

The Maharaja Sayajirao University of Baroda								ACADEMIC YEAR 2023 -2024		
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -I	BASIC ELECTRICAL ENGINEERING (ELE3222)							Lecture Hrs per week	3	
Semester-II								Max marks	100	
Pre-Requisite:Basic Mathematics										
CO1	Explain various terms,definitions related to electrical and magnetic circuits									
CO2	Understand the different rules for electrical and magnetic circuit.									
CO3	Describe the thermal effect in electrical system.									
CO4	Learn methods of induced emf									
CO5	Learn different cells and charging system									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	E.m.f. sources of e.m.f. Types of current and voltage, Resistance, factors affecting resistance, Effect of Temperature on resistance, Temperature co-efficient of resistance.	4	12	CO1	PO1,PO4	1,2,3	PSO1			
2	Ohms law, series and parallel circuits of resistances, Star and delta conversion.	6	12	CO2	PO1,PO2	2,3	PSO1			
3	Electrical work, electrical power, Electrical energy heating effect of electric current. Joule's law, thermal efficiency relation between mechanical and electrical units of work, Power and energy.	4	12	CO1,CO3	PO1,PO3	1,2,3	PSO1			

4	Primary cells,Secondary cells,dry cells,standard cells,lead acid cells ,storage batteries.Solar batteries,series and parallel combination. Grouping of cells,efficiency of cells,charging systems,Alkaline battery,Nickel-iron, Nickel-cadmium,silver-zinc battery.	6	13	CO5	PO5	1,2	PSO1	Ent, SD	G	PE
5	Natural and artificial magnet, magnetic field, magnetic flux density, M.M.F., magnetic field strength reluctance, permeability, magnetic field due to current through straight conductor, a circular coil, a solenoid coil, a toroidal, Right hand rule, Maxwell's cork screw rule, B-H curve, Hysteresis loop, residual magnetic flux, relativity coercive force	10	24	CO1,CO2	PO1,PO3	2,3	PSO1			
6	Effect of electromagnetic field, Series& parallel magnetic ckt., magnetic leakage & fringing effect. Electrical and magnetic circuit comparison.Faraday's laws of induced e.m.f., Lenz's law dynamically and statically induced e.m.f., Flemings right hand rule and left hand rule, self-inductance, mutual inductance, energy stored in magnetic field force acting on a current carrying conductors, Eddycurrents.	12	27	CO1,CO2,C O4	PO1,PO3	1,2,3	PSO1			
		42	100							
Reference books:										
1	Electrical Technology by B.L.THERAJA									
2	Fundamentals of Electricity by REBNARD C. GRHAM E.E.									
3	Electrical Technology by EDWARD HAGES									

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POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	ANALOG ELECTRONICS (ELE3331)						Lecture Hrs per week	4		
Semester-I							Max marks	100		
Pre-Requisite: Science and Mathematics in Secondary Education, knowledge of Basics of Electrical Engg.										
CO1	Understand the basics of semiconductors and Diodes.									
CO2	Explain Types of Transistors									
CO3	Analyze working of Rectifiers, filters, and regulators circuits.									
CO4	Classify Amplifiers and Oscillators circuits									
CO5	Illustrate OP-AMP circuits and 555 Timer applications.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1	Types of material based on energy band- conductor, semiconductor, insulator, intrinsic and extrinsic semiconductors. P-N junction diodes, zener diode, LED, schottkey diode, varactor diode, characteristic, applications and specifications of all diodes	10	15	CO1	PO1	1,2,3	PSO1			
2	Types of transistors- BJT, UJT, FET, construction working and applications of BJT, FET and UJT, transistor as a switch, transistor as an amplifier, UJT as an oscillator, voltage amplifier, power amplifier	10	20	CO2	PO1	2,3, 5	PSO1	Emp, Ent, SD	L, N,G	ES, PE

3	Operational amplifiers, application of OP-AMP –adder, subtractor, integrator, differentiator, OP-AMP specifications, OP-AMP based oscillators	10	20	CO4, CO5	PO1, PO3,PO5	1,2,3	PSO1			
4	Regulators- linear and switching regulators	15	20	CO3	PO3,PO5	1,2, 3	PSO1			
5	Switching circuits- clipping, clamping, voltage multiplier, multivibrators	5	20	CO5	PO3,PO5	2,3	PSO1			
6	PCB manufacturing	5	5	CO1, CO2	PO3,PO5	1,2,3	PSO1			
		55	100							

Reference books:

1	Electronic Devices & Circuit Theory By Boylestad, Pearson Education India
2	Integrated Electronics By Millman & Halkias, Tata McGraw-Hill Education
3	Electronic Devices & Circuits By J. B. Gupta, S. K. Publication
4	Electronic Devices & Circuits By Sanjeev Gupta, Dhanpat Rai Publications (P) Limited
5	Electronic Devices & Circuits By B. L. Theraja, S. Chand Limited

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POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	DIGITAL ELECTRONICS (ELE3332)						Lecture Hrs per week	4		
Semester-I							Max marks	100		
Pre-Requisite: Basic Mathematics, Basic Electronics										
CO1	Learn number system and conversion between each number system.									
CO2	Classify various logic gates, boolean algebra , minimization techniques and choose the best for designing logic circuit.									
CO3	Understand, analyze and design logical operations using combinational circuits.									
CO4	Analyze working of sequential circuits and design of counters.									
CO5	Learn concept of memories, analog to digital and digital to analog convertor and its applications.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Decimal, Binary, octal, and hexa-decimal number systems, Conversion from Decimal number system to Binary, Octal, Hexadecimal and vice versa. Weighted and non weighted Binary Codes: Binary code, excess-3 code, gray code, error detection and correction codes, ASCII numbers.	8	12	CO1	PO1	1,2,3	PSO1			

2	AND, OR, NOT Logic, Logic gates: AND, OR, NOT, NAND,NOR, X-OR , X-NOR , Positive logic and Negative Logic with TTL logic.Logic Operators, Boolean laws, Converting Boolean expressions to NAND, NOR Logic and Vice versa, NAND and NOR implementation, Product of Sums and Sum of Products, Karnaugh Map method – Two, three, four, five variable K-maps, Don't-Care conditions. Logic Families	12	22	CO2	PO1, PO4	PO2, 1,2,3	PSO1	Ent, SD	G	PE
3	Half Adder, Full Adder, Half and full Subtractor, Binary parallel adder, Adder cum Subtractor, BCD Adder, Magnitude comparator , Encoders & Decoders, Multiplexers–De-multiplexer.	10	20	CO2,CO3	PO2,PO3, PO4, PO5	2,3	PSO1			
4	Basic difference between Combinational logic and Sequential logic, Latches, Flip-Flops: S-R , J-K, D, T, Master Slave flip-flops, Registers, Shift registers , counters, Asynchronous and Synchronous Counters.	12	22	CO2,CO4	PO3, PO4, PO5	1,2,3	PSO1			
5	Memory: Memory in Computer Systems, Types of memory, Organization and operation, Reading & Writing, Semiconductor memory, Flash Memory	8	12	CO5	PO4, PO7	1,2	PSO1			
6	D/A and A/D Converters: Digital to Analog Converters D/A converter Specifications, Types of D/A converters, D/A converter Applications, A/D converters, A/D Converter Specifications, Types of A/D converters, A/D converter Applications	8	12	CO5	PO3,PO4	1,2,3	PSO1			
		58	100							

Reference books:

1	Digital Logic and Computer Design by M Morris Mano, Prentice Hall Publication
2	Digital Principles and Applications by Malvino& Leach , McGraw-Hill Education
3	Modern Digital Electronics by R.P.Jain, Tata McGraw-Hill Education
4	Digital Electronics: Principles and Integrated Circuits by A.K. Maini, Wiley India Publications
5	Fundamentals of Digital circuits by Anand Kumar, Prentice Hall Publication

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POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	Electrical Circuits & Networks (ELE3330)						Lecture Hrs per week	4		
Semester-I							Max marks	100		
Pre-Requisite: Basic Mathematics, Basic Electronics										
CO1	Understand the basics of electrical energy generation,power factor.Understand AC series and parallel circuits,resonance and harmonics.									
CO2	Understand polyphase system and different connections.									
CO3	Understand transients,effects of transients,electro static and electromagnetic transients.									
CO4	Apply basic theorem to solve electrical circuits.									
CO5	Understand vectors and apply arithmetic operations of vectors.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	A.C. wave form, basic terms, associated with a.c. relation between r.m.s. average and maximum value , peak factor and form factor, generation of A.C.sinusoidal e.m.f.voltage and current, relation in circuits consisting of resistance, inductance and capacitance, active and reactive component of power. Reactances, impedances. A.C. series & parallel circuits, power and power factor calculation, resonance in series and parallel circuits, resonant frequency, Harmonics & Complex wave.	26	35	CO1	PO1	1,2,3	PSO1			

2	Polyphase system, generation of two phase, and three phase, three wire and three phase 4 wire systems, balanced and unbalanced system. Relation between line and phase, voltages and currents in star and delta connected 3 phase system power.	6	15	CO2	PO1,PO2	2,3	PSO1	Ent, SD	G	PE
3	Transients in R.C. and R.L. series d.c. Circuits. Time constant, uses of transients unit, Kirchhoff's laws, Mesh analysis, Nodal analysis, Voltage source, Current source, source conversion, Superposition theorem, Thevenin's theorem. Norton's theorems, , maximum power transfer theorem.	20	40	CO3,CO4	PO1,PO2,PO ₃	1,2,3,4,5	PSO1			
4	Vector or phasors rectangular form, and polar form for representing vectors, addition and subtraction, multiplication and division of vector.	2	10	CO5	PO1,PO2	1,2	PSO1			
		54	100							
Reference books:										
1	Electrical Techonology by B.L.Theraja Volume 1.									
2	Electrical Techonology by V.K.Mehta.									

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Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	OFFICE AUTOMATION (CSE3301L)						Lecture Hrs per week	4		
Semester-I							Max marks	50		
Pre-Requisite: Basic Mathematics, Basic computer										
CO1	Introduces the basic features of Microsoft Office, Windows basics, and file management.									
CO2	Identification of software for documentation and computer related work.									
CO3	Develops familiarity with Word, Excel, Access, Visio, PowerPoint, email, and Internet basics.									
CO4	Learn LATEX and their commands for formatting.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1	Formatting of document, hyperlink, bibliography and references, watermark, mail merge	8	16	CO1	PO1	1,2,3	PSO1	Ent, SD	G	PE
2	Formation of worksheets, conditional formatting, formulas and functions, concept of Pivot Table, V Lookup, H-Lookup, insertion of charts and graphs, sorting and filtering of data.	12	22	CO1,CO2	PO1, PO2, PO4	2,3	PSO1			
3	Preparing Presentation, Presentation Templates, Animation and transition , audio and video in PPT, hyperlink , flowchart.	10	22	CO1,CO2	PO2,PO3, PO4, PO5	1,2,3	PSO1			
4	Designing & Creating database, Editing & Modifying a database, Adding & Editing records in a database, Sample database design, forms, query. Use of Visio software, drawing of flow chart, electrical, electronics and logical diagrams.	12	22	CO1,CO3	PO3, PO4, PO5	1,2,3	PSO1			

5	Introduction to latex, comparison with word document, inserting graphics, tables and other facilities of latex.	8	18	CO4	PO4, PO7	1,2,3	PSO1			
		50	100							
Reference books:										
1	Microsoft Office by John Walkenbach									
2	Microsoft Power Point By Faithe Wempen									
3	Microsoft Excel by John Walkenbach									
4	Reference Manual of M.S. Office for Office Automation.									
5	Learning LaTeX by Griffiths									

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POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	Thermal and Water Power Engineering (MEC3307)						Lecture Hrs per week	4		
Semester-I							Max marks	100		
Pre-Requisite: Applied Physics, Applied Mathematics and Applied Chemistry.										
CO1	appreciate basic concept of thermodynamic, thermodynamic processes and laws. Also interpret the properties of steam and analyze the various thermodynamic processes carry out on steam.									
CO2	identify the various types of fuels with its merits and demerits									
CO3	demonstrate various types of boilers, steam turbine and Internal combustion engines. Also they able to compute the performance parameters of boiler and Internal									
CO4	interpret the concept of impact of jet and able to compute force exerted by jet of water on plate in different conditions.									
CO5	identify and solve the problems of hydraulic turbine, pump, hydraulic press, intensifier and accumulator related to their construction, working principles and its practical applications									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Laws of Thermodynamics.	8	12	CO1	PO1, PO2, PO7	1,2	PSO1			
2	Fuels: Solid. liquid and gaseous. Calorific values and their measurements	3	6	CO2	PO1, PO2, PO4, PO5, PO7	1,2	PSO1			

3	Properties of steam, sensible heat, latent heat, Superheat and total heat. Qualities of steam, use of steam tables. Expensive working of steam in an engine cylinder.	7	12	CO1	PO1, PO2, PO3, PO4, PO7	1,2,3	PSO1	Ent, SD	G	PE
4	Boilers: General description & principles of working of smoke tube and water tube boilers. Different types of boilers. Boiler mountings and accessories	6	10	CO3	PO1, PO2, PO3, PO4, PO7	1,2	PSO1			
5	I.C. Engines ideal constant volume and constant pressure cycle of operation. Two and four stroke cycle engines and their comparison. Principles of working of gas, petrol and oil engines.	6	10	CO3	PO1, PO2, PO3, PO4, PO7	1,2,3	PSO1			
6	Reciprocating pumps: Types, Construction and performance.	5	8	CO5	PO1, PO2, PO3, PO4, PO7	1,2	PSO1			
7	Turbines: Impact of jet on plane and curved blades, stationary and moving vanes. Water wheels, impulse and reaction turbines. Efficiency, performance, speed regulation. Selection of turbines for different purpose.	17	28	CO4, CO5	PO1, PO2, PO3, PO4, PO7	1,2,3	PSO1			
8	Centrifugal pumps: Velocity diagrams, vane angles, types including sub-miscible. Single and multistage turbine pumps	5	8	CO5	PO1, PO2, PO3, PO4, PO7	1,2	PSO1			
9	General treatment of hydraulic power transmission.	3	6	CO5	PO1, PO2, PO3, PO4, PO7	1,2	PSO1			
		60	100							

Reference books:

1	Elements of heat engine by Prof R.C. Patel Vol. I & II
2	Hydraulic and hydraulic machine by R. C. Patel
3	Engineering thermodynamics by P. K. Nag
4	Thermal engineering by R. S. Khurmi
5	Hydraulics and Hydraulic Machines – R.S. Khurmi

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POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	DC Machines & Transformer (ELE3425)						Lecture Hrs per week	4		
Semester-II							Max marks	100		
Pre-Requisite: Basic mathematics, Basics of Electrical and magnetic circuits										
CO1	Learn the basic principle of electrical machines.									
CO2	understand the constructional and operational characteristics of DC machines (generator/ motor).									
CO3	evaluate parameters of DC machines with the help of standard test methods.									
CO4	understand the constructional and operational characteristics of AC machines (transformer).									
CO5	evaluate parameters of AC machines with the help of standard test methods.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Energy Conversion Principles :- Explain Laws Of Conservation Of Energy and Role of Electrical Engineering And Its Uses - Electromechanical Energy Conversion Principles And EMF - Singly And Doubly Excited Machines.	4	7	CO1	PO1	1,2,3	PSO1			

2	<p>DC Generators :- Working Principle - Simple Loop Generator - Construction And Materials Used For Various Parts Of DC Machine - Functions of Various Parts - Classification of Different Types of Generators – Emf Equation – Total loss in DC Generator – Power Stages – Condition for Maximum Efficiency - Armature Reaction And Its Effects - Commutation And Ways To Improve Commutation - Uses Of Generators.</p>	6	11	CO1,CO2	PO1,PO2,PO4	1,2,3	PSO1			
3	<p>DC Motors :- Working Principle - Classification of DC Motor - Concept of Back Emf - Voltage Equation of A Motor - Condition For Maximum Power – Torque - Armature Torque - Shaft Torque – Speed - Speed Regulation - Torque And Speed Of A DC Motor –Power Stages - Need Of DC Motor Starters - Construction And Working Of Motor Starters - Three Point Starter - Four Point Starter - Performance Characteristics Of DC Shunt DC Series DC Compound Motors - Speed Control Of DC Motors (Series And Shunt) Field Control Method - Armature Control Method - Series Parallel Control - Applications Of DC Shunt DC Series DC Compound Motors – Examples.</p>	14	25	CO2, CO3	PO2,PO3,PO4	1,2,3	PSO1			
4	<p>Testing Of DC Machines :- Swinburne’s Test</p>	2	3	CO3	PO4	2,3	PSO1	Ent, SD	G	PE

5	<p>Transformers :- Single Phase Transformer Construction - Working Principle - Materials Used For Different Parts - Core And Shell Type Of Transformers - Elementary Theory Of An Ideal Transformer - EMF Equation And Transformation Ratio - Transformer On No Load - Transformer On Load - Transformer With Winding Resistance But No Magnetic Leakage - Magnetic Leakage - Transformer With Resistance And Leakage Reactance - Exact Voltage Drop - Equivalent Circuit - Transformer Tests: Open Circuit ,Short Circuit - Sumpner's Back To Back Test - Losses In A Transformer - Iron Loss (Hysteresis And Eddy Current Loss) - Copper Losses - Percentage Resistance, Reactance And Impedance - Efficiency And Condition For Maximum Efficiency - All Day Efficiency - Voltage Regulation - Parallel Operation: Need, Necessary And Desirable Conditions For Parallel Operation - Construction And Working Of Auto Transformer.</p>	20	36	CO1,CO4,CO5	PO1,PO2,PO3,PO4	1,2,3	PSO1			
6	<p>Poly Phase Transformers :- Comparison Of 3 Phase Transformer With Bank Of 3 Single Phase Transformer - Arrangement Of Core And Windings In Transformer - Construction And Accessories Of 3 Phase Transformer (In Brief):Main Tank, Bushings, Conservator With Breather, Oil Level Gauge, Radiators, Tap Changer (On Load And Off Load), Buchholz Relay, Explosion Vent, Temperature Indicators, Junction Box - Star Delta Connections And Vector Groups – Delta Star Connection - Transformer Rating.</p>	10	18	CO4,CO5	PO1,PO5	1,2,3	PSO1			
		56	100							
Reference books:										
1	Electrical Technology Vol II By B.L.Theraja, S.Chand									
2	Electric Machines by Ashfaq Husain, Dhanpat Rai & Co.									
3	Electrical Machines By J.B.Gupta, S.K. Kataria & Sons									
4	Electrical Machines By P.S. Bhimra Khanna Publishers									
5	Electrical Machines By Nagrath And Kothari, Tata McGraw Hill Education									
6	Electrical Technology By H.Cotton, Pitman London									

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POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	Electrical & Electronics Workshop (ELE3429)						Lecture Hrs per week	4		
Semester-II							Max marks	50		
Pre-Requisite: Basic Electrical, Basic Electronics										
CO1	perform installation of electrical and electronic appliances.									
CO2	learn troubleshooting of single phase machine.									
CO3	Learn specification of electrical and electronic appliances.									
CO4	prepare PCB and mounting of electronic components for minor project									
CO5	Testing and troubleshooting of Minor Project.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1	1.Fabrication / Rewinding of No Volt Coil (NVC) 2. Earthing of Electrical Machines / Equipments 3. Rewinding of Ceiling Fan 4. Rewinding of AC / DC Motor 5. Troubleshooting of Tube Light 6. Troubleshooting of Electric Iron 7. Troubleshooting of Mixer – Grinder	28	25	CO1,CO2,CO3	PO5,PO6,PO7	1,2	PSO1,PSO2			

2	1. Making of Small Electronic Circuit 2. Making of an Experimental Board 3. Preparation of Useful Charts For Laboratory 4. Learning of Schematic Design on PC Software 5. Learning of PCB Layout Design on PC Software 6. PCB Manufacturing 7. Repairing of Electronic Appliance – Power Supply, Multi-Meter, CRO etc...	28	25	CO3,CO4,CO5	PO2,PO3,PO4,PO5,PO6,PO7	1,2	PSO1,PSO2	Ent, SD	G	PE
		56	50							
Reference books:										
1	Workshop Practice In Electrical Engineering By M.L.Gupta, Metro Politan Book Amp.									
2	Study Of Electrical Appliances And Devices By K.B.Bhatia, Jain Book Agency									
3	Electronics Materials & Components: Grover &Jamwal, Galgotia Publications									
4	Electronics Devices and Circuits By J.B.Gupta, Katson Education Series									
5	Project Book, VegaKit									

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POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	Electrical Installation & Maintenance (ELE3426)							Lecture Hrs per week	4	
Semester-II								Max marks	100	
Pre-Requisite: Basic mathematics, Basics of Electrical and magnetic circuits										
CO1	Apply practical aspects of electrical Tools, Accessories and Installation of Electrical Equipment.									
CO2	Comprehend necessity of earthing, different methods of Earthing and Grounding.									
CO3	Develop realistic maintenance strategies for electrical wiring systems									
CO4	Explain the different types of Maintenance, maintenance in various electrical equipments, electrical machines.									
CO5	Describe the Troubleshooting of various electrical appliances, equipments and electrical machines.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1	Installation of Electrical Equipment:- What is Electrical Installation, Describe the planning before unloading of heavy electrical equipments at site. Select appropriate tools for installation of electrical equipment, Explain the procedure for handling, inspection, storage and installation of static and rotating electrical equipment. Foundation of electrical equipment at site Alignment of electrical machines, Tools/Instruments necessary for installation	8	14	CO1	PO1,PO4	2,3	PSO1			

2	<p>Electric Earthing and Shock: -Need for earthing and different methods of earthing(plate earthing, pipeearthing, etc.), Various methods of measuring the earth resistance</p> <p>Comparison between equipment earthing and system grounding, Advantage of neutral earthing of generator in power station.</p> <p>Earthing procedure in different types of electrical installations</p> <p>Earthing in extra high voltage and underground cable, Maximum permissible resistance of the earthing system. Measurement of earth resistance: voltmeter-ammeter method, earth tester method, ohm meter method and earth loop tester method</p> <p>Earthing procedure - Building installation, Domestic appliances, Industrial premises, Earthing of substation, generating station and overhead line.</p>	10	16	CO2	PO4,PO5	2,3	PSO1			
3	<p>Internal Wiring Systems and Lamp Circuits: - Electric Shock, Cure of Electrical Shocks, Artificial Respiration, Precautions against Shock. Wiring Systems: Looping in System, Tree System, Ring System, Lamp Circuits, Simple circuits, Series Parallel Circuits, Master Switch Circuits, Fluorescent Tube Lighting, Stair case wiring, go down wiring</p> <p>Master ON wiring, Master OFF wiring, Variable master control.</p>	10	18	CO3	PO4,PO5	2,3	PSO1			
4	<p>Type and Installation of Wiring System: - Introduction, Methods of Installing Wiring, Cleat Wiring, Wooden Casing and Capping, Joints in Casing and Capping, Tough Rubber Sheathed Wiring, Metal Sheathed Wiring Metal Conduit Wiring.</p> <p>Different Types of Joint : -</p> <p>Married Joint, Western Union Splice Tap Joint, Tap Joint for Stranded Wires, Pigtail Joint ,Pigtail Joint of a solid conductor and flexible wire.</p>	10	14	CO3	PO4,PO5	2,3	PSO1	Ent, SD	G	PE

5	<p>Maintenance of Electrical Equipment: - Defination of Maintenance, Different types of maintenance , Need and different types of maintenances: Preventive maintenance: need, classification, advantages, activities Breakdown maintenance: concept, advantages, activities Reason for failure of electrical equipment due to poor maintenance Factors for preparing maintenance schedule Prepare maintenance schedule of different equipment Maintenance schedule of transformer below and above 1000kVA Maintenance schedule -induction motor, circuit Breaker, overhead line, storage Battery Probable faults due to poor maintenance in transformer, induction motor, circuit breaker, overhead lines and battery</p>	10	18	CO4	PO4,PO5,PO7	2,3	PSO1			
6	<p>Troubleshooting: - Various internal and external faults that occur in electrical equipment Common troubles in various electrical equipment and machines (DC Machines, AC Machines, Transformers, Circuit-breaker, underground cable, etc...) Instruments and tools for trouble shooting. Trouble shooting chart for various electrical equipment, machines and domestic appliances. Motor, DC Generator, Transformer, Synchronous Motor, Induction Motor, Circuit-breaker. Trouble shooting chart for Domestic appliances-electrical iron, ceiling fan, Washing machine, Air cooler, Vacuumcleaner, Fluorescent tube light: Construction, working and troubleshooting chart.</p>	8	20	CO5	PO4,PO5,PO7	2,3	PSO1			
		56	100							
Reference books:										
1	E.W.Golding – Electrical measurement and measuring instruments.									
2	Measurements C.T.Baldwin – Methods of electrical.									
3	B.L.Theraja – Vol I & Vol -2									
4	Electrical measurement & measuring instruments by A. K. Sawney									
5	Electrical Estimating & Costing by S.L.Uppal.									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2022 -2023			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	ELECTRICAL MEASURING INSTRUMENTS (ELE3427)						Lecture Hrs per week	4		
Semester-II							Max marks	100		
Pre-Requisite: Basic of Electrical Circuits & Networks										
CO1	Describe the construction and working principle of various measuring instruments.									
CO2	Identify various types of electronic instrument suitable for specific measurements and types of errors.									
CO3	Study of special purpose meters for electrical measurements									
CO4	Comprehend DC potentiometer and its applications.									
CO5	Learn measurements of Resistance, Inductance, Capacitance & Three phase power.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Classification of Instruments indicating integrating & recording types. Deflecting, controlling & damping forces in the instruments, Errors in measurement, characteristics of instruments and measurements.	4	8	CO1	PO1, PO2	1,2	PSO 1			
2	Permanent magnets moving coil, ammeters, voltmeters and their errors.	4	8	CO1,CO2	PO2, PO4	2,3	PSO 1			
3	Moving iron ammeters, voltmeters and their errors.	4	8	CO1,CO2	PO2, PO4	2,3	PSO 1			
4	Electrodynamic ammeters, voltmeters, and wattmeter-single phase and three phase and their errors.	4	8	CO2,CO3	PO2, PO4	2,3	PSO 1			

5	Induction type ammeters, voltmeters, wattmeters and their errors.	4	8	CO2,CO3	PO2, PO4	2,3	PSO 1	Ent, SD	G	PE			
6	Thermal type ammeters and voltmeters.	4	8	CO2, CO3	PO2, PO4	2,3	PSO 1						
7	Electrostatic type voltmeters and wattmeters.	4	8	CO3	PO2, PO4	2,3	PSO 1						
8	Rectifier type ammeters and voltmeters.	4	6	CO3	PO2, PO4	2,3	PSO 1						
9	Multimeter & calculation of series & shunt resistance.	4	6	CO3	PO2, PO4	2,3	PSO 1						
10	AC Energy meter single phase & Three phase. Calibration of these meters by rotor substandard and substandard Wattmeter with stop clock. Various adjustment in these meters, Digital Meters	4	6	CO2,CO3	PO5	1,2,3	PSO 1						
11	Frequency meters, power factor meters, Synchrosopes, trivector meter, Meggar, Peak voltmeter and a simple description of recording instruments.	8	14	CO2,CO3	PO2, PO4	1,2	PSO 1						
12	D.C. Potentiometer, Calibration of Ammeter and Calibration of voltmeter using D.C. potentiometer.	4	6	CO4	PO2	1,2	PSO 1						
13	Measurement of three phase power, Measurement of resistance inductance and capacitance	4	6	CO5	PO2,PO5	1,2,3	PSO 1						
		56	100										
Reference books:													
1	E W Golding - Electrical measurements and measuring instruments												
2	Measurements C T Baldwin - Methods of electrical												
3	B L Theraja - Vol 1												
4	Electrical Measuremnts & Measuring Instruments by A K Sawney												

The Maharaja Sayajirao University of Baroda								ACADEMIC YEAR 2022 -2023		
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -II	Microprocessor & Microcontroller (ELE3428)							Lecture Hrs per week	4	
Semester-II								Max marks	100	
Pre-Requisite: Mathematics, Basics of Digital Electronics										
CO1	Understand the basic element, architecture and functions of 8085 Microprocessor.									
CO2	Learn machine language format, addressing modes and operations with various types of instructions to solve programs.									
CO3	Illustrate peripheral interface with Intel 8085.									
CO4	Understand the basic element, architecture, Instruction set and functions of 8051 Microcontroller.									
CO5	Illustrate peripherals and functions of peripheral ICs with 8051, programs for 8051 using C Language.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1	Introduction To Intel 8085 Microprocessor :- Evolution of Microprocessors - Terminology Used In Microprocessors: Hardware, Software, Firmware, Bus, Address Bus, Data Bus & Control Bus - 8085 Microprocessor Architecture: ALU, T&C Unit, Buses, Signals, Registers and Flags - 8085 Pin Configuration & Function of Each Pin - Fetch, Decode and Execute Operations. Op-Code Fetch & Execute Cycle, T State, Machine Cycle - Memory & I/O Read and Write Cycles.	8	15	CO1,CO3	PO1, PO4	1,2	PSO1			

2	Intel 8085 Microprocessor Instruction Set and Programming :- Addressing Modes of 8085 - Instruction Set of 8085: Data Transfer, Arithmetic, Logical, Branch & Call and Stack, IO & Machine Control Instructions - Development of 8085 Assembly Language Programs - 8085 Interrupts - Assembly Language Programs.	8	15	CO1,CO2	PO2, PO3	1,2	PSO1	Ent, SD	G	PE
3	External Memory Interface with Intel 8085 :- Memory Mapped I/O and I/O Mapped I/O - Address Decoding, Interfacing of Memory Chips with 8085.	6	10	CO3	PO1, PO3	1,2	PSO2			
4	Peripheral ICs and Applications :- Block Diagram, Pin Description and Interfacing of 8255(PPI) & 8253(PIT) with 8085 Microprocessor - Interfacing of LEDs, Keys, 7-Seg Display. Interfacing of other ICs with 8085 Microprocessor.	6	10	CO1, CO3	PO1, PO3, PO5	1,2	PSO2			
5	Introduction To Intel 8051 Microcontroller :- Comparison of Microprocessor and Microcontroller - Comparison of Machine Language, Assembly Language & High Level Language - 8051 Microcontroller Architecture: Functions of Each Block, ALU, T&C Unit, Buses, Signals, Flags, ROM/Flash and RAM - RAM Organization: General Purpose Registers and Bit Addressable Registers - Special Function Registers: Program Counter, Stack Pointer, PSW and DPTR - On Chip Peripherals: Timer/Counter, Serial Port, Interrupt Handler - Oscillator and Clock: Clock Cycle, State, Machine Cycle, Instruction Cycle, Reset, Power On Reset(Basic Interrupts) – 8051 Pin Configuration & Function of Each Pin - Overview of 8051 Family.	6	10	CO4	PO1, PO7	1,2	PSO1			
6	Intel 8051 Microcontroller Instruction Set and Programming :- Addressing Modes of 8051 - Instruction Set of 8051: Data Transfer, Arithmetic, Logical, Branching/Looping and Bit Manipulation Instructions - Programming Model of 8051 - Basic Assembly Language Programs.	8	15	CO4	PO3, PO4	1,2	PSO1			
7	Introduction To Program Development Tools (IDE) :- Concept of IDE, Editor, Assembler, Compiler, Linker, Simulator and Debugger - Basics of C Language, Example Programs In C Language.	6	10	CO5	PO1, PO4	1,2,3	PSO1			
8	Applications and Design of Microcontroller Based Systems :- Interfacing of LEDs, 7-Seg Display, LCD, Switches, Converters, Relays, Motor - Programs In C Language.	8	15	CO4,CO5	PO2, PO5	1,2,3	PSO2			
		56	100							

Reference books:

1	Digital principles and applications by Malvino Leach.
2	Digital computers fundamental by T.C. Bartee.
3	8085 Microprocessor by B.Ram
4	8085 microprocessor by Gaonkar

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024				
POLYTECHNIC											
Department of Electrical Engineering											
Diploma in Electrical Engineering: Regular (Grant-in aid)											
Year -III	AC ROTATING MACHINES (ELE3623)						Lecture Hrs per week	4			
Semester-I							Max marks	100			
Pre-Requisite: Basic mathematics, Basics of Electrical and magnetic circuits											
CO1	Learn production of 3-phase rotating magnetic field.										
CO2	Understand construction and working principle of Induction Motor.										
CO3	Acquire knowledge of various speed control methods of Induction motor										
CO4	Explain the construction, working principle and application of AC Generator										
CO5	Describe the construction, working principle and application of synchronous motor.										
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation										
COURSE CONTENT / SYLLABUS											
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)	

1	<p>Poly Phase Induction Motor :- Classification Of A C Motors - Advantages and Disadvantages - Construction: Stator and Rotor Types: Squirrel Cage, Phase Wound Rotor- Production Of Rotating Magnetic Field (Mathematical Proof) - Why Does The Rotor Rotate – Slip - Frequency Of Rotor Current - Relation Between Torque And Rotor Power Factor - Starting Torque Of A Squirrel Cage Induction Motor - Starting Torque Of A Slip Ring Motor - Condition For Maximum Starting Torque - Effect Of Change In Supply Voltage On Starting Torque - Rotor E.M.F And Reactance Under Running Conditions - Torque Under Running Conditions - Condition For Maximum Torque Under Running Conditions - Relation Between Torque And Slip - Full Load And Maximum Torque - Starting Torque And Maximum Torque - Measurement Of Slip - Power Stages In An Induction Motor - Torque Developed By An Induction Motor - Torque, Mechanical Output And Rotor Output - Induction Motor Torque Equation - Synchronous Watt - Variations In Rotor Current - Induction Motor As Generalized Transformer - Rotor Output - Equivalent Circuit Of The Rotor - Equivalent Circuit Of An Induction Motor - No Load Test - Blocked Rotor Test - Construction Of The Circle Diagram - Maximum Quantities - Starting Of Induction Motors: Primary Resistor Starter, DOL Starter, Star Delta Starter, Auto Transformer Starter, Rotor Resistor Starter- Crawling - Cogging Or Magnetic Locking - Double Squirrel Cage Motor - Equivalent Circuit Of Double Squirrel Cage Motor - Speed Control Of Induction Motor: Control From Stator Side, Control From Rotor Side - Induction Motor Applications.</p>	24	42	CO1,CO2, CO3	PO1,PO4 , PO7	1,2,3	PSO1			
2	<p>3 Phase Alternators :- Working Principle - Stationary Armature - Details Of Construction: Salient, Cylindrical - Damper Windings - Speed And Frequency - Short Pitch Winding - Distribution Or Breadth Factor - Equation Of Induced EMF - Effect Of Harmonics On Pitch And Distribution Factors - Factors Affecting Alternator Size - Alternator On Load - Synchronous Reactance - Vector Diagrams Of A Loaded Alternator - Voltage Regulation - Determination Of Voltage Regulation: Synchronous Impedance Method, Zero Power Factor Or Potier Method (Brief) - Parallel Operation Of Alternators (Brief) - Synchronizing Of Alternators.</p>	16	29	CO4	PO1, PO4,PO7	1,2,3	PSO1	Ent, SD	G	PE

3	3 Phase Synchronous Motors :- Synchronous Motor-General - Principle Of Operation - Methods Of Starting - Motor On Load With Constant Excitation - Power Flow Within A Synchronous Motor - Power Developed By A Synchronous Motor - Two Reactance Concept For Salient Pole Synchronous Motor - Stability And Maximum Load Angle - Synchronous Motor With Different Excitations - Effect Of Increased Load With Constant Excitation - Effect Of Changing Excitation On Constant Load - Different Types Torques Of A Synchronous Motor - Effect Of Excitation On Armature Current And Power Factor - Hunting Or Surging Or Phase Swinging –Methods of Starting - Synchronous Motor Ratings - Comparison Between Synchronous And Induction Motor - Synchronous Motor Applications.	16	29	CO5	PO1, PO4,PO7	1,2,3	PSO1			
		56	100							
Reference books:										
1	Electrical Technology Vol II By B.L.Theraja, S.Chand									
2	Electric Machines by Ashfaq Husain, Dhanpat Rai & Co.									
3	Electrical Machines By J.B.Gupta, S.K. Kataria & Sons									
4	Electrical Machines By P.S. Bhimra Khanna Publishers									
5	Electrical Machines By Nagrath And Kothari, Tata McGraw Hill Education									
6	Electrical Technology By H.Cotton, Pitman London									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	ELECTRICAL AND ELECTRONICS COMPUTER AIDED DRAWING (TWPV) (ELE3517L)						Lecture Hrs per week	4		
Semester-I							Max marks	50		
Pre-Requisite: Basic Mathematics, Basic Electronics, Electrical										
CO1	Learn the autocad software and learn basics of EECAD drawings.									
CO2	Learn the various commands of it.									
CO3	Learn the dimensioning and text editing in drawings and use of ready made blocks.									
CO4	Create technical drawings of machines.									
CO5	Create power plant design, power electronics circuit using commands and readymade blocks.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV) and Professional Ethics (PE)
1	Introduction to Computer Aided Drawing :- Familiarizing various coordinate systems and commands used in any standard drafting software - Drawing of lines, circle, polygon, arc, ellipse etc	4	20	CO1,CO2	PO1,PO4	1,2	PSO1	Ent, SD	G	PE
2	Creating 2D Drawings :- Transformations Commands: move, copy, rotate, scale, mirror, offset and array, trim, extend, fillet, chamfer. Dimensioning and text editing - Exercises on basic drafting principles - To create technical drawings	4	20	CO2,CO3	PO2,PO3	1,2	PSO1			

3	Drawing of Various Sheets using AutoCAD :- Sheet I - Electrical and Electronic Symbols Sheet II -Design of thermal power plant. Sheet III – Design of 3 phase 4 pole,24 slots Alternator winding. Sheet IV – Design of 132 KV Gotri substation. Sheet V – Design of SCR firing circuit using UJT. Sheet VI – Design of interfacing of 8085 with 8255. Sheet VII – Design of 3 point starter and star-delta starter.	40	60	CO2,CO3,CO 4,CO5	PO2,PO5	1,2,3,5	PSO1			
		48	100							
Reference books:										
1	An Introduction to CAD Using CADKEY By Hugh F. Keedy									
2	Mastering AutoCAD 2015 and AutoCAD LT 2015 By George Omura									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2022 -2023			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	Electronics Instrumentation and Control (ELE3513)						Lecture Hrs per week	4		
Semester-I							Max marks	100		
Pre-Requisite: Digital electronics, Mathematics, physics, and basics of electrical and electronics engineering										
CO1	Identify the distinct measurement method and errors associated with measurement									
CO2	Learn data acquisition system instrumentation.									
CO3	Recognize the working of various pressure instruments and equipments used for the measurement of non electrical engineering parameters in industry									
CO4	Outline various control system in instrumentation, its application of P, PI, PID control									
CO5	Learn PLC, and DCS system and applications in specific area.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	BASIC CONCEPTS AND QUALITIES OF MEASUREMENTS Measurements and its aim, The functional elements of an Instruments, Performance characteristics, static and dynamic errors Statistical analysis, Instrumentation Amplifier.	6	10	CO1	PO1,PO4	1,2	PSO1			
2	ACTIVE AND PASSIVE TRANSDUCERS Analog and Digital mode of operation, Null deflection methods, ADC, DAC. Transducers as input element instrumentation system,	8	15	CO1,CO2	PO1, PO4	1,2,3	PSO1			
3	MEASUREMENT OF NON ELECTRICAL QUANTITIES Pressure, temperature, distance, weight, flow, speed etc	12	25	CO3	PO1	1	PSO1			

4	CONTROL SYSTEM AND MATHEMATICAL MODELING Types of control systems, Concepts of Transfer Function, Automatic Control system	2	5	CO4	PO3, PO4	2,3	PSO1	EMP/ENT/ SD	G	PE
5	PROCESSES CONTROL SYSTEM Introduction of control system like continuous control system, Discontinuous control system, Artificial control system, Open loop, closed loop-P,I,D, PI,P&D, Electronics circuit of controller, Servo controls, Regulatory control, Distributed control systems.	14	25	CO4	PO1,PO7	1,2,3	PSO1			
6	PLC, DCS & SCADA Introduction of PLC, Operation of PLC, Basic Input/ Output Devises used for the Process Control, Concept of Ladder Logic using NO and NC contacts, Concept of Latching, Application development based on Timers and Counters, Application of PLC, Concept of DCS System, SCADA..	12	20	CO5	PO1,PO7	2,3	PSO1			
		54	100							
Reference books:										
1	Industrial Instrumentation and control S.K. Singh Tata McGrew Hill									
2	Instrumentation and control Agrawal									
3	Electronics Instrumentation by H.S Kalsi									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024				
POLYTECHNIC											
Department of Electrical Engineering											
Diploma in Electrical Engineering: Regular (Grant-in aid)											
Year -III	ELECTRICAL POWER ENGINEERING-I (ELE3515)						Lecture Hrs per week	4			
Semester-I							Max marks	100			
Pre-Requisite: Basic Electrical, Electrical Machine											
CO1	Understand the different power generation methods.										
CO2	Illustrate the terms and factors of electrical power system.										
CO3	Find the various technical parameters/materials based on the requirement of the transmission/distribution system										
CO4	Learn the fault analysis and calculations for transmission line.										
CO5	Understand the specifications and requirements of underground cabling for transmission line .										
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation										
COURSE CONTENT / SYLLABUS											
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)	
1	Methods of generation of electrical power, effect of power generation in the economy of a country, General features, essential equipments, layout of hydro, diesel and nuclear power station. Station auxiliaries such as coal handling plant, cooling water plant, water softening plant, Fuel pump air compressor. Battery room, cooling towers, choice of power plant, Solar energy, Wind energy, Diesel power plant, Combined cycle power plant.	10	20	CO1	PO1,PO5	1,2,3	PSO1				

2	Estimation load, Load curve, load duration curve, Load factor, diversity factor, plant capacity factor. Utilization factor. Maximum demand, their effects on cost of generation, base load and peak load station, selection of units and operation schedule from load curve. Inter connection of power station.	6	6	CO2	PO1,PO2, PO5	2,3	PSO1	Emp, Ent, SD	G	PE
3	Systems of transmission, comparison of supply system, choice of voltage, conductors size and material, types of conductors, types of supports, construction of overhead line, sag calculation for equilevel support. Effect of wind and ice on the sag. Use sag template and sag chart.	8	18	CO3	PO2,PO5	1,2,3	PSO1, PSO2			
4	Type and construction features of insulators, voltages distribution across the units of suspension type insulators, string efficiency, methods of increasing the string efficiency, arcing horn and grading ring.	12	16	CO3	PO2,PO5	1,2	PSO1, PSO2			
5	Short transmission line : Regulation, efficiency losses, sending end power factor, sending end voltage with given receiving end condition. Effect of higher p.f. and higher voltage on regulation, efficiency of transmission line, comparison of over head and under ground lines. Calculations of induction & capacitance for simple arrangement with symmetrical spacing.	8	16	CO5	PO2,PO3, PO4	2,3	PSO1, PSO2			
6	Short circuit KVA calculation in simple circuit, ohmic and percentage rating of reactors. Methods of limiting the short circuit current, use and location of reactors.	6	12	CO4	PO1,PO2	1,2,3	PSO1, PSO2			
7	Principle voltage control : Tap changing transformer, booster transformer, induction regulation, synchronous condenser, corona skin effect. Types and construction of cables. Methods of laying the cable, method of location of faults in the underground line.	6	12	CO4	PO5,PO7	1,2,3	PSO1, PSO2			
		56	100							
Reference books:										
1	Bckett - Generation and transmission.									
2	Soni, Bhatnager and Gupta- A course in Electrical power									
3	S. D. Uppal – Electrical Power.									
4	H. Cotton – Electrical Transmission and distribution									
5	B. L. Mathur- Electrical Power.									
6	V.K. Mehta – Electrical Power System.									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	Embedded Systems (ELE3516)						Lecture Hrs per week	4		
Semester-I							Max marks	100		
Pre-Requisite: Basic Mathematics, Basics of Electronics and Electrical Engineering, Microprocessor, Microcontroller										
CO1	Learn the basics of Embeddes system, types of microprocessors and Microcontrollers for Embedded System									
CO2	Acquire knowledge of arduino architecture , Peripherals and its interfacing.									
CO3	Learn arduino programming and basics of Python programming.									
CO4	Implementing mini Projects using Arduino Uno & Raspberry Pi Boards.									
CO5	Understand Computers Architecture, Configuration, Memories, and I/O Devices.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employabil ity (Emp)/ Entreprene urship (Ent)/ Skill Developme nt (SD)	Relevance to Local (L)/ National (N)/ Regional(R) /Global (G)	Relation to Gender (G), Environme nt and Sustainabili ty (ES), Human Values (HV)and Professiona l Ethics (PE)
1	Introduction: Introduction to Embedded system - Understanding Embedded System - Different types of Microprocessors & Microcontrollers.	2	10	CO1	PO1	1,2	PSO1			

2	<p>Arduino: Introduction to Arduino - Pin Configuration and Architecture. - Device and Platform Features. - Concept of Digital and Analog Ports. - Familiarizing with Arduino Interfacing Boards - Introduction to Embedded C and Arduino Platform. Basic Programming.</p>	14	25	CO2, CO3, CO4	PO1, PO4,PO6	1,2,3	PSO1,PSO2	Emp, Ent, SD	G	PE
3	<p>Raspberry Pi: Introduction to Raspberry Pi - What is SOC? - Versions of Raspberry Pi & their Difference - Block Diagram & Pin Configuration. OS Installation - Configuration - Pi over VNC - Introduction to Python - Basic Programming in Python - Interfacing Peripherals & their Programming, IoT.</p>	20	25	CO2, CO3, CO4	PO1, PO4,PO6	1,2,3	PSO1, PSO2			
4	<p>Personal Computer: Basics of Computer - Organization of Computer - Software and Hardware. - BIOS - OS Installation. Computer Hardware Components: Mother Board and Mother Board Components, CPU, Primary Memories, Secondary Memories, SMPS. Input Devices: Keyboard, Mouse, Scanners etc. Output Devices: Monitor, Printer, Plotters etc.</p>	20	40	CO5	PO4, PO5,PO7	1,2,3	PSO1			
		56	100							
Reference books:										
1	Programming Arduino Getting Started with Sketches By Dr. Simon Monk									
2	Raspberry Pi Cookbook By Dr. Simon Monk									
3	Modern Computer Hardware By Manahar Lotia									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	ENERGY CONSERVATION & AUDIT (ELE3627)						Lecture Hrs per week	4		
Semester-II							Max marks	100		
Pre-Requisite: Basic knowledge of electrical machines & electrical maintenance.										
CO1	Define different energies, energy act, energy audit & activities									
CO2	Express energy action planning, project management & energy monitoring									
CO3	Describe energy efficiency motors and their factors									
CO4	Basic terms in lighting system & illumination electrical sources									
CO5	Explanation of different energy efficient technologies for electrical system.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Energy Definition of Energy - Primary & Secondary Energy - Commercial & Noncommercial Energy - Renewable & Nonrenewable Energy - Various Forms of Energy: Potential Energy & Kinetic Energy - Energy Conservation - Grades of Energy - Energy Units - Sector wise Energy Consumption in India - Per Capita Energy Consumption in India - Electricity Act 2003 & Its Salient Features - Energy & Environment (in Brief)	8	14	CO1	PO1, PO5		PSO1			

2	Energy Conservation Energy Management: Definition & Objectives - Energy Audit: Types & Methodology - Need for Energy Audit - Types of Energy Audit - Preliminary Energy Audit Methodology - Detailed Energy Audit Methodology: Phase I Pre Audit Phase Activities, Phase II Detailed Energy Audit Activities, Identification of Energy Conservation Opportunities, Classification of Energy Conservation Measures - Understanding Energy Costs - Benchmarking & Energy Performance - Matching Energy Usage to Environment - Maximizing System Efficiency - Fuel & Energy Substitution - Energy Audit Instrument	10	19	CO1	PO2, PO3, PO5, PO6, PO7		PSO1			
3	Energy Management & Audit Material & Energy Balance: Introduction & Basic Principle - Energy Action Planning: Introduction, Energy Management System - Financial Management: Introduction, Financial Analysis - Project Management: Introduction, Steps in Project Management (List), Project Definition & Scope - Energy Monitoring & Targeting: Definition, Elements of Monitoring & Targeting System - Global Environmental Issues	10	19	CO2	PO2, PO3, PO4, PO7	1,2,3	PSO1	Ent, SD	G	PE
4	Energy Efficiency In Electric Motors Motor Selection - Factors Affecting Energy Efficiency & Minimizing Motor Losses in Operation - Rewinding effect on Energy Efficiency - Speed Control of AC Induction Motors - Motor Load Survey: Methodology	8	14	CO3	PO1, PO3, PO4,		PSO1			
5	Energy Efficiency in Lighting System Efficient Replacement Options, Energy Saving Potential in Street Lighting - Some Good Practices in Lighting, Basic Terms in Lighting System & Features - Lamp Types & Their Features - Recommended Luminance Levels for Various Tasks / Activities / Locations - Methodology of Lighting System Energy Efficiency Study - Case Examples: - Electronic Ballast - Energy Efficient Lighting Controls	10	19	CO4	PO1, PO2, PO3, PO4, PO7		PSO1			

6	Energy Efficient Technologies in Electrical Systems Maximum Demand Controllers - Automatic Power Factor Controllers - Energy Efficient Motors - Soft Starter - Variable Speed Drives - Energy Efficient Transformers, Amorphous Transformers, Epoxy Resin Cast / Encapsulated Dry Type Transformer	8	15	CO5	PO1, PO3, PO4	PSO1			
		54	100						
Reference books:									
1	Power Electronics by M.H Rashid								
2	Power Electronics By M.D.Singh								
3	Semiconductor Physics By Ned Mohan								
4	Generation Distribution & Utilization of Electrical Energy By C.L.Wadhwa New Academic Science								
5	Efficient Use & Management of Electricity in Industry By B.G.Deasi, J.S.Rana, R.Paraman, A.V.Dinesh, Devki R&D Engineers								

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	ELECTRONIC COMMUNICATION ENGINEERING (ELE3626)						Lecture Hrs per week	4		
Semester-II							Max marks	100		
Pre-Requisite: Basic Mathematics, Basic Electronics										
CO1	Process basic information using various modulation techniques in communication system with different types of mediums.									
CO2	Understand the working of transmitters, receivers, importance of receivers.									
CO3	Describe the multiplexing processes, propagation of waves in different media, Digital Communication Techniques.									
CO4	Develop the ability to compare the strengths and weaknesses of various communication systems, Mobile communication system.									
CO5	Understand the concept of data communication, network topologies and terminologies.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Simplex, Half Duplex, Full Duplex Communication, Block Schematic of general communication system, Baseband and broadband signals, concept of Modulation, Need of Modulation, Bandwidth, types of modulation	6	10	CO1	PO1	1,2	PSO1			
2	Amplitude Modulation: Expression of AM signal, modulation index, Average power of AM, AM in time domain and Frequency Domain, Generation of AM, AM Transmitters, AM receivers, Characteristics of Radio Receivers, AM Demodulation, SSB Modulation Demodulation, DSB Modulation and Demodulation. Frequency modulation demodulation, Phase modulation Demodulation	12	20	CO2	PO1,PO4	1,2,3	PSO1			

3	Channel Multiplexing, Radio wave Propagation: ground wave, sky wave, line of sight propagation, Optical Communication, Power Line Carrier Communication.	12	20	CO3	PO1, PO4	1,2,3	PSO1	Ent, SD	G	PE
4	Digital Transmission PCM, Delta modulation, Adaptive Delta modulation, Digital modulation techniques, Satellite Communication, microwave communication.	8	13	CO3	PO2, PO7	1,2,3	PSO1			
5	Telephonic systems, Wireless communication concept, GSM architecture Mobile communication: Concept of cellular communication, cell fundamentals, frequency reuse concept, co-channel and adjacent channel interference, various mechanism for capacity increase, Roaming and handoff	10	17	CO4	PO1, PO4, PO7	1,2,3	PSO1			
6	Data Communication: Introduction to data communication, computer network, Network topologies, bus topologies, types of networks, Protocols, TCP-IP model, OSI model, IEEE standards.	12	20	CO5	PO1, PO5	1,2	PSO1			
		60	100							

Reference books:

1	Electronic Communications System: Fundamentals Through Advanced, 5e By Tomasi
2	Communication system by Sanjay Sharma
3	Data Communications and Networking By forouzan
4	Data and Computer Communications by W Stallings
5	Satellite Communications, Fourth Edition By Dennis Roddy

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	ELECTRICAL POWER ENGINEERING-II (ELE3624)						Lecture Hrs per week	4		
Semester-II							Max marks	100		
Pre-Requisite: Basic Electrical, Electrical Machine										
CO1	Understand the basic of transmission and distribution.									
CO2	Preparation of Electricity bill with different tariff to reduce energy cost using power factor and load factor.									
CO3	Study of various Power factor improvement methods.									
CO4	To impart the knowledge of various Electric heating, Electric welding and To make students capable to identify various illumination scheme.									
CO5	Understand the concept of traction, movement of train, speed control and breaking									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employabil ity (Emp)/ Entreprene urship (Ent)/ Skill Developme nt (SD)	Relevance to Local (L)/ National (N)/ Regional(R)Global (G)	Relation to Gender (G), Environme nt and Sustainabili ty (ES), Human Values (HV)and Professiona l Ethics (PE)
1	Difference between transmission and Distribution. Distributors, Feeder, Service mains. Calculation of voltage drop in distribution feed from both ends with equal and unequal voltages with concentric load and uniform distributed load. Ring main distributor. Voltage drop calculation in A.C distribution.	14	24	CO1	PO1,PO2, PO3	1,2,3	PSO1, PSO2			
2	Criteria for fixing the tariff, Flat rate, Block rate, Two part, Power factor tariff. Low power factor penalty Clause, Bill preparation with different tariff reduction of energy cost by improvement of power factor and load factor, Use of peak-off supply.	4	6	CO2,CO3	PO1	2,3	PSO1,P SO2			

3	Methods of improving the P.F. Reasons for low P.F. Advantages of higher P.F, Effect of P.F on annual saving. Types of Substation layout and equipment of Substation. Functions of Substation, Location of Substation.	10	20	CO3	PO1,PO3	1,2,3	PSO1,P SO2	Emp, Ent, SD	G	PE
4	Electrical heating, Methods of Electrical heating, Construction and working principles of resistance oven, induction and arc furnace. Advantages of electrical heating, resistance and arc welding, dielectric heating.	6	10	CO4	PO5,PO7	1,2	PSO1,P SO2			
5	Study of different types of lamps (Incandescent and gas discharge lamp), their characteristics, types of fittings, different terms used in illumination, design of illumination scheme.	8	16	CO4	PO3,PO5	2,3	PSO1,P SO2			
6	System of electric traction, advantages and disadvantages of electric traction over steam traction. Comparison between A.C and D.C system for electric traction. Different types of speed time curves. Analysis of speed time curve. Important terms used in electric traction. Factors effecting the schedule speed of train. Study of simplified speed time curve. Relationship between principle quantities in speed time curve. Mechanics of train moment. Specific energy output, various factors effecting the specific energy consumption. Electrical and Mechanical characteristics of electric traction motor, Series and parallel control of D.C series motor. Shunt and Bridge Transition. Multiple unit control. Negative and positive Boosters. Linear induction motor, Maglev train.	8	14	CO5	PO1,PO2, PO5, PO7	1,2,3	PSO1,P SO2			
7	ELECTRICAL BRAKING:Plugging, rheostatic and regenerative braking. A.C and D.C locomotive, basic construction and operation. Methods of current collection: overhead and conductor rail system.	6	10	CO5	PO3,PO7	1,2,3	PSO1,P SO2			
		56	100							
Reference books:										
1	Utilization of Electrical Energy. By O.A. Talyor.									
2	Electrical Power and Utilization By A.T.Starr.									
3	Electrical Power By S.L.Uppal.									
4	Course in Electrical Power By Soni Gupta &Bhatnagar.									
5	Electrical Power By B.L.Mathur.									
6	Power Systems By V.K.Mehta.									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	POWER ELECTRONICS(ELE3625)						Lecture Hrs per week	4		
Semester-II							Max marks	100		
Pre-Requisite: Basics of Semiconductors, semiconductor devices, basics of mathematics.										
CO1	Realize power semiconductor devices characteristics and Protection and Commutating circuits.									
CO2	Learn various applications like rectifiers and converters of power devices like power diodes, thyristors etc.									
CO3	Implementation of circuits like AC to AC controller for controlling electrical parameters like voltage, current, frequency, speed of motors, etc									
CO4	Learn DC to DC and DC to AC circuits .									
CO5	Understand the use of power electronic circuits used in various domestic and industrial applications.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	POWER ELECTRONICS DEVICES Power electronics devices such as, Power DIODE, MOSFET, IGBT, SCR, TRIAC, DIAC, GTO, ETU, construction, working and switching characteristics, Protection of the devices, Firing and gate drive circuits, Commutation.	10	20	CO1	PO1, PO4	1,2,3	PSO1			

2	<p>UNCONTROLLED RECTIFIER (USING DIODE) Single phase half wave and full wave rectifiers, Three phase half wave and full wave rectifiers, Equation of voltage, current, ripple factor, efficiency, and waveforms and related example</p> <p>CONTROLLED RECTIFIER (USING SCR) Single phase half wave rectifiers, Equation of voltage, current, ripple factor, efficiency and waveforms and related example, Single phase Full Wave Controlled rectifier, Equation of voltage, current, ripple factor, efficiency, and waveforms and related examples, Three phase half wave rectifiers, Equation of voltage, current, ripple factor, efficiency, and waveforms and related example</p>	15	20	CO2, CO5	PO1, PO2, PO3, PO4	2,3, 5	PSO1	Emp, Ent, SD	L, N,G	ES, PE
3	<p>AC TO AC CONTROLLER Phase control method, Frequency control method, Applications and related example</p>	8	15	CO3, CO5	PO3,PO5, PO7	1,2,3	PSO1			
4	<p>CHOPPERS Classification of chopper, Buck, Boost and buck-boost type of Chopper applications. Switch mode power supply</p>	6	15	CO4, CO5	PO3,PO5, PO7	1,2. 3	PSO1			
5	<p>INVERTERS Types of Inverters and its application in UPS, Industrial applications like Induction heating and Dielectric heating.</p>	4	10	CO4, CO5	PO1,PO3,PO 5, PO7	2,3	PSO1			
6	<p>Drives: •AC drives (for Induction motor stator side and rotor side) •DC drives for (Shunt and Series motors)</p>	10	20	CO2,CO4, CO5	PO3,PO5, PO7	1,2,3	PSO1			
		53	100							
Reference books:										
1	Power Electronics by M.H Rashid									
2	Power Electronics By M.D.Singh									
3	Semiconductor Physics By Ned Mohan									

The Maharaja Sayajirao University of Baroda							ACADEMIC YEAR 2023 -2024			
POLYTECHNIC										
Department of Electrical Engineering										
Diploma in Electrical Engineering: Regular (Grant-in aid)										
Year -III	Switchgear and Protection (ELE3618)						Lecture Hrs per week	4		
Semester-II							Max marks	100		
Pre-Requisite: Knowledge of Transmission and Distribution and Switchgear equipments.										
CO1	Identifying various types of faults in the power system.									
CO2	Selecting suitable switchgears for different applications.									
CO3	Identifying various types of Instrument transformers for protection.									
CO4	Testing the performance of different protective relays.									
CO5	Explain various protection schemes of various power system components.									
BT	1. Remember 2. Understand 3. Application 4. Analysis 5. Evaluation 6. Creation									
COURSE CONTENT / SYLLABUS										
Unit	Unit name	Hrs	Weightage	CO	PO	BT	PSO	Elements of Employability (Emp)/ Entrepreneurship (Ent)/ Skill Development (SD)	Relevance to Local (L)/ National (N)/ Regional(R)/Global (G)	Relation to Gender (G), Environment and Sustainability (ES), Human Values (HV)and Professional Ethics (PE)
1	Introduction : Faults and Abnormal Conditions, Some Terms in the Test, The Fault Clearing Process, The Trip-circuit, Recent Advances, Classification Based on Arc Quenching Medium, Technical Particulars of a Circuit-breaker, Interlocks, Indication and Auxiliary Switch, Circuit-breaker Time (Total Break Time), Auto Reclosure, Sub-transient, Transient and Steady State, Rated Characteristics of Circuit-breakers, The Matter and Plasma, Deionization, Electric Arc, Arc Formation in A.C. Circuit-breakers, Modes At Arc Extinction, Arc Extinction in Vacuum, Arc Extinction in SFG Gas, Arc Time Constant.	6	10	CO1	PO1,PO2, PO5, PO7	1,2,3	PSO1			

2	Circuit-Breakers: Construction of Air-break Circuit-breaker, Miniature Circuit-breaker, Properties of Sf6 Gas, Types Design, Single Pressure Puffer Type SF6 Circuit-breaker, Merits& Demerits of SF6 Circuit-breakers, Arc Extinction in Vacuum Interrupters, construction of Vacuum Interrupter, Merits & Demerits of Vacuum Circuit-breakers, Breakdown maintenance, preventive maintenance, Inspection, service and overhauling of Circuit Breakers, Indian standards.	14	24	CO1,CO2	PO2,PO3	2,3	PSO1	EMP/ENT/ SD	G	PE
3	Instrument Transformers: Introduction, Terms and Definitions of CT & PT, Accuracy Class CT & PT, Burden on CT & PT, Vector Diagram of CT, Magnetization Curve of CT, Open Circuited Secondary of CT, Polarity of CT and Connections, Selection of Current Transformers of Protection Ratings, Type of Construction CT's, Testing of CT's & PT's (Brief), Theory of Voltage Transformers, Specifications for Voltage Transformers, Electromagnetic Voltage Transformer, Capacitor Voltage Transformers (CVT), Indian standards.	10	16	CO3	PO2,PO5	1,2,3	PSO1			
4	Introduction to Protective Relaying : About Protective Relaying, Faults, Causes and Effects, Importance of Protective Relaying, Protective Zones, Primary and Back-up Protection, Back Up Protection by Time Grading Principle, Desirable Qualities of Protective Relaying, Some Terms in Protective Relaying, Actuating Quantities, Electro-mechanical Relays and Static Relays, Basic Connections of Trip Circuit, Auxiliary Switch, Sealing, and Auxiliary Relays, Measurement in Relays, Programmable Relay, System Security, Role of Engineers , Static Overcurrent Relays, Static Versus Electromagnetic Relays, Limitations of Static Relays	12	20	CO4	PO2,PO5	1,2	PSO1			

5	Overcurrent Protection and Earth Fault Protection: Applications of Over-current Protection, Relays Used in Over-current Protection , Characteristics of Relay Units for Overcurrent Protection, Earth-fault Protection, Connections of Ct's for Earth-fault Protection, Combined Earth-fault and Phase-fault Protection. Differential Protection : Applications of Differential Protection, Principle of Circulating Current Differential (Merz-prize) Protection, Difficulties in Differential Protection, Differential Protection of 3-phase Circuits, Biased or Per Cent Differential Relay. Distance Protection : Introduction to Distance Protection.	10	16	CO4	PO2,PO3, PO5	2,3	PSO1			
6	Protection of Transformers: Protection Requirements, Safety Devices with Power Transformers, Gas Actuated Devices , Biased Differential Protection, Percentage Differential Protection of Power Transformer	4	7	CO5	PO1,PO2, PO5, PO7	1,2,3	PSO1			
7	Lightening Arrestor: Lightning Arrester, Types of lightning arrester	4	7	CO5	PO1,PO2, PO5, PO7	1,2,3	PSO1			
		60	100							
Reference books:										
1	Switchgear Protection and Power System By S.S.Rao, Khanna Publishers									
2	Principles of Power System by V.K.Mehta, S. Chand Publications									
3	Power System Protection and SwitchGear by Badri Ram, McGraw Hill Professional									
4	Power System Protection and SwitchGear by BhuvaneshOza, McGraw Hill Education (India) Pvt. Ltd.									