semester of Study (Recommended)	**Category of course**	**Course Code**	**Subjects**	**Mode of delivery & credits** *L-Lecture. T-Tutorial. P-practical*			**Total Credits** *C-Credit*
				L	**T**	**P**	**C**
THEORY							
SIXTH	**PC**	DEE 601	Switch Gear and Protection	3	1	0	4
		DEE 603	Utilization of Electric power	3	0	0	3
	PE	DPE 641/642/633	PE-IV	3	0	0	3
	OE	DOE 641/642/643	OE-III [Courses from other Branches]	3	0	0	3
	HSS	DHS 601	Entrepreneurship and Startup	3	0	0	3
	Mandatory Course	DAU 601	Indian Constitution	2	0	0	0 (Non-credit)
	SESSIONAL						
	PC	DEE 602	POWER SYSTEM LAB	0	0	2	1
		DPE 635/644	PE-V LAB	0	0	2	1
	Project	DPR 642	MAJOR PROJECT	0	0	4	2
	Seminar	DSE 642	SEMINAR	1	0	0	1
PERIODS PER WEEK				**18**	**1**	**8**	
TOTAL (THEORY + LABS) CREDITS							**21**
TOTAL PERIODS PER WEEK							**27**
GRAND TOTAL FOR THIRD YEAR							**43**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING PROGRAMME ELECTIVES (PE)*							
SEMESTER	**Code no.**	**Name of the PE courses**	**Prerequisite/ Corequisite courses with code**	**L**	**T**	**P**	**C**
PE-I							
SEM-IV	DPE 441	Electrical Equipment Maintenance	Electrical Machine	3	0	0	3
	DPE 442	Industrial Instrumentation And Condition Monitoring	Electrical Measurements and Instrumentation	3	0	0	3
	DPE 443	Applied Communication	Basic Electronics	3	0	0	3
PE-II							
SEM- V	DPE 541	Industrial Automation & Control.	Electrical Measurements and Instrumentation	3	0	0	3
	DPE 542	Communication Technologies	Analog & digital Electronics	3	0	0	3
	DPE 543	Principle of Electric Vehicle	Power electronics	3	0	0	3
PE-III							
SEM-V	DPE 544	Solar Power Technologies	Electrical energy generation	3	0	0	3
	DPE 545	Electric Traction	Utilization of Electric power	3	0	0	3
	DPE 546	Electrical Testing and Commissioning	Power system	3	0	0	3
PE-IV							
SEM-VI	DPE 641	Applications of IOT	Microprocessor and Microcontroller	3	0	0	3
	DPE 642	Industrial Drives	Utilization of Electric power	3	0	0	3
	DPE 633	Programmable Logic Controllers	Microprocessor and Microcontroller	3	0	0	3
PE-V [Sessional]							
SEM-VI	DPE 635	Programmable Logic Controllers Lab	Microprocessor and Microcontroller	0	0	2	1
	DPE 644	Industrial Drives Lab	Utilization of Electric power	0	0	2	1

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING OPEN ELECTIVES (OE)*							
SEMESTER	**Code No.**	**Name of the OE courses**	**Prerequisites courses with code**	**L**	**T**	**P**	**C**
OE-I							
FOURTH	DOE 441	Utilization of Electrical Energy		3	0	0	3
	DOE 442	Electrical Energy Generation System		3	0	0	3
	D0E 443	Fundamental of Power Electronics		3	0	0	3
OE- II							
FIFTH	DOE 541	Introduction to Power System		3	0	0	3
	DOE 542	Computational technique in Electrical Engineering		3	0	0	3
	DOE 543	Building Electrification and House Wiring		3	0	0	3
OE- III							
SIXTH	DOE 651	Consumer Electronics		3	0	0	3
	DOE 652	Introduction to Sustainable Energy		3	0	0	3
	DOE 653	Electromechanical Energy Conversion		3	0	0	3
***OPEN ELECTIVES TO BE OPTED ONLY BY OTHER DEPARTMENT STUDENTS**							

SWITCH GEAR & PROTECTION

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DEE 601**			COURSE TITLE**: SWITCH GEAR & PROTECTION**				
COMPULSORY / OPTIONAL: **COMPULSORY (**Basic Electrical Engineering, Power Systems)							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:
This course envisions imparting to students to:

1.	To understand the concepts of electrical protection systems for power systems.
2.	To study different types of switchgear, circuit breakers, and protective relays.
3.	To learn about overcurrent, differential, and distance protection schemes
4.	To develop knowledge of insulation coordination and earthing in electrical systems
5.	To analyze fault detection, isolation, and system recovery mechanisms.

Course Outcomes:
After the completion of this course, students will be able to:

CO 1.	Explain the fundamentals of switchgear and protection in power systems.
CO 2.	Understand the working principles, types, and applications of circuit breakers.
CO 3.	Analyze different types of protective relays and their applications.
CO 4.	Apply protection techniques for transformers, generators, transmission lines, and busbars
CO 5.	Demonstrate the significance of earthing and insulation coordination in electrical networks.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : FUNDAMENTALS OF PROTECTION SYSTEMS** 1.1 Need for protective relays and switchgear in power systems. 1.2 Components of a protection system: CTs, PTs, relays, and circuit breakers. 1.3 Basic protection principles: Over current, short circuit, and earth fault protection. ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE : CIRCUIT BREAKERS & ARC EXTINCTION** 2.1 Working principles and construction of circuit breakers. 2.2 Types of circuit breakers: Air Circuit Breaker (ACB), Oil Circuit Breaker (OCB), SF6 Circuit Breaker, Vacuum Circuit Breaker (VCB). 2.3 Arc extinction methods: High resistance and low resistance interruption. 2.4 Testing and maintenance of circuit breakers. ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE : PROTECTIVE RELAYS** 3.1 Classification of relays: Electromagnetic, Static, and Numerical relays. 3.2 Operating principles of Over current, Earth Fault, Differential, and Distance relays. 3.3 Directional and Non-Directional relays. 3.4 Protection coordination between relays and breakers. ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE : PROTECTION OF POWER SYSTEM COMPONENTS** 4.1 Transformer protection: Buchholz relay, differential protection, and overcurrent protection. 4.2 Generator protection: Reverse power protection, differential protection. 4.3 Transmission line protection: Distance protection, pilot wire protection. 4.4 Bus bar protection: Differential protection and frame leakage protection. ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE : EARTHING & INSULATION COORDINATION** 5.1 Importance of earthing in power systems. 5.2 Types of earthing: Solid, Resistance, and Reactance grounding. 5.3 Insulation coordination in power systems. 5.4 Protection against lightning and surge arresters. ***Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Switchgear and Protection	Sunil S. Rao	
2.	Power System Protection and Switchgear	Badriram & Vishwakarma	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Electrical Power System Protection	C.L. Wadhwa	
4.	Fundamentals of Power System Protection	Y.G. Paithankar & S.R. Bhide	
5.	The Art & Science of Protective Relaying	C. Russell Mason	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	2	2	1	2	2	2	2	2	1
2	3	3	3	2	3	3	2	3	1	2
3	3	3	3	3	3	2	2	2	1	1
4	3	3	2	3	3	2	1	3	1	2
5	2	2	2	3	3	2	2	2	1	3

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

UTILIZATION OF ELECTRIC POWER

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DEE 603**			COURSE TITLE**:** UTILIZATION OF ELECTRIC POWER				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:

This course envisions imparting to students to:

1.	To understand the concepts of electric drives, traction, and heating systems.
2.	To study the various methods of electric heating, welding, and illumination systems.
3.	To gain knowledge of electric traction systems and their control.
4.	To learn about energy conservation techniques in electrical systems.
5.	To analyze industrial applications of electric power.

Course Outcomes:

After the completion of this course, students will be able to:

CO 1.	Explain the working and selection criteria of electric drives and motors.
CO 2.	Understand electric heating and welding processes used in industries.
CO 3.	Apply the principles of illumination for designing lighting systems.
CO 4.	Analyze electric traction systems and their control.
CO 5.	Implement energy conservation techniques in electrical systems.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : HEATING & WELDING** 1.1 Introduction and types of electric heating 1.2 Electric furnaces 1.3 Di electric heating 1.4 Introduction and types of electric welding ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE : ELECTROLYTIC & ELECTRO-METALLURGICAL PROCESSES** 2.1 Introduction 2.2 Faraday's law of electrolysis 2.3 Extraction of metals 2.4 Refining of metals ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE : CONTROL OF MOTORS** 3.1Introduction to control of motors 3.2 1-ph & 3-ph motor controls 3.3 Electrical and mechanical braking of motors. 3.4 Introduction to electric traction. ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE : INDUSTRIAL APPLICATIONS OF ELECTRIC MOTOR** 5.5 Introduction 5.6 Selection of motors 5.7 Electric drives 5.8 Motors for particular services ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE : ILLUMINATION** 5.1 Introduction 5.2 Lows of illumination 5.3 Lighting Fittings 5.4 illumination of different purposes ***Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Utilization of Electrical Power	R.K. Rajput	
2.	Utilization of Electrical Energy	E. Openshaw Taylor	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Art and Science of Utilization of Electrical Energy	H. Partab	
4.	Electric Traction	J. Upadhyay & S.N. Mahendra	
5.	Energy Management and Conservation	W.R. Murphy & G. McKay	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	3	3	2	2	3	1	1	2	3
2	3	3	3	2	2	3	2	1	1	2
3	3	3	2	2	3	3	1	1	2	2
4	2	2	3	3	3	2	2	2	1	3
5	3	3	2	2	3	1	2	2	1	3

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

APPLICATIONS OF IoT

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DPE 641**			COURSE TITLE**:** APPLICATIONS OF IoT				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:
This course envisions imparting to students to:

1.	To understand the fundamentals of the Internet of Things (IoT) and its applications.
2.	To learn about IoT architecture, sensors, and communication protocols.
3.	To explore IoT applications in electrical engineering and automation.
4.	To develop skills in IoT-based system design and cloud integration
5.	To analyze real-time data collection, processing, and security aspects of IoT

Course Outcomes:
After the completion of this course, students will be able to:

CO 1.	Explain the fundamental concepts and architecture of IoT.
CO 2.	Describe the working of sensors, actuators, and embedded systems in IoT applications.
CO 3.	Implement IoT communication protocols for data exchange.
CO 4.	Design and develop IoT applications in electrical engineering.
CO 5.	Analyze security challenges and data management in IoT networks.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : INTRODUCTION TO IOT** 1.1 Overview of IoT and its importance. 1.2 Components of IoT: Sensors, Actuators, Processors, Communication Networks. 1.3 IoT Architecture and its layers. 1.4 Applications of IoT in electrical engineering. ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE : SENSORS, ACTUATORS, AND EMBEDDED SYSTEMS** 2.1 Types of sensors and actuators used in IoT. 2.2 Basics of microcontrollers (Arduino, ESP8266, ESP32, Raspberry Pi). 2.3 Communication interfaces: I2C, SPI, UART. 2.4 Hands-on practice: Interfacing sensors with microcontrollers. ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE : IOT COMMUNICATION PROTOCOLS & NETWORKING** 3.1 IoT Communication Technologies: Wi-Fi, Bluetooth, Zigbee, LoRa, RFID, NFC. 3.2 Internet Protocols: HTTP, MQTT, CoAP. 3.3 Cloud computing and IoT: Data storage and processing. 3.4 Hands-on practice: Data transmission using MQTT and HTTP. ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE : IOT APPLICATIONS IN ELECTRICAL ENGINEERING** 1.1 Smart Home Automation (Controlling appliances using IoT). 1.2 Smart Grid and Smart Metering. 1.3 Industrial Automation using IoT. 1.4 Predictive maintenance and fault detection in electrical systems. 1.5 Hands-on practice: IoT-based home automation project. ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE : IOT SECURITY & DATA MANAGEMENT** 5.1 Security challenges in IoT systems. 5.2 Data encryption and authentication methods. 5.3 Privacy issues and secure communication in IoT networks. 5.4 Case studies on IoT security breaches. ***Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Internet of Things: Architecture and Design Principles	Raj Kamal	
2.	Mastering the Internet of Things	Peter Waher	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Internet of Things with ESP8266	Marco Schwartz	
4.	Internet of Things: Principles and Paradigms	Rajkumar Buyya & Amir Vahid Dastjerdi	
5.	Building the Internet of Things	Maciej Kranz	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	2	2	2	3	2	2	1	2	3
2	3	3	3	2	2	1	2	2	1	2
3	3	3	2	2	2	3	3	1	1	3
4	2	3	3	3	2	3	3	2	2	3
5	3	3	3	2	2	3	3	2	1	2

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

INDUSTRIAL DRIVES

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DPE 642**			COURSE TITLE**:** INDUSTRIAL DRIVES				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:

This course envisions imparting to students to:

1.	To understand the fundamental principles of electric drives and their control.
2.	To study different types of motors used in industrial drives and their applications.
3.	To analyze the working of power electronic converters used for motor control.
4.	To learn about speed control techniques for DC and AC drives.
5.	To explore industrial applications of electric drives and their selection criteria.

Course Outcomes:

After the completion of this course, students will be able to:

CO 1.	Explain the fundamentals of industrial drives and their classifications.
CO 2.	Analyze the working and speed control techniques of DC drives.
CO 3.	Understand AC drives and their speed control methods.
CO 4.	Implement power electronic converters for industrial drive applications.
CO 5.	Select appropriate drives for industrial applications considering efficiency and automation.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : FUNDAMENTALS OF ELECTRIC DRIVES** 1.1 Introduction to electric drives and their classification. 1.2 Components of an electric drive system. 1.3 Advantages and disadvantages of electric drives over mechanical drives. 1.4 Load characteristics and torque-speed curves. ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE : DC DRIVES** 2.1 DC motor characteristics and their applications. 2.2 Speed control of DC motors using converters and choppers. 2.3 Regenerative braking, plugging, and dynamic braking. 2.4 Industrial applications of DC drives. ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE : AC DRIVES** 3.1 Types of AC motors used in industrial drives. 3.2 Speed control of induction motors using voltage control, frequency control, and rotor resistance control. 3.3 Variable Frequency Drives (VFDs) and their applications. 3.4 Industrial applications of AC drives. ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE : POWER ELECTRONIC CONVERTERS FOR DRIVES** 4.1 Rectifiers, choppers, inverters, and their role in industrial drives. 4.2 Control of drives using thyristors, IGBTs, and MOSFETs. 4.3 Vector control and direct torque control of AC motors. 4.4 Hands-on practice: Speed control of an induction motor using a VFD. ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE : INDUSTRIAL APPLICATIONS & SELECTION OF DRIVES** 5.1 Selection of drives for industrial applications. 5.2 Applications in industries such as steel mills, paper mills, textile industries, and robotics. 5.3 Case studies on industrial drive systems. 5.4 Energy-efficient drive systems and their role in automation. ***Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Fundamentals of Electric Drives	G.K. Dubey	
2.	Electric Drives: Concepts and Applications	Vedam Subrahmanyam	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Power Semiconductor Controlled Drives	G.K. Dubey	
4.	Electrical Machines, Drives, and Power System	Theodore Wildi	
5.	Industrial Motor Control	Stephen Herman	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	2	2	2	3	2	2	3	2	3
2	3	3	3	2	3	2	2	2	2	2
3	2	2	3	2	3	2	3	3	1	2
4	3	3	3	2	2	2	3	3	1	2
5	3	3	3	2	3	2	2	2	1	2

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

PROGRAMMABLE LOGIC CONTROLLERS

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DPE 633**			COURSE TITLE**: PROGRAMMABLE LOGIC CONTROLLERS**				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:

This course envisions imparting to students to: Understand and develop a basic circuit. To use this knowledge and programming skill in the field of automation it is also necessary to learn about Programmable Logic Controller. Programmable Logic Controller works as brain of automation system, which can be programmed for desired functions for controlling different Machines. The Industries therefore demand for persons having automation knowledge with skill of P.L.C. programming. To cater to the need of Industries and to convert their basic skill in to some advance level, this course is being introduced.

Course Outcomes:

After the completion of this course, students will be able to:

CO 1.	Explain the architecture, operation, and types of Programmable Logic Controllers used in industrial automation.
CO 2.	Develop and troubleshoot basic ladder logic programs using timers, counters, and logical instructions.
CO 3.	Apply advanced PLC functions such as arithmetic, comparison, and shift operations in real-time scenarios.
CO 4.	Interface PLCs with field devices and communication networks for industrial automation tasks.
CO 5.	Design, implement, and simulate a PLC-based automation project with appropriate documentation and safety considerations.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : PLC Overview** 1.1 Principles of operation of PLC 1.2 PLC verses computer 1.3 PLC hardware components 1.4 Scan time of a cycle. 1.5 Industrial PLC. 1.6 Application of PLC ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE : Memory and Logical Sensor** 2.1 Memory Address. 2.2 Program Files. 2.3 Data files: User Bits Memory, Timer Counter Memory, PLC Status Bits, User Function Control Memory, Integer Memory, Floating Point Memory 2.4 Sensor wiring: Switches, TTL, Sinking and sourcing, Connection of switch 2.5 Human/ product Presence Detection Sensors: Reed Switch, Optical Sensor, Capacitive Sensor, Inductive Sensor ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE : Boolean Logic Design and Timers, Counter , Latch Concept** 3.1 Boolean algebra: Rules of Boolean Algebra, Logic Design for a given application. 3.2 Common Logic Forms: Complex gate forms, Multiplexer. 3.3 Timers: On-delay timer, Off delay timer, Retentive timer. 3.4 Counters: Up-Counters, Down Counter, Up-Down Counter. 3.5 Master Control Relay. ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE : Logic Function Ladder and Advance functions of PLC** 4.1 Data handling Function: Move Function, Mathematical Function, Conversion Function 4.2 Logic Function: Comparison of Value, Boolean Function 4.3 List Function: Shift registers, Stacks, Sequencer 4.4 Program Control: Branching ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE : Applications of PLC** 5.1 Object counter 5.2 On-off control 5.3 Sequential starting of motors – Motor in forward and reverse direction 5.4 Traffic light control ,Car parking, Filling of Bottle 5.5 Room Automation.

	Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Programmable Logic Controllers	W. Bolton	
2.	Programmable Logic Controllers: Principles and Applications	John W. Webb and Ronald A. Reis	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Programmable Logic Controllers: Hardware and Programming	Max Rabiee	
4.	Industrial Automation and Process Control	Jon Stenerson & Jeffery W. Finch	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	2	3	2	3	3	2	2	2	2	2
2	3	3	3	3	2	2	2	3	3	2
3	3	2	2	2	2	2	1	2	1	2
4	2	3	3	2	3	3	3	3	2	1
5	2	3	2	2	1	1	1	2	1	2

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

PROGRAMMABLE LOGIC CONTROLLERS LAB.

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DPE 635**			COURSE TITLE: PROGRAMMABLE LOGIC CONTROLLERS LAB.				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	50	50	100

Course Objectives

This course envisions imparting to students to: This course is offered by Dept. of Electrical and Electronics Engineering as a lab, targeting students who wish to pursue research & development in industries or higher studies in field of Automation Engineering, including Embedded systems, Robotics, and other advanced systems. Offers hands-on experience on varied programmable Logic Controllers testing boards.

Course Outcomes

After the completion of this course, students will be able to:

CO 1	Understand the basics functionalities of PLC
CO 2	Understand different applications of PLC in industrial automation
CO 3	Implement interfacing of different switches, sensors and actuators with PLC
CO 4	Design , edit ,test ,and document PLC ladder logic program.
CO 5	Design and Implement PLC program to control different industrial processes such as traffic light, lift control and bottle filling plant.

List of Experiments (The experiment list may vary to accommodate recent development in the field)

1. Study of Logic Gates and implementation using PLC ladder diagram.
2. Implementation of Latching circuit and study of its application.
3. Implementation of Switching of Light circuit using PLC logic.
4. Implementation of Door Bell.
5. To perform Stepper Motor Control using PLC ladder programming
6. Implementation of Process control using PLC ladder diagram.
7. To perform Traffic Light Control using PLC ladder diagram.
8. To study and implement Bottle filling Plant using PLC ladder diagram.
9. To study and implementation of Conveyor Control System.
10. To study and implementation of Conveyor Control System. Ladder diagram
11. Drilling Tool
12. Seven segment display using PLC ladder program.
13. Implementation of Lift Control logic using PLC ladder diagram
14. ity based traffic light Implementation of Density based traffic light system.

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1	Programmable Logic Controllers	McGraw- Hills Publications, 4 th edition, 2010	9780028026619
2.	An Engineering Approach to Digital Design,	William. I. Fletcher, Design, Prentice Hall of India Publishers, New Delhi, 1 st edition, 1999. IV. C. H. Roth, Fundamentals of Logic Design, Jaico Publishing th Edition, 1999. 4. Reis & Reis, Programmable Logic Controllers, PHI Learning Publications, 5 th edition, 2002	9788120306516

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Fundamentals of Logic Design.	C. H. Roth, Jaico Publishing house, 4 th Edition, 1999.	9788172247744
4.	Programmable Logic Controllers	Reis & Reis, PHI Learning Publications, 5 th edition, 2002	9789332555129

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	2	2	2	3	1	0	1	2	1	1
2	2	1	2	2	1	1	1	2	1	1
3	2	2	3	3	1	1	1	2	1	1
4	2	2	1	3	1	1	1	2	1	1
5	2	1	2	2	1	1	1	2	1	1

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

INDUSTRIAL DRIVES LAB.

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DPE 644**			COURSE TITLE: INDUSTRIAL DRIVES LAB				
COMPULSORY / OPTIONAL: **COMPULSORY**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
0	0	2	2	1	50	50	100

Course Objectives

This course envisions imparting to students to:

1.	To provide hands-on experience in the operation and control of electrical drives.
2.	To study different types of DC and AC drives and their control techniques.
3.	To analyze the speed control methods of industrial motors.
4.	To understand the application of power electronic converters in drives.
5.	To familiarize students with modern industrial drive systems and automation techniques.

Course Outcomes

After the completion of this course, students will be able to:

CO 1	Understand different types of industrial drives and their working principles.
CO 2	Perform experiments on DC motor drives and analyze their speed control methods.
CO 3	Implement various speed control techniques for AC motor drives.
CO 4	Apply power electronics concepts in industrial drives and evaluate performance.
CO 5	Explore modern trends in industrial drive automation and smart drive technologies.

List of Experiments (The experiment list may vary to accommodate recent development in the field)

1. Study of different types of industrial drives and their applications.
2. Identification and testing of components used in industrial drive systems.
3. Speed control of a DC shunt motor using a field control method.
4. Speed control of a DC series motor using a voltage control method.
5. Performance testing of a DC motor drive under loaded and unloaded conditions.
6. Experiment on four-quadrant operation of a DC motor drive using a chopper circuit.
7. Speed control of a three-phase induction motor using a variable frequency drive (VFD).
8. Stator voltage control method for speed control of an induction motor.
9. Rotor resistance control method for slip ring induction motor.
10. Experiment on single-phase and three-phase rectifiers for drive applications.
11. Study and implementation of chopper-controlled DC drives.
12. Study and implementation of chopper-controlled DC drives.
13. Study of soft-starting techniques for industrial motors.
14. Experiment on stepper motor drive and its position control.
15. Experiment on servo motor drive and its speed control.
16. BLDC motor drive and its speed-torque characteristics.
17. Case study on smart drive systems and automation in industrial applications.

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Fundamentals of Electrical Drives	G.K. Dubey	
2.	Electric Drives: Concepts and Applications	Vedam Subrahmanyam	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Power Electronics and Motor Drives	Bimal K. Bose	
4.	Electrical Machines, Drives, and Power Systems	Theodore Wildi	

CONSUMER ELECTRONICS

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DOE 651**			COURSE TITLE**:** CONSUMER ELECTRONICS				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:

This course envisions imparting to students to:

1.	To understand the fundamentals of consumer electronic devices and their working principles.
2.	To study audio, video, and home automation systems.
3.	To explore modern display technologies and multimedia systems.
4.	To analyze communication devices and smart appliances.
5.	To gain knowledge about troubleshooting and servicing consumer electronic products.

Course Outcomes:

After the completion of this course, students will be able to:

CO 1.	Understand the fundamentals of consumer electronics and their applications.
CO 2.	Explain the working principles of audio systems and digital sound technology.
CO 3.	Analyze different types of display systems and video technologies.
CO 4.	Demonstrate knowledge of communication devices and smart appliances.
CO 5.	Perform troubleshooting and servicing of common consumer electronic devices.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : INTRODUCTION TO CONSUMER ELECTRONICS** 1.1 Evolution of consumer electronics. 1.2 Classification of consumer electronic products. 1.3 Overview of analog and digital circuits used in consumer devices. ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE : AUDIO SYSTEMS** 2.1 Microphones, loudspeakers, and their working principles. 2.2 Audio amplifiers, equalizers, and surround sound systems. 2.3 Digital audio systems: MP3, AAC, Bluetooth audio. 2.4 Noise cancellation technology. ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE : VIDEO SYSTEMS & DISPLAY TECHNOLOGIES** 3.1 Working of CRT, LCD, LED, OLED, and Plasma displays. 3.2 elevision technology: Analog TV, Digital TV, Smart TV. 3.3 Video projectors and home theater systems. 3.4 Camera sensors and image processing. ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE : COMMUNICATION & SMART DEVICES** 4.1 Mobile communication technology: GSM, 4G, 5G, VoIP. 4.2 Wireless communication: Bluetooth, Wi-Fi, NFC. 4.3 Smart home automation: IoT-based smart appliances. 4.4 Wearable electronics (smartwatches, fitness trackers). ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE : TROUBLESHOOTING & SERVICING OF CONSUMER ELECTRONICS** 5.1 Common faults and troubleshooting in audio/video systems. 5.2 Repair techniques for mobile phones, televisions, and home appliances. 5.3 Circuit testing using multimeters and oscilloscopes. 5.4 Safety precautions in servicing consumer electronic products. ***Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Consumer Electronics	S.P. Bali	
2.	Modern Television Practice	R.R. Gulati	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Consumer Electronics	B.R. Gupta	
4.	Mobile Cellular Telecommunications	William C.Y. Lee	
5.	Electronic Communication Systems	George Kennedy & Bernard Davis	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	2	2	2	3	2	2	1	2	3
2	3	2	2	3	3	3	2	2	2	3
3	2	2	3	3	3	2	2	1	2	2
4	3	2	3	3	3	3	3	2	1	2
5	3	2	2	3	2	2	2	3	1	2

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

INTRODUCTION TO SUSTAINABLE ENERGY

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DOE 652**			COURSE TITLE**: INTRODUCTION TO SUSTAINABLE ENERGY**				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:

This course envisions imparting to students to:

1.	To understand the importance and need for sustainable energy.
2.	To explore different types of renewable energy sources and their applications.
3.	To analyze energy efficiency, conservation, and environmental impact.
4.	To study modern sustainable energy technologies and their implementation.
5.	To develop awareness of global energy challenges and sustainable solutions.

Course Outcomes:

After the completion of this course, students will be able to:

CO 1.	Explain the fundamentals and importance of sustainable energy.
CO 2.	Describe solar energy principles and applications.
CO 3.	Analyze wind and hydropower energy generation techniques.
CO 4.	Evaluate biomass, geothermal, and emerging sustainable energy technologies.
CO 5.	Apply energy efficiency and conservation strategies for sustainable development.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : FUNDAMENTALS OF SUSTAINABLE ENERGY** 1.1 Introduction to energy, power, and sustainability. 1.2 Energy demand, consumption trends, and environmental impact. 1.3 Classification of energy sources: Renewable vs. Non-renewable. ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE :** Solar Energy 2.1 Basics of solar radiation and photovoltaic (PV) effect. 2.2 Solar thermal and photovoltaic systems. 2.3 Solar energy applications: Solar panels, water heating, and solar farms. 2.4 Grid-connected and off-grid solar power systems. ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE :** Wind and Hydropower Energy 3.1 Principles of wind energy conversion. 3.2 Wind turbine types, components, and power generation. 3.3 Basics of hydropower: Dams, small-scale hydro, and pumped storage. 3.4 Environmental and economic aspects of wind and hydro energy. ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE :** Biomass, Geothermal & Emerging Energy Technologies 4.1 Biomass energy: Sources, conversion techniques, and biofuels. 4.2 Basics of geothermal energy and power plants. 4.3 Ocean energy: Tidal, wave, and ocean thermal energy conversion (OTEC). 4.4 Hydrogen fuel cells and smart grid technology. ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE :** Energy Efficiency & Sustainability 5.1 Energy conservation techniques in industries and households. 5.2 Role of smart grids and energy storage solutions. 5.3 Government policies, incentives, and international agreements on renewable energy. 5.4 Case studies on sustainable energy projects. ***Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Renewable Energy Sources and Emerging Technologies	D.P. Kothari, K.C. Singal, Rakesh Ranjan	
2.	Fundamentals of Renewable Energy Systems	D. Mukherjee and S. Chakrabarti	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Non-Conventional Energy Sources	G.D. Rai	
4.	Principles of Renewable Energy	Boyle, Godfrey	
5.	Renewable Energy: Power for a Sustainable Future	Stephen Peake	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	3	3	2	2	2	1	2	2	3
2	3	3	2	2	2	3	3	2	2	3
3	3	3	3	3	2	2	2	2	1	2
4	2	2	2	3	3	3	2	2	2	3
5	3	3	3	2	2	2	3	2	1	2

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)

ELECTROMECHANICAL ENERGY CONVERSION

PROGRAMME: DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING							
COURSE CODE: **DOE 653**			COURSE TITLE**:** Electromechanical Energy Conversion				
COMPULSORY / OPTIONAL: **OPTIONAL**							
Teaching Scheme and Credits					EXAMINATION SCHEME		
L	T	P	HOURS/WEEEK	CREDIT	PE	FINAL	TOTAL
3	0	0	3	3	50	50	100

RATIONALE:

This course envisions imparting to students to:

1.	To understand the fundamental principles of electromechanical energy conversion.
2.	To study the construction, working, and characteristics of electrical machines (DC, AC, and Special Machines).
3.	To analyze the performance and efficiency of transformers and rotating electrical machines.
4.	To introduce students to machine control, protection, and maintenance.
5.	To apply the knowledge of electrical machines in industrial applications.

Course Outcomes:

After the completion of this course, students will be able to:

CO 1.	Explain the fundamental principles of electromechanical energy conversion.
CO 2.	Describe the construction, operation, and applications of DC machines.
CO 3.	Analyze the working and performance of transformers.
CO 4.	Examine the characteristics and control methods of AC machines.
CO 5.	Identify different types of special electrical machines and their applications.

COURSE CONTENT DETAILS:

MODULE	TOPICS/SUBTOPICS
1	**TITLE : FUNDAMENTALS OF ELECTROMECHANICAL ENERGY CONVERSION** 1.1 Energy conversion principles 1.2 Magnetic field and magnetic circuits 1.3 Faraday's Law of Electromagnetic Induction 1.4 Torque and EMF in electromechanical systems 1.5 Singly and doubly excited magnetic systems ***Course Outcome: CO1 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
2	**TITLE : DC MACHINES** 2.1 Construction and types of DC machines 2.2 Working principle of DC motors and generators 2.3 EMF equation of DC generator 2.4 Characteristics and applications of DC motors (series, shunt, and compound) 2.5 Speed control and starting of DC motors ***Course Outcome: CO2 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
3	**TITLE : TRANSFORMERS** 3.1 Construction and working principle of single-phase and three-phase transformers 3.2 EMF equation of transformers 3.3 Equivalent circuit and phasor diagrams 3.4 Losses and efficiency calculations 3.5 Auto-transformers and instrument transformers ***Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
4	**TITLE : AC MACHINES – INDUCTION MOTORS AND SYNCHRONOUS MACHINES** 3.1 Construction and working of three-phase induction motors 3.2 Slip, torque equation, and torque-slip characteristics 3.3 Starters and speed control of induction motors 3.4 Synchronous generators: construction, working, and voltage regulation 3.5 Synchronous motors: operation and applications ***Course Outcome: CO4 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***
5	**TITLE : SPECIAL MACHINES AND INDUSTRIAL APPLICATIONS** 5.1 Stepper motors, Servo motors, and Universal motors 5.2 Permanent Magnet Machines and Brushless DC Motors 5.3 Applications of electrical machines in industrial automation 5.4 Basics of machine protection, maintenance, and troubleshooting ***Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 20 (PE+FINAL)***

Books recommended:

Textbook:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
1.	Electric Machinery Fundamentals	Stephen J. Chapman	
2.	Electrical Machines	P.S. Bimbhra	

Reference book:

S. N.	Title	Author, Publisher, Edition and Year of publication	ISBN
3.	Principles of Electric Machines and Power Electronics	P.C. Sen	
4.	Electrical Technology Vol-II (AC & DC Machines)	B.L. Theraja & A.K. Theraja	
5.	Electrical Machines	J.B. Gupta	

E- Reference

Mapping of Course Outcomes onto Program Outcomes

Course Outcome #	Program Outcomes							PSO		
	1	2	3	4	5	6	7	1	2	3
1	3	3	2	3	3	1	2	2	1	3
2	3	3	3	2	2	2	1	1	2	2
3	3	3	3	3	2	2	2	2	1	2
4	3	2	2	2	3	3	3	2	1	2
5	3	3	3	3	2	2	2	2	1	2

EXPERT CONSULTATION COMMITTEE (ACADEMICS / INDUSTRIES)