

(Established under Gujarat Private Universities Act, 2009)

Shroff S.R. Rotary Institute of Chemical Technology

Ref: UPL University/SRICT/BOS/EE/2022-23/03

Teaching Scheme for Third Year Diploma Electrical Engineering

Semester-V (Electrical Engineering) Structure

Sr. No.	Category	Course Code	Course Name	Hours Per Week			Total Hours	Credits	E	M	I	V	Total
				L	T	P							
1	Humanities & Social Science	EE1313	Economic for Engineers	3	0	0	3	3	70	30	0	0	100
2	Program core courses	EE1314	Electrical Switchgear	3	0	0	3	3	70	30	0	0	100
3	Program core courses	EE1315	Electrification of Residential and Industrial Buildings	2	0	2	4	3	70	30	20	30	150
4	Program core courses	EE1316	Microprocessor and Controller Applications	3	0	2	5	4	70	30	20	30	150
5	Program Elective-II	EE1317 EE1318	Program Elective-II	3	0	2	5	4	70	30	20	30	150
6	Open Elective-II	EE1319/ EE1320	Open Elective-II	3	0	0	3	3	70	30	0	0	100
7	Audit Course	MH1301	Indian Constitution	2	0	0	2	0	50	0	0	0	50
8	Internship	MH1302	Internship	0	0	0	0	3	0	0	50	50	100
Total							25	23	470	180	110	140	900



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Semester-VI (Electrical Engineering) Structure

Sr. No.	Category	Course Code	Course Name	Hours Per Week			Total Hours	Credits	E	M	I	V	Total
				L	T	P							
1	Program core courses	EE1321	Testing and Maintenance of Electrical Equipments	2	0	2	4	3	70	30	20	30	150
2	Program core courses	EE1322	Substation Engineering	2	0	0	2	2	70	30	0	0	100
3	Program Elective-III	EE1323/ EE1324	Program Elective-III	2	0	2	4	3	70	30	20	30	150
4	Program Elective-IV	EE1325/ EE1326	Program Elective-IV	2	0	2	4	3	70	30	20	30	150
5	Open Elective-III	EE1327/ EE1328	Open Elective-III	3	0	0	3	3	70	30	0	0	100
6	Major Project	MH1303	Project	0	0	18	18	9	0	0	100	100	200
Total							35	23	350	150	160	190	850



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Program Elective-II	
Course Code	Course Name
EE1317	Power System Protection
EE1318	Renewable Energy Sources

Open Elective-II	
Course Code	Course Name
EE1319	Special Electrical Machines
EE1320	Electric Traction And Control

Professional Elective-III	
Course Code	Course Name
EE1323	High Voltage Engineering
EE1324	Industrial Automation

Professional Elective-IV	
Course Code	Course Name
EE1325	Maintenance of Transformer And Circuit Breaker
EE1326	Electric Drives

Open Elective-III	
Course Code	Course Name
EE1327	Power Quality
EE1328	Electric Vehicles

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Diploma Engineering

Course Code: EE1313

Course Name: Economics for Engineers

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Humanities & Social Science

Prerequisite: NA

Rationale: Engineering economics is a field that addresses the dynamic environment of economic calculations and principles through the prism of engineering. It is a fundamental skill that all successful engineering firms employ in order to retain competitive advantage and market share. The subject endeavors to provide them with the tools to optimize profits, minimize costs, analyze various scenarios, forecast fluctuations in business cycles, and more.

Teaching and Examination Scheme:

Teaching Scheme			Credit C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Economic Decisions Making: Overview, Problems, Role, Decision making process.	04
2	Engineering Costs & Estimation: Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model.	08
3	Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.	06
SECTION-B		
4	Cash Flow & Rate Of Return Analysis: Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.	06
5	Inflation And Price Change: Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates.	06

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Diploma Engineering

Course Code: EE1313

Course Name: Economics for Engineers

6	Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.	06
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Reference Books:

1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle : Engineering Economics Analysis, OUP
3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R. Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Describe the principles of economics that govern the operation of any organization under diverse market conditions.
CO-2	Explain different types of costs, interests used in engineering projects.
CO-3	Analyze the present worth analysis.
CO-4	Evaluate Interest rates and Understanding cash flow diagram.
CO-5	Analyze cash flow and rate of return.
CO-6	Examine the Inflation and Price Change.

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Diploma Engineering

Course Code: EE1313

Course Name: Economics for Engineers

List of Open Source Software/learning website:

1. Websites Recommended: www.finmin.nic.in , www.rbi.org.in , www.planningcommission.nic.in
2. Economic Review, American Economic Review, Economic and Political Weekly (EPW), Economic Times, Business Standard etc

References used for designing a course:

1. GTU
2. Jawaharlal Nehru Technological University Hyderabad

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Diploma Engineering
Course Code: EE1314
Course Name: Electrical Switchgear

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Program Core Course

Prerequisite: EPG and Electrical Transmission and Distribution

Rationale: In modern world electrical power system is growing fast due to expanding technical activities. As such the students must know about the switchgear and protection system. It is expected that the knowledge of facts, concepts, principles & procedural aspects of switchgear and protection system must be known by students which ultimately help the students in discharging their duties as a supervisor or a technician in substations, manufacturing industries & public service utilities.

Teaching and Examination Scheme:

Teaching Scheme			Credit C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA(I)	
3	0	0	3	70	30	0	0	100

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Introduction To Switchgear: Essential Features of switchgear, Switchgear Equipment, Bus-Bar Arrangement, Switchgear Accommodation, Faults in a power system.	4
2	Fuses : Desirable characteristics of fuse element, Fuse Element materials, Types of Fuses and important terms used for fuses, Low and High voltage fuses, Current carrying capacity of fuse element, Difference Between a Fuse and Circuit Breaker.	6
3	Protective Current and Potential Transformers : Construction of Current Transformers, Magnetisation Curve of a CT (CT Saturation Characteristic), CT Errors, Calculation of CT Accuracy, Factors to be Considered while Selecting a CT, Problems Encountered in CT , Construction of Potential Transformer, Capacitor Voltage Transformer, Specifications of Voltage Transformer	8

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Diploma Engineering

Course Code: EE1314

Course Name: Electrical Switchgear

SECTION-B		
4	Circuit breakers: Operating principle – Arc phenomenon, principle, DC and AC Circuit Breaking – Problems of circuit interruption – Interruption of capacitive currents, Current chopping, Resistance Switching and methods of arc extinction – Arc interruption theories – Arc voltage, restriking voltage, Recovery voltage.	7
5	Different types of circuit breakers: Air break and Air blast circuit breaker. Plain break and controlled break all circuit breakers. Minimum oil circuit breakers. Vacuum circuit breaker, SF6 circuit breaker. – Construction and Operating Principle – HVDC circuit breaker – Selection of circuit breaker and its ratings – Auto reclosing.	8
6	Electrical Switchgear: High-Voltage AC Circuit Breakers, High-Voltage DC (HVDC) Circuit Breakers, Isolators, Miniature Circuit Breakers, Earth Leakage Circuit Breakers	3

Text Books:

1. Power system protection and switchgear by Oza, Nair, Mehta, Makwana
2. Fundamentals Of Power System Protection – Y. G. Parithankar & S. R. Bhide, 2nd edition, PHI
3. Switchgear And Protection – S. S. Rao, Khanna publication

Reference Books:

1. Power System Protection – B. Ram , TMH Publication
2. Modern Power System Protection – DivyeshOza, TMH Publication.

List of Practical: (Min. 10 Practical should be performed): NA

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Describe the fundamentals of Electrical Switchgear.
CO-2	Explain different types of fuses.
CO-3	Understanding the CT and PT.
CO-4	Understanding the principles of Circuit Breaker and arc quenching phenomena.
CO-5	Applying the knowledge of arc quenching to understand different types of Circuit Breaker.
CO-6	Analyzing various circuit breaker parameters.

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Diploma Engineering

Course Code: EE1314

Course Name: Electrical Switchgear

List of Open Source Software/learning website:

- NPTEL web courses and video courses

References used for designing a course:

1. GTU
2. AICTE



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Diploma Engineering

Course Code: EE1314

Course Name: Electrical Switchgear

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Diploma of Engineering

Course Code: EE1315

Course Name: Electrification of Residential and Industrial Buildings

Shroff S.R. Rotary Institute of Chemical Technology

Semester: - V

Type of course: Program Core Courses

Prerequisite: Fundamental knowledge of Basics of Electrical Engineering

Rationale: With the revolutionary changes in the building construction, advent of new building materials and electrical fittings and accessories there is an increase in demand for specialists in electrification of high rise-multistoried building and commercial complexes. Therefore a limited exposure to electrification of small building is not sufficient and this subject needs to be taught as a specialized subject. This course will provide knowledge about electrification of high rise buildings and complexes. Studying this course will enable the diploma pass outs to plan, design, and estimate and execute the electrification of multistoried buildings and commercial complexes independently and professionally as per IE rules. If proper skills are developed then pass outs may start their own business of electrification of building complexes, which is very profitable and growing business and requires very less investment.

Course Objective: The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency: Applying IE rules, undertake the electrification of multistory buildings and commercial complexes.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
2	0	2	3	70	30	30	20	150

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Diploma of Engineering

Course Code: EE1315

Course Name: Electrification of Residential and Industrial Buildings

Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Elements of Electrification: Testing of wiring Installation for verification of current, earthing resistance, insulation resistance and continuity as per IS, Selection of electrical accessories such as main cable, main switches circuit breakers etc.	3
2	Electrification of Multistoried Buildings: Wiring layout of an electrical installation, Type of wiring- Concealed /Surface conduit etc., Calculate number of sub circuits from the total circuit requirement, Calculation total electrical load on distribution work, Specification of wiring material and accessories. Estimation of total cost of electrification, Load calculation for lifts, escalators, air conditioners: wiring diagram.	5
3	Electrification of Residential and Industrial Buildings : Comparison of Residential and Industrial Installation, Special requirements of Residential and Industrial building electrification points of view, Estimating and Costing of material.	4
SECTION-B		
4	Distribution System for Multistoried Buildings: Different Methods of service connection. Distribution panels and bus bar system, Cable laying in building, Meter connection-bifurcation of metering-meters as per consumers demand, Estimating and costing of electrification of underground service connection of building.	5
5	Electrical Safety: Importance of safety rules, Safety precaution in electrical installation of multistoried buildings a) Earthing system (IE rules regarding safety) b) Lightning arrestors arrangements c) Use of ELCB and MCB in an installation.	5
6	IE-1956 Rules: IE rules related to Electrical Installation and Testing.	2

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Diploma of Engineering

Course Code: EE1315

Course Name: Electrification of Residential and Industrial Buildings

Text Books:

1. Electrical Design Estimation and Costing, Raina K.B. Bhattacharya S.K, Willet Estern Ltd., Latest edition
2. Electrical Estimation and Costing, Uppal S.L., Khanna Publisher, New Delhi, Latest edition

Reference Books:

1. National Building code of India Group 1 and Group 4, Bureau of Indian standard, New Delhi, Book no. 1604, Latest Edition
2. A Course in Electrical Installation Estimating & Costing ,Gupta J.B. , S.K. Kataria and Sons, Latest edition

List of Practical: (Min. 5 Practical should be performed):

1. Draw a complete wiring diagram, of any one of the commercial complexes. (Cinema, hotel, library, cultural hall, hospital etc. [A group of 5 students, having one different complex –per group.]
2. Calculate load, draw wiring diagram and estimate cost of any given high rise building.
3. Design Economical illumination system for any complex, building.
4. Calculate Load for lift, escalators, air conditioning in high rise building. (A group of 5 students, having one different complex per group.)
5. Perform electrical tests for commercial and high rise buildings as per IE.
6. Prepare case study for standard specifications of various electrical accessories and fittings.
7. Make comparative report of different types of wiring installations.
8. Mini project on planning and estimating of electrification of given building.
9. Mini project on planning and estimating of electrification of given hotel.
10. Mini project on planning and estimating of electrification of library.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Memorizing the IE rules for Electrification of Residential and Industrial Buildings..
CO-2	Estimate the materials and cost of Electrification for different buildings.
CO-3	Prepare the report of Electrification of Residential and Industrial Buildings.
CO-4	Calculate the average and peak power requirement of Residential and Industrial Buildings..
CO-5	Test a given wiring installation of a Residential and Industrial Buildings.
CO-6	Solve the problems in wiring installation of a Residential and Industrial Buildings..



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Diploma of Engineering

Course Code: EE1315

Course Name: Electrification of Residential and Industrial Buildings

List of Open Source Software/learning website:

1. <http://electrical-engineering-portal.com/>
2. <http://www.edumedia-sciences.com>
3. www.nptel.iitm.ac.in

References used for designing a course:

- 1) Gujarat Technological University Diploma and Degree Curriculum

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Diploma Engineering

Course Code: EE1316

Course Name: Microprocessor and Controller Applications

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Program Core Course

Prerequisite: Analog and Digital Electronics

Rationale: In modern process industries and power stations use of microprocessor and microcontrollers are very common in order to control, monitor and process various parameters and data. Microprocessor and Microcontroller is specialized and essential field where the industries need highly skilled manpower. Hence this course is designed to develop skills to maintain microprocessor based system and the programming practices will develop the skills to indigenous real time applications.

Teaching and Examination Scheme:

Teaching Scheme			Credit C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Fundamentals of microprocessor: History of microprocessor, Block diagram, Microprocessor architecture, Pin diagram, Difference between microprocessor and microcontroller	5
2	Microprocessor based system: Digital computer, Van Neumann and Harvard Architecture, CISC and RISC Processors, Bus Organization, Multiplexing of address/data bus, Generation of control signals, All the instructions of 8085, Simple programs of addition, subtraction, multiplication, division & logic operations.	8
3	8085 Microprocessor: 8085 machine cycle, Definition of T- state, machine cycle and instruction cycle, Fetch and execution of MOV and OUT instructions only	5
SECTION-B		

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Diploma Engineering

Course Code: EE1316

Course Name: Microprocessor and Controller Applications

4	8051 Microcontroller: Introduction of 8051 microcontroller, Pin diagram of 8051, Architectural block diagram of 8051, Flags and Program Status Word (PSW), Flag register, Stack and Stack pointer	6
5	8051 Assembly language programming: Addressing modes: immediate, Register, Direct, Indirect, Indexed, Relative and bit addressing, Instructions: Moving data, Arithmetic operation, Logical operation, Jump and Call instructions, Simple programs	6
6	Application programming of 8051: 8051 Timer and counter, TCON, TMOD, Serial communication: basic, SBUF and SCON- PCON registers, Mode of operation, Simple program of serial communication	6

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085, By Romesh Gaonkar, Penram International Publishing (India) LTD
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay (Second Edition , Pearson Education)

Reference Books:

1. The 8051 Microcontroller & Embedded Systems using Assembly and C By K. J. Ayala, D. V. Gadre
2. Fundamentals of Microprocessors and Microcontrollers, Ram, B., Dhanpat Rai Publications, New Delhi

List of Practical: (Min. 10 Practical should be performed):

1. To study the microprocessor 8085.
2. Write 8085 assembly language program for addition of two 8-bit numbers and sum is 8 bit.
3. Write 8085 assembly language program for addition of two 8-bit numbers and sum is 16 bit.
4. Write 8085 assembly language program for subtraction.
5. Write 8085 assembly language program for one's complement of an 8-bit numbers.
6. Study of 8051 Micro controller kit and instructions of 8051.
7. To perform 8-bit addition using 8051 microcontroller.
8. To perform logic operations on 8051 microcontroller kit.
9. Write a program for 8051 to generate 1 KHz square pulse waveform of 50% duty cycle on port 1.0 using timer.
10. Execute Programs on Rotate and SWAP instructions.

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Diploma Engineering

Course Code: EE1316

Course Name: Microprocessor and Controller Applications

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Describe 8085 microprocessor architecture of MCS51 family
CO-2	Understand different architecture and different processors used in microprocessor and microcontroller.
CO-3	Understand timing diagram of different instructions.
CO-4	Describe the importance and function of each pin of microcontroller & PSW.
CO-5	Understand different types of instructions used for microcontroller.
CO-6	Learn and analyze assembly language programs of serial communication.

List of Open Source Software/learning website:

1. NPTEL
2. www.infineon.com
3. www.silabs.com

References used for designing a course:

1. UGC syllabus
2. GTU
3. PDPU

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Diploma Engineering

Course Code: EE1317

Course Name: Power System Protection

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Program Elective-II

Prerequisite: EPG and Electrical Transmission and Distribution

Rationale: An electrical power system consists of generators, transformers, and transmission and distribution lines. In case of fault, an automatic protective scheme comprising of circuit breakers and protective relays isolate the faulty section providing protection to the healthy section. Safety of machines/equipment and human beings is the major criteria of every protection scheme. It is essential that the diploma pass out students should develop skills of operating various controls and switchgear in power system. They are also required to carry out remedial measures for faults/abnormalities in machines/equipment in power system using appropriate diagnostic instrument/devices. This course attempts to develop these skills in students and hence it is a core course for all electrical engineers.

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA(I)		
3	0	2	4	70	30	30	20	150

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Diploma Engineering

Course Code: EE1317

Course Name: Power System Protection

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Elements of Protection: Line diagram of a power system and its elements, Faults and abnormalities, their causes, types and effects, Functions of basic elements of a protective system, Backup protection & its types, Zone of Protection.	8
2	Protective Relays: Concept of protective relay and its selection, Classification of relays, Principle of working and operation of relays and their construction, Basic terms related to relay like pick up value, reset value- and operating current etc., Use the static relays in modern power system, Settings of various types of relays, Maintenance and testing of relays, Principle and working of microprocessor based relay.	12
3	Neutral Earthing: Importance of Neutral Earthing, Methods of Neutral Earthing & its advantages, Applications.	4
SECTION-B		
4	Protective Systems: Abnormalities & faults in a power system & its effects, over current protection, directional over current protection, differential protection, distance protection. Harmonic constrains in differential protection.	8
5	Protection of Power System Equipment: Protection schemes for alternator, Protection against Prime mover failure and unbalance loading, Protection of transformer, Protection of Transmission line and feeders, Protection of motors, Protection of bus bars.	10
6	Over Voltage Protection: Causes of over voltages, Methods of reducing over voltages, Operating principles, construction & applications of lightening arrester, Insulation co-ordination & volt- time characteristic.	6

Text Books:

1. Power system protection and switchgear by Oza, Nair, Mehta, Makwana
2. Fundamentals Of Power System Protection – Y. G. Parithankar & S. R. Bhide, 2nd edition, PHI
3. Switchgear And Protection – S. S. Rao, Khanna publication

Reference Books:

1. Power System Protection – B. Ram , TMH Publication
2. Modern Power System Protection – DivyeshOza, TMH Publication.

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Diploma Engineering

Course Code: EE1317

Course Name: Power System Protection

List of Practical: (Min. 10 Practical should be performed):

1. Check the Polarity of Current Transformer and Potential Transformer and connect it with the relay
2. Identify various switchgear equipment available in the lab and write its specification and symbols
3. To study over voltage protection scheme
4. To study under voltage protection scheme.
5. Interpret various protective scheme used for transmission lines and feeders (from Blue print and visit).
6. Draw schematic diagram of protective schemes for 11 KV/ 33 KV/66 KV switchyards nearby area. (after visit)
7. To study differential protection of transformer.
8. To study the protection schemes for different abnormal conditions in an alternator.
9. To study the concept of earthing.
10. Apply balance current protection scheme using appropriate switch gear.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the elements of Power system Protection.
CO-2	Describe the principles of protective relay.
CO-3	Explain the concept of neutral earthing.
CO-4	Analyzing various protective systems and their applications.
CO-5	Applying the knowledge of protective system to protect various power system equipment's.
CO-6	Understand the concept of Over Voltage Protection.

List of Open Source Software/learning website:

- NPTEL web courses and video courses

References used for designing a course:

1. GTU
2. AICTE

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Diploma of Engineering

Course Code: EE1318

Course Name: Renewable Energy Sources

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Program Elective-II

Prerequisite: Knowledge of Basic Electrical Engineering, Electrical Measurement and Instruments

Rationale: Gujarat is one of the several states in India where a large number of wind and solar grid connected electric power installations, and competent technicians to maintain these vital renewable energy power plants is a dire need of the industry. It is to fulfill this need, that this curriculum has been designed so that the diploma engineer would be able to maintain the installations thereby minimizing the downtime. It is presumed that the students have studied

Teaching and Examination Scheme:

Teaching Scheme				Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	MSE (M)	I (V)	E (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Introduction of Renewable Energy: Importance of renewable sources of energy, Needs of renewable energy, advantages and limitations of RE, present energy scenario of Energy across Globe and India.	4
2	Solar Energy: Solar Energy and related terms, Conversion of Solar energy into Electricity, Advantages and disadvantages of Solar PV Energy, Solar PV Electrical Power Generation system (SPV), Applications of Solar Energy.	7
3	Wind Energy: Wind Energy Conversion, Site selection, basic components of wind energy conservation system (WECS), classification of WECS, advantages and disadvantages of wind energy, applications of wind energy wind energy	7

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Diploma of Engineering

Course Code: EE1318

Course Name: Renewable Energy Sources

SECTION-B		
4	Bio Energy: Biomass and its conversion technology, biomass gasification, types and applications of gasifiers, Biogas plant. Advantages and disadvantages of Bio energy, Application of Bio energy	6
5	Geothermal Energy: Potential and classification of geothermal energy and equalayer, Conversion of geothermal energy into electric power, Advantages and disadvantages of Geo thermal Energy, Application of Geo thermal Energy	6
6	Tidal Energy: Wave and tidal power, Methods of power generation from waves, Methods of power generation from tides, Advantages and disadvantages of Tidal Energy.	6

Text Books:

1. Renewable energy resources: Tiwari and ghosal, Narosa publication.
2. Non-Conventional Energy Sources. G.D.Ray, Khanna Publications.

Reference Books:

1. Non-Conventional Energy Systems: K M. Mittal, A H Wheeler Publishing Co Ltd.
2. Non-conventional energy resources, Shobh Nath Singh, Pearson India
3. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, McGrawHill Education
4. Biomass Energy, Oxford & IBH Publication Co.
5. Twidell and Wier, Renewable Energy Resources, CRC Press (Taylor and Francis).
6. C.S. Solanki, Renewal Energy Technologies: A Practical Guide for Beginners PHI Learning

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Diploma of Engineering

Course Code: EE1318

Course Name: Renewable Energy Sources

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	To Understand the Need, importance and scope of renewable Energy
CO-2	To understand role significance of solar PV Energy and its conversion into electricity
CO-3	To know the wind Energy and its application
CO-4	To understand role significance of bio Energy and its conversion system
CO-5	To learn the importance of Geo thermal Energy and its application
CO-6	To utilize the Tidal energy and its conversion systems

List of Open Source Software/learning website:

- <https://www.NPTEL> video lectures.
- <https://nise.res.in/>
- <https://niwe.res.in>

References used for designing a course:

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Diploma Engineering

Course Code: EE1319

Course Name: Special Electrical Machines

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of Course: Open Elective-II

Prerequisite: Fundamentals of Electrical Machines-I, Electrical Machines-II and Basic Electrical Engineering

Rationale: This course is focused on different types of special machines which are used in power system and in Electrical Industries. Designing of special types of electrical machines (transformers, synchronous machines, induction generators, fraction HP motors) and their maintenance procedure are covered in this syllabus.

Teaching and Examination Scheme:

Teaching Scheme				Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	I (V)	E (V)	
3	0	0	3	70	30	00	00	100

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Special Transformer Types: Different types of connections of power and distribution transformers, Welding transformers, Isolation transformer, Pulse transformer, Audio transformers and microphone transformers. Instrument transformers: current transformers and potential transformers, Constant Voltage Transformer (CVT) and Constant Current Transformer (CCT).	06
2	Special Induction Machines: Dual winding Squirrel cage induction generator, Soft starters, Reactive power compensation, Wound rotor induction generator (WRIG), Doubly fed induction generator (DFIG), Brushless doubly fed induction generator (BDFIG).	06
3	Special Synchronous Machines: Wound rotor synchronous generators for renewable energy applications, Wound rotor synchronous generators in large and small direct drive wind turbines, Permanent magnet synchronous generators in large and small direct drive wind turbines.	06
SECTION-B		
4	Fractional Horse Power Motors: Fractional horse power (FHP) motor, Hysteresis motor, Permanent magnet motor, Reluctance motor, Switched reluctance motor.	06

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1319

Course Name: Special Electrical Machines

5	Other Special Motors: Stepper motor and its types, Brushless DC motors, Servomotors, Synchros, Resolvers.	06
6	Maintenance of Special Machines: Maintenance Procedure-Special types of transformers, Special Induction Motors, Special Induction Motors, Special Fractional HP Motors.	06

Text Books:

1. “Electrical Technology Vol. II” by Theraja B. L., S Chand and Co., New Delhi.

Reference Books:

1. “Electrical Machines” by Hussain Ashfaq, Dhanpat Rai and Company, New Delhi
2. “Theory and performance of Electrical Machines” by Gupta, J.B., S.K. Kataria and sons, New Delhi.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Design the special types of transformers used for industrial applications.
CO-2	Examine the performance parameters of induction generators.
CO-3	Check the performance criteria of special types of synchronous machines.
CO-4	Describe the concept of FHP motor sand their applications.
CO-5	Explain the working principle of different types of stepper motors, BLDC motors etc.
CO-6	Demonstrate maintenance of special types of machines.

List of Open Source Software/learning website:

1. https://learnabout-electronics.org/ac_theory/transformers04.php/
2. <http://www.allaboutcircuits.com/>

References used for designing a course:

1. <https://nptel.ac.in/courses/108102146>
2. <https://archive.nptel.ac.in/courses/108/102/108102156/>

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1320

Course Name: Electric Traction And Control

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Open Elective-II

Prerequisite: Basic Electrical Engineering

Rationale: The country is leading towards the railway electrification and also moving towards metro, monorail system. The diploma student is required to know about the electric traction scheme and its latest trends. This subject is offered as one of the elective, highlighting the current and future trends in traction systems, auxiliary equipment, electric locomotives, control of traction motors and future-trends. The Diploma pass student with this elective will be able to maintain the traction systems, auxiliary equipment, electric locomotives and traction motors.

Teaching and Examination Scheme:

Teaching Scheme			Credit C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Traction Systems and Latest Trends: Present scenario of Indian Railways – High speed traction, Metro, Latest trends in traction, Metro, monorail, Magnetic levitation Vehicle, Steam, diesel, diesel-electric, Battery and electric traction systems, General arrangement of D.C., A.C. single phase, 3 phase, Composite systems, Choice of traction system - Diesel-Electric or Electric	08
2	Mechanics of Train Movement: Analysis of speed time curves for main line, suburban and urban services, Simplified speed time curves, Relationship between principal quantities in speed time curves, Requirement of tractive effort, Specific energy consumption and Factors affecting it.	08
3	Auxiliary Equipment: Power conversion and transmission systems, Control and auxiliary equipment.	02

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1320

Course Name: Electric Traction And Control

SECTION-B		
4	Electric Locomotives and Auxiliary Equipment: Important features of electric locomotives , Different types of locomotives , Current collecting equipment , Coach wiring and lighting devices ,	04
5	Traction Motors and Their Control: Features of traction motors, Significance of D.C. series motor as traction motor, A. C. Traction motors-single phase, Three phase, Linear Induction Motor , Comparison between different traction motors, Series-parallel control , Open circuit, Shunt and bridge transition , Pulse Width Modulation control of induction motors, Types of electric braking system.	10
6	Feeding and Distribution System: Distribution systems pertaining to traction (distributions and feeders), Traction sub-station requirements and selection, Method of feeding the traction sub- station	04

Text Books:

1. Modern Electric Traction H. Partab Dhanpat Rai and Sons, New Delhi
2. Electric Traction J. Upadhyay S. N. Mahendra Allied Publishers Ltd., Dhanpat Rai and Sons, New Delhi
3. Electric Traction A.T. Dover Mac millan, Dhanpat Rai and Sons, New Delhi
4. Electric Traction Hand Book R. B. Brooks. Sir Isaac Pitman and sons ltd. London. Reference Books:

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Distinguish different traction systems and latest trends in traction systems.
CO-2	Differentiate services of traction system based on speed time curve.
CO-3	Control different types of traction motors
CO-4	Use various traction system auxiliaries.
CO-5	Explain the distribution system of a traction system.
CO-6	Conclude about application of traction motors.

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Diploma Engineering

Course Code: EE1320

Course Name: Electric Traction And Control

List of Open Source Software/learning website:

- i. www.irieen.com (Indian Railways Institute of Electrical Engineering, Nasik Road)
- ii. www.wr.railnet.gov.in/bctweb/ELECTRICAL.htm
- iii. www.scrailway.gov.in
- iv. Vlab.co.in

References used for designing a course:

1. GTU Sem 5 Electric Traction And Control

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering
Course Code: MH1301
Course Name: Indian Constitution

Shroff S.R. Rotary Institute of Chemical Technology

Semester: V

Type of course: Audit Course

Prerequisite: None.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	0	0	50	0	0	0	50

Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Introduction to Constitution: Meaning and importance of the Constitution, History of Indian Constitution, salient features of Indian Constitution. Preamble of the Constitution.	3
2	Fundamental Rights: Fundamental rights – meaning and limitations, Right to equality, Right against exploitation, Right of freedom of religion Cultural and educational rights, Right to property, Directive principles of state policy.	6
3	Fundamental Duties: Fundamental duties -their enforcement and their relevance.	3
SECTION-B		
4	Union Government: Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.	4
5	State Government:	4

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: MH1301

Course Name: Indian Constitution

	State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court.	
6	Election provisions, Emergency provisions, Amendment of the constitution Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.	4

Total L - 28 Hours

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	35	25	5	5	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Course Outcomes:

At the end of the course the student should be able to:

CO 1	Understand and explain the significance of Indian Constitution as the fundamental law of the land.
CO 2	Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
CO 3	To Understand the Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities.
CO 4	Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national Building.
CO 5	Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail.
CO 6	Understand Electoral Process, Emergency provisions and Amendment procedure.

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: MH1301

Course Name: Indian Constitution

Textbooks

1. M.V.Pylee, “Introduction to the Constitution of India”, 4th Edition, Vikaspublication, 2005.
2. Durga Das Basu (DD Basu) , “Introduction to the constitution of India”, (Student Edition), 19th edition, Prentice-Hall EEE, 2008.
3. Constitution of India. D. D. Basu. (Prantice Hall of India Pvt. Ltd., New Delhi)
4. Constitution of India. D. K. Singh. (Eastern Book Company, Lucknow)
5. Constitution of India (P M Baxi)
6. Constitutional Law of India, Dr. J.N. Pandey, Central Law Agency
7. Introduction to the Consitution of India, Durga Das Basu, LexisNexis.
8. Indian Constitutional Law, M.P. Jain, LexisNexis
9. V.N.Shukla’s Constitution of India, Mahndra Pal Singh, Eastern Book Company
10. Constitutional Law – I Structure, Udai Raj Rai, Eastern Book Company

Reference Book:

1. Merunandan, “Multiple Choice Questions on Constitution of India”, 2nd Edition, Meraga publication, 2007.

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1321

Course Name: Testing and Maintenance of Electrical Equipments

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of Course: Program Core Course

Prerequisite: Fundamentals of Electrical Machines, Electrical Measurements

Rationale: Power Systems and Industrial Plants consist of number of electrical drives, transformers, circuit breakers and other equipments which require installation, commissioning and regular maintenance to prevent permanent break down. It is required to carry out/supervises installation, commissioning and maintenance of various electrical equipments in power stations, substations and industry. This course will enable the students to understand the concepts, principles and acquire basic skills of installation, commissioning and maintenance of electrical equipments in power stations, substations and industry.

Teaching and Examination Scheme:

Teaching Scheme				Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	ESE (P)	
2	-	2	3	70	30	20	30	150

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1321

Course Name: Testing and Maintenance of Electrical Equipments

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Electrical Safety and Insulation: Do's and don'ts regarding safety for operators. Electrical safety in industry/power stations/ substations at the time of operation/ control/ maintenance. Factors affecting life of insulating materials, classifications of insulating materials as per IS:1271-1958.	3
2	Testing of Transformers: General Requirements for Type, Routine and Special Tests, Measurement of winding resistance; Measurement of voltage ratio and check of voltage vector relationship; Measurement of impedance voltage/short-circuit impedance and load loss; Measurement of insulation resistance.	4
3	Testing of Rotating Machines: Testing of three-phase Induction motor as per I.S.325 - 1970. Testing of single-phase induction motor as per I.S.990-1965. Testing of D.C. machines	5
SECTION-B		
4	Maintenance of Electrical Equipment: Functions of the Maintenance Department; Reasons of failure of electrical equipment. Preventive maintenance & Breakdown maintenance: need, classification, advantages, activities Frequency of maintenance.	4
5	Earthing: Necessity of earthing. System earthing: advantage of neutral earthing of generator in power station. Methods of earthing: plate earthing, pipe earthing and coil earthing. Measurement of earth resistance: voltmeter-ammeter method, earth tester method, ohm meter method and earth loop tester method. Comparison between equipment earthing and system grounding.	3
6	Troubleshooting: Causes of faults in electrical equipment (Internal and external), Common troubles in electrical equipment – DC Machines, AC Machines, Transformers, Circuit-breaker, underground cable, electrical Installation. Trouble shooting chart for DC Motor, DC Generator, Transformer, Synchronous Motor, Induction Motor, Circuit-breaker.	5

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1321

Course Name: Testing and Maintenance of Electrical Equipments

Text Books:

1. Rao. S, “Testing Commissioning operation and maintenance of Electrical Equipments”, Khanna Publication (Latest edition), New Delhi
2. Singh Tarlok, “Installation, commissioning and maintenance of Electrical equipment”, S. K. Kataria and Sons, New Delhi.

Reference Books:

1. Paul Gill, “Electrical power equipment maintenance and testing”, CRC Press, 2008.
2. Deshpande. M. V., “Design and Testing of Electrical Machines”, PHI Learning Pvt. Ltd., 2010 ISBN No. 8120336453, 9788120336452.

List of Practical: (Min. 10 Practical should be performed):

1. Interpret IE rules pertaining to safety.
2. Measure insulation resistance of a winding/cables/wiring installation.
3. Measure insulation resistance of a transformer oil.
4. Types of earthing & Measurement of earth resistance of installation of building and appliances by different methods.
5. Perform various tests on insulating oil.
6. To perform various Test of Induction Motor and their significance.
7. To perform various Test of Transformer and their significance.
8. Prepare maintenance schedule for power transformer.
9. Prepare maintenance schedule for induction motor.
10. Trouble shoot a ceiling fan.
11. Measure no load losses and no load current of a transformer as per IS.
12. Find efficiency of M.G. set.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Illustrate safety procedures with respect to earthing and insulation of electrical equipment.
CO-2	Analyze and Test transformer in accordance with IS codes.
CO-3	Analyze and Test rotating machine in accordance with IS codes.
CO-4	Undertake regular preventive and breakdown maintenance.
CO-5	Summarize of different types of earthing for different types of electrical installations
CO-6	Prepare Trouble shooting chart for various electrical equipment, machines and domestic appliances.

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1321

Course Name: Testing and Maintenance of Electrical Equipments

List of Open Source Software/learning website:

1. <http://www.bis.org.in/index.asp>
2. <http://164.100.105.199:8071/php/BIS/IndStndrdLocatr/StandrdsSelection.php>
3. http://www.ieee.org/publications_standards/publications_standards_index.html
4. <http://www.nema.org/Standards/About-Standards/pages/default.aspx>
5. <http://www.electricalsafetyfirst.org.uk/guides-and-advice/around-the-home/first-aid/>

References used for designing a course:

1. AICTE Model Curriculum-Jan 2018
2. GTU

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1322

Course Name: Substation Engineering

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of Course: Program Core Course

Prerequisite: Fundamentals of Power Systems.

Rationale: This course is focused on different types of substations in power system. Different types of substation layout, its equipments, safety precautions, its grounding and communication systems are covered in this course.

Teaching and Examination Scheme:

Teaching Scheme			C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	0	2	70	30	00	00	100

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Introduction of Substation: Background, Needs Determination, Budgeting and Financing, Traditional and Innovative Substation Design, Site Acquisition, Design, Construction, and Commissioning Process.	04
2	Gas-Insulated Substations (GIS): GIS, Single line diagram of substation, SF ₆ insulated switchgear, Partial discharge monitoring, Loss measurement and temperature rise test, Installation and maintenance of GIS	04
3	Air-Insulated Substations (AIS): Single Bus, Double Bus, Double Breaker, Main and Transfer Bus, Double Bus, Single Breaker, Ring Bus, Breaker-and-a-Half, Comparison of Configurations	04
SECTION-B		
4	High-Voltage Power Electronic Substations: Converter Stations (HVDC), FACTS Controllers, Control and Protection System, Losses and Cooling, Civil Works, Reliability and Availability, Future Trends	04
5	Substation Communications: Introduction, Supervisory Control and Data Acquisition (SCADA) Historical Perspective, SCADA Functional Requirements, SCADA Communication	04

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1322

Course Name: Substation Engineering

	Requirements, Components of a SCADA System, Communications Media	
6	<p>Substation Protection:</p> <p>(a) Substation Grounding- Reasons for Substation Grounding System, Accidental Ground Circuit, Design Criteria</p> <p>(b) Substation Fire Protection- Fire Hazards, Fire Protection Measures, Fire Protection Selection, Substation Control Building Fire-Protection-Review Checklist, Substation Switchyard Fire Protection Assessment Process.</p> <p>(c) Oil Containment- Oil-Filled Equipment in Substation, Spill Risk Assessment, Containment Selection Consideration, Oil Spill Prevention Techniques</p>	04

Text Books:

1. “Electric Power Substations Engineering” by John D. McDonald, CRC Press edition 2003.

Reference Books:

1. “Substation Design and equipments” by Partapsinghsatnam and P V Gupta, Dhanpat Rai & Sons
2. “Relevant IS Code for Power quality”, Latest code

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the criteria for selection of substations.
CO-2	Describe the construction of Gas Insulated Substation.
CO-3	Describe the construction of Air Insulated Substation.
CO-4	Evaluate and perform the operation of Power Electronic Substations.
CO-5	Demonstrate the communication structure of a substation.
CO-6	Explain the protection of substation by earthing, fire, oil containment etc.

List of Open Source Software/learning website:

1. <http://nptel.iitm.ac.in/>
2. <http://iitm.vlab.co.in/?sub=46&brch=144&sim=1056&cnt=4>

References used for designing a course:

1. <https://sot.pdpu.ac.in/downloads/BT-Sem-VI-Elec.pdf>

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1323

Course Name: High Voltage Engineering

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Program Elective-III

Prerequisite: Basic Electrical Engineering

Rationale: Electrical power transmission is trending towards higher and higher voltages. Under such scenario, the conceptual understanding related to insulation, testing the HV devices is must for every electrical engineer. The subject deals with HV test generating devices, measurement devices, over voltages including lightning and non-destructive testing as well.

Teaching and Examination Scheme:

Teaching Scheme			Credit C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	E (V)	P (I)	
2	0	2	3	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Electrostatic fields and field stress control: Electrical field distribution and breakdown strength of insulating materials Numerical analysis of electrical fields in high voltage equipment: numerical methods - Finite Element Method (FEM)	03
2	Electrical breakdown in gases: Gases as insulating media - ionization and decay processes, Townsend first ionization coefficient, photo ionization, ionization by interaction of metastable with atoms, thermal ionization, deionization by recombination, deionization by attachment-negative ion formation,	04
3	Breakdown in liquid and solid dielectrics: Liquid as insulators, breakdown in liquids - transformer oil test, alternative liquid insulations like vegetable oils, esters and silicon oils - breakdown in solids, intrinsic breakdown, streamer breakdown, electromechanical breakdown, edge breakdown and treeing, thermal breakdown, erosion breakdown, tracking - breakdown of solid dielectrics in practice, partial discharges in solid insulation.	05

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1323

Course Name: High Voltage Engineering

SECTION-B		
4	Generation of high voltages: Generation of high direct voltages, half and full wave rectifier circuits, voltage multiplier circuits, Van de Graff generators, electrostatic generators, examples - generation of alternating voltages, testing transformers, examples - impulse voltages, Standard lightning and switching surge and associated parameters and their corrections, design and construction of impulse voltage generator circuits, Marx circuit, operation, examples - impulse current generator.	06
5	Measurement of high voltages: High direct voltage measurement, peak voltage measurements by spark gaps, sphere gaps, factors affecting sphere gap measurements,	03
6	Non-destructive test techniques: Insulation: Measurement of d.c. resistivity - dielectric loss and capacitance measurements, current comparator bridges, Tan Delta measurement, Partial-discharge (PD) measurements - the basic PD test circuit, Dissolved gas analysis - Key gas method .Insulation Coordination.	03

Text Books:

1. Naidu M. S. and Kamaraju V., "High Voltage Engineering", fourth Edition, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2009
2. Wadhwa C.L., "High Voltage Engineering", third edition, New Age publishers, New Delhi, 2010.
3. Kuffel, E., Zaengl W.S., Kuffel J., "High Voltage Engineering: Fundamentals" Butterworth Heinmann (A division of Reed Educational & Profession Publishing Limited), 2nd Edition, 2000.

Reference Books:

1. A. Haddad, D. Warne, "Advances in High Voltage Engineering", IET Power and Energy, Series 40, 2007
2. Alston L L, High Voltage Technology, Oxford University Press, 2008

List of Practical: (Min. 10 Practical should be performed):

1. Study of high voltage laboratory
2. To study the horn gap arrester.
3. To determine breakdown mechanism in oil dielectric
4. To determine the dielectric strength of transformer oil.
5. Determination of breakdown voltage for different types of insulating materials.
6. To study sphere gap for measurement of high d.c. & a.c. and impulse voltages.
7. To study the components, control and operation of 150kv, 225j impulse generator.
8. Study of horn gap type lightning arrester by high voltage ac/dc test set.
9. Testing of pin type insulator by ac/dc high voltage tester.
10. To study 50kv capacitance divider.

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Diploma Engineering

Course Code: EE1323

Course Name: High Voltage Engineering

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Apply numerical methods for engineering problem.
CO-2	Recall breakdown mechanism for dielectric materials in solid, liquid and gaseous state.
CO-3	Classify insulation test techniques.
CO-4	Examine methods for generation of test high voltage and as well for its measurement.
CO-5	Examine methods for non destructive test techniques.
CO-6	Conclude about correctness of design and manufacturing of high voltage insulations after performing tests

List of Open Source Software/learning website:

1. . Finite Element Method Magnetics FEMM
2. LTSpice for circuitsimulation,
3. KiCAD for CADapplication
4. Vlab.co.in

References used for designing a course:

1. GTU Sem 7 High Voltage Engineering
2. SVNIT High Voltage Engineering

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1324

Course Name: Industrial Automation

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Program Elective-III

Prerequisite: Knowledge of Basic Electrical Engineering, Basic Electronics, Digital Electronics, Electrical Measurement and Instruments

Rationale: Automation is playing a key role in Industries. Industries rely heavily on automation for economic viability and mass production. It is important for the students to learn basic of automation, This course will provide opportunity to learn industrial automation techniques.

Teaching and Examination Scheme:

Teaching Scheme			Credit C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	MSE (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Introduction: Fundamental of Automation & Automation system, Advantages and Disadvantages of Automation System, Industrial Automation, Need of Industrial Automation, Benefits of Industrial Automation,	4
2	Industrial Automation system & its Components: Architecture of Industrial Automation system, Types of Industrial Automation System, Industrial Automation tools, Industrial bus system, component of Industrial Automation System	4
3	Programmable logic controllers (PLC): Programmable logic controllers, Architecture of PLC, Components of PLC, type of Languages used in PLC, Advantage & Disadvantages of using PLC for Industrial automation, Application of PLC in Industries.	4
SECTION-B		
4	Distributed Control System: Importance of DCS , Structure of DCS, Basic Components of a Typical DCS Network, Working & Operation of DCS System, Comparison between PLC and DCS Advantages of DCS, Application of DCS in Industry.	4

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Diploma Engineering

Course Code: EE1324

Course Name: Industrial Automation

Industrial automation using robots:		
5	Basic construction and configuration of robot, Types of Industrial Robots, Pick and place robot, Welding robot, Selection of Industrial Robot and Application of Industrial Robots	4
6	Internet of things (IoT) and Industry 4.0 Fundamentals of Internet of things(IoT), Basic working of IoT, Benefit of IoT in Industrial Automation System, History of Industry Revolution, Overview of Industry 4.0 Technologies and Benefits of Industry 4.0 Model to Industry.	4

Text Books:

Reference Books:

1. Dr. R. Anjana, Industrial Automation, Technical Publications
2. Industrial Instrumentation and Control By. S.K. Singh The McGraw Hill Companies
3. Programmable logic controller, Dunning, Delmar
4. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover, P.H.I.Learning Private Limited
5. Hydraulics and Pneumatics by Andrew Parr, JAICO Publishing Home, Ahmedabad
6. Industrial Automation and Robotics by Er. A. K. Gupta and S. K. Arora, University Science Press Laxmi Publishing Pvt. Ltd.
7. Robotics and Control by R. K. Mittal and I. J. Nagrath, McGraw Hill Education (India) Private Limited.
8. Anagha H. Sahasrabudhe, Industry 4.0, Technical Publications
9. I. A. Dhotre, Industrial Internet Of Things, Technical Publications

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	To Understand basic concepts Industrial Automation System
CO-2	To Identify different Components and its application for industrial automation
CO-3	To Demonstrate PLC for Industrial Automation
CO-4	To Learn Distributed Control System
CO-5	To explain importance of Industrial automation robots
CO-6	To enhance awareness on Internet of things (IoT) and Industry 4.0

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Diploma Engineering

Course Code: EE1324

Course Name: Industrial Automation

List of Open Source Software/learning website:

- Open Source Software:
 - LTSpice for circuit simulation,
 - KiCAD for CAD application
- Web-based tools for design:
 - <http://www.fairchildsemi.com/support/design-tools/power-supply-webdesigner/>
 - <http://www.ti.com/lstds/ti/analog/webench/overview.page>
- Circuit Lab:
 - <https://www.circuitlab.com/editor/>
- Open source Math Tools:
 - <http://maxima.sourceforge.net/>
 - <http://www.sagemath.org/>
 - <http://www.scilab.org/>
 - <http://www.gnu.org/software/octave/>
- Learning website
 - <http://www.electrical-engineering-portal.com/>
 - <http://nptel.iitm.ac.in/courses.php>
- Virtual Lab Website
- www.vlab.co.in

References used for designing a course:

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1325

Course Name: Maintenance of Transformer and Circuit Breaker

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Program Elective-IV

Prerequisite: Electrical Switchgear and Power System Protection.

Rationale: Power system consists of a number of transformers, circuit breakers installed at substations including poll mounted distribution transformers whose numbers are in thousands only in Gujarat. These require regular maintenance to prevent permanent break down. Most of the industries and big commercial installations such as big institutes/hotels/complexes/hospitals that have their own substation also require maintenance of transformers and circuit breakers on regular basis. Most of the big cities are now establishing their own Metro railways. Indian Railways and city metros also have their own substations where transformer and circuit breakers are installed. Power companies also off load their maintenance work of distribution transformers and circuit breakers to private agencies. Thus there is huge demand for maintenance of transformers and circuit breakers.

Teaching and Examination Scheme:

Teaching Scheme			Credit C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA(I)	
2	0	2	3	70	30	30	20	150

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1325

Course Name: Maintenance of Transformer and Circuit Breaker

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Preventive Maintenance: Maintenance and its types - Preventive and Breakdown, Advantages of preventive maintenance, Scope of preventive maintenance, Economics of preventive maintenance	2
2	Maintenance of Different Parts of Power Transformer: Significance of transformer maintenance, Parts of transformer- tank. Core, winding, conservator, radiators, bushings, terminals, temperature measurement system, safety valves, tap changers and accessories/ fittings etc., Factors affecting the life of transformer- moisture, water oxygen, solid impurities, varnish, slackness of windings and dust, Inspection-sensory, records and electrical test, General/Typical maintenance schedule of power transformers-up to 1000 kVA and above 1000 kVA, Maintenance of transformer oil characteristic, interpretation of tests, procedure of testing BDV, filtering plant.	5
3	Analysis of Transformer Maintenance: Causes of failures of power transformers and preventive actions, Detective devices-Buchholz relay, Pressure relief device, Differential relay, Dial thermometer alarm contact, Over current relay, ground fault relay, voltmeter, ammeter, Human senses, Check list of maintenance of power transformers, Causes and methods to reduce Audible Noise (AN) from transformer, Maintenance of distribution transformer - Reasons for failure of Distribution Transformers and the remedial measures, Inspection & Maintenance Schedule for Distribution Transformers, Inspection & Maintenance of transformer and accessories within the sub-station and its proximity, Procedure of measuring the insulation resistance of transformer windings.	5
SECTION-B		
4	Commissioning And Recharging of Transformers: Concept of commissioning and recharging of transformer, General checks, Insulation resistance test, Measurement of oil characteristics, Off circuit tap switch, Continuity test, Measurement of winding resistance, Voltage ratio tests, Magnetizing current, Charging of the transformer, Do's and Don'ts for transformer, Various commissioning tests on a power transformers	3
5	Maintenance Tests on Circuit Breakers: Steps in maintenance of Circuit Breaker, Maintenance of moulded case , low-voltage circuit breakers - Frequency and routine maintenance tests, Maintenance of medium voltage circuit breakers – Air, Oil and Vacuum circuit breakers, Frequency of maintenance, safety practices and maintenance procedures for each of the above, Maintenance of high-voltage circuit breakers - frequency of inspections, External and internal inspection guidelines, typical internal breaker problems, Influence of duty imposed, Types of tests performed.	5
6	Maintenance of Different Types of Circuit Breaker: Oil Circuit Breaker, Post fault maintenance, Steps in maintenance of MOCB, Maintenance for AIR Circuit Breaker and Frequency of maintenance, Maintenance of AIR BLAST Circuit Breaker, SF6 gas circuit breakers, VACCUM Circuit Breakers, Causes of failure of CB, trouble shooting and procedure of failure	4

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1325

Course Name: Maintenance of Transformer and Circuit Breaker

analysis, Typical Record card for maintenance work of Circuit Breaker.

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Text Books:

1. Testing Commissioning operation and maintenance of Electrical Equipments– S. S. Rao, Khanna publication
2. Power system protection and switchgear by Oza, Nair, Mehta, Makwana
3. Fundamentals Of Power System Protection – Y. G. Parithankar & S. R. Bhide, 2nd edition, PHI

Reference Books:

1. Power System Protection – B. Ram , TMH Publication
2. Modern Power System Protection – DivyeshOza, TMH Publication.

List of Practical: (Min. 10 Practical should be performed):

1. To study about maintenance and analysis between preventive and breakdown maintenance.
2. Prepare a report on various accessories and fitments on a power transformer in a substation.
3. To study and perform various tests applied to an insulating oil.
4. Prepare a technical report on various causes of troubles and failure of power transformer.
5. Prepare a typical maintenance schedule for transformer up to 1000kva.
6. Prepare a technical report on filtering process and filtering plant for transformer oil filtration.
7. Prepare test report of a power transformer after commissioning.
8. Perform voltage ration tests of three phase transformer.
9. To study about various types of tests performed on high volatge ac circuit breaker.
10. Prepare test report of tests on circuit breakers after commissioning.

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: EE1325

Course Name: Maintenance of Transformer and Circuit Breaker

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Describe the fundamentals of Preventive Maintenance.
CO-2	Explain Maintenance practices on different parts of Transformer.
CO-3	Analyzing the various parameters on transformer maintenance.
CO-4	Understanding the concept of commissioning and recharging of transformer.
CO-5	Explain the maintenance test performed on Circuit Breaker.
CO-6	Apply the concept of maintenance on different types of Circuit Breaker.

List of Open Source Software/learning website:

NPTEL web courses and video courses

<https://electrical-engineering-portal.com/>

References used for designing a course:

1. GTU

(Established under Gujarat Private Universities Act, 2009)

Diploma of Engineering

Course Code: EE1326

Course Name: Electric Drives

Shroff S.R. Rotary Institute of Chemical Technology

Semester: - VI

Type of course: Program Elective-IV

Prerequisite: Electrical Machine-I & II, Power Electronics

Rationale: Today's industrial and domestic loads demands precise and smooth variable speed control. The development of compact thyristor power converters has made this possible by smooth speed control of both AC and DC motors which are employed for several applications such as DC/AC drives, Vehicles and renewable energy. This course enables to develop the basics of electric drives and maintain different types of DC/AC drives in industries. The competency in this area is highly required in diploma pass outs working in most of the industries since these industries employ large number of motors and drives and their smooth operation and maintenance requires lot of competent man power. Thus this course is must for students who want to work in industries.

Course Objective: The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency: Operate and maintain different types of DC/AC and special electrical machine drives in the industry.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
2	0	2	3	70	30	30	20	150

(Established under Gujarat Private Universities Act, 2009)

Diploma of Engineering

Course Code: EE1326

Course Name: Electric Drives

Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Basics of Electrical Drives: Electric drive, types, AC v/s DC drives, choice of electric drives, Selection of electric drive for applications: agricultural pumps, steel mills, paper mills, rolling mills, spinning mills, cement industries, chemical industries, refineries, shipping, power stations and automobiles, Motor duty class, classification– continuous, short time, intermittent periodic.	3
2	Dynamics of Electrical Drives: Steady state load Torque speed characteristics, Multi quadrant operation of drives, Types of Braking-(a) Plugging, (b) dynamic/rheostat braking and (c) regenerative braking.	6
3	DC Drives: Speed control of DC series and shunt motors – armature and field control, Solid state speed control of single phase and 3 phase DC drives with the following: a) Half wave converter c) Full converter, Chopper controlled drives.	3
SECTION-B		
4	AC Drives - Three Phase Induction Motor Drive: Basic principle of 3 phase induction motor drive, Stator voltage control -3 phase AC voltage controller PWM Drives. Basics of V/F Drive.	4
5	AC Drives - Three Phase Synchronous Motor Drive: Control of synchronous motor - Synchronous mode and Self mode, Self-controlled synchronous motor drive employing load commutated thyristor inverter.	4
6	Drives for Advanced Electrical Machines: Basics of brushless DC motor (BLDC), BLDC Drive, Basics of switched reluctance motor (SRM), SRM Drive, DC drives with chopper control for electrical vehicle.	4

(Established under Gujarat Private Universities Act, 2009)

Diploma of Engineering

Course Code: EE1326

Course Name: Electric Drives

Text Books:

1. "Fundamentals of Electrical Drives" by G K Dubey
2. "Thyristor DC Drives" by P C Sen

Reference Books:

1. "Electric Motor Drives" by R Krishnan
2. "Electric Drives" by De Nisit K and Sen Prasanta K

List of Practical: (Min. 5 Practical should be performed):

1. Control the speed of DC motor using single phase half wave Converter.
2. Control the speed of DC motor using single phase full converter.
3. Control the speed of DC motor using single phase dual converter
4. Control the speed of DC motor using three phase half wave converter.
5. Control the speed of DC motor using three phase full converter.
6. Control the speed of DC motor using chopper.
7. Test the performance of 3 phase induction motor V/f drive.
8. Test the performance of 3- ϕ induction motor using VSI drive.
9. Test the performance of a self-controlled synchronous motor drive employing load commutated thyristor inverter.
10. Test the performance of BLDC motor drive.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Memorizing the fundamentals of Electric Drives and speed control methods.
CO-2	Comparing the different types of drives with respect to their techniques and advantages or disadvantages.
CO-3	Experimenting the different types of Electric DC and AC drives testing and speed control methods.
CO-4	Explaining the working of various Electric DC and AC drives.
CO-5	Measuring and calculating the various parameters of Electric DC and AC drives.
CO-6	Writing test report for the various Electric DC and AC drives.

List of Open Source Software/learning website:

1. SEQUEL (open source)
2. PSim
3. Matlab (Simulink)
4. ORCAD



(Established under Gujarat Private Universities Act, 2009)

Diploma of Engineering

Course Code: EE1326

Course Name: Electric Drives

References used for designing a course:

- 1) Gujarat Technological University Diploma Curriculum

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering
Course Code: EE1327
Course Name: Power Quality

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Open Elective-III

Prerequisite: Basic Electrical Engineering

Rationale: The quality of power can have a direct economic impact on many industrial consumers as there is a great emphasis on automation and more modern electronically controlled, energy-efficient equipment. This course will enable the diploma pass out students to maintain earthing system in substation and analyze power frequency disturbance, electrical transients and harmonics in the power supply and apply appropriate mitigation techniques. Thus this course is very important for students who want to work in power companies

Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	0	3	70	30	0	0	100

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering
Course Code: EE1327
Course Name: Power Quality

Course Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Fundamentals of Power Quality: Significance of Power Quality (PQ) , Causes of Electric PQ problems – Transients- Impulsive, Oscillatory, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power Quality measurement equipment- power line disturbance analyzer, harmonic / spectrum analyzer, flicker meters, disturbance analyzer.	08
2	Harmonics: Harmonics – Odd and even, Voltage and current harmonics, inter harmonics, Effect of harmonics on: Motors Transformer, conductors, capacitors, power electronic equipment, meters, Relays, digital equipment, telephone/communication equipment, cable and lamps	07
3	Power Factor: Introduction, Active and Reactive power, Displacement and true power factor, power factor improvement, correction, penalty.	03
SECTION-B		
4	Electromagnetic Interference: Electric and magnetic fields, Electromagnetic interference terminology, Power frequency fields, High frequency interference, EMI Mitigation, Cable shielding to minimize EMI, Health concerns of EMI	08
5	Power Quality Measurement: Power quality measurement devices, power quality measurements, Number of test locations, Test duration, Instrument setup, Instrument set up guidelines.	05
6	Distributed Generation and Power Quality: Resurgence of DG, DG technologies, Interface to the utility system, Power quality issues, Operating conflicts,	05

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering
Course Code: EE1327
Course Name: Power Quality

Text Books:

1. Power Quality C Sankaran CRC Press
2. Harmonics and Power system Francisco C. De La Rosa CRC (Taylor and Francis)
3. Electric Power Quality Heydt.G.T Stars in a circle publications, Indiana,
4. Power System Quality Assessment J. Arrillaga, N.R. Watson, S. Chen, New York:Wiley, Latest edition
5. Electrical Power Systems Quality R.C. Duggan MG Graw Hill, Latest edition

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Explain Various Power Quality terms of Electrical Power System.
CO-2	Analyze the causes of Harmonics, its effect on various equipment and its mitigation techniques.
CO-3	Analyze various Power Quality problems
CO-4	Analyze the power factor in power systems.
CO-5	Evaluate performance of power systems (in regards to Power Quality Issues) under various power quality polluting devices using appropriate power quality measuring tools.
CO-6	Application of Power quality measurement devices.

List of Open Source Software/learning website:

- i. <http://nptel.iitm.ac.in>
- ii. <http://iitm.vlab.co.in/?sub=46&brch=144&sim=1056&cnt=4>
- iii. <http://www.edumedia-sciences.com>
- iv. <http://www.engineeringtv.com/video/Texas-Instruments>

References used for designing a course:

1. GTU Diploma Sem 6 Power Quality.

(Established under Gujarat Private Universities Act, 2009)

Diploma of Engineering

Course Code: EE1328

Course Name: Electric Vehicles

Shroff S.R. Rotary Institute of Chemical Technology

Semester: - VI

Type of course: Open Elective-III

Prerequisite: Electrical Machine-I & II, Power Electronics

Rationale: Vehicle is an unavoidable machine for the industry, individual and government. The fuel consumptions have led the nations to be dependent on electric vehicles and needs a major change in the operation in context to energy saving. The electric vehicle has drawn attention of the designers, researchers and manufacturers for the skilled persons needed in this era. The energy saving concept has led to electric vehicle in all the concepts for the transportation.

Course Objective: The aim of this course is to help the student to attain the following industry identified competency through various teaching learning experiences:

- Maintain electric vehicles

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	0	0	3	70	30	0	0	100

(Established under Gujarat Private Universities Act, 2009)

Diploma of Engineering

Course Code: EE1328

Course Name: Electric Vehicles

Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Electric Vehicles: History, Basics of Electric Vehicles ,Components of Electric Vehicle, General Layout of EV, EV classification : Battery Electric Vehicles (BEVs), Fuel-Cell Electric Vehicles (FCEVs) Comparison with Internal Combustion Engine on Technology, Advantages & Disadvantages of EV, National Policy for adoption of EVs.	7
2	Dynamics of Electric vehicles: Classification of motors used in Electric vehicles, Energy saving potential of hybrid drive trains HEV Configurations-Series, parallel, Series-parallel, complex.	4
3	DC-DC Converters for EV Applications: Classification of converters – unidirectional and bidirectional Principle of step down operation Boost and Buck- Boost converters Principle of Step-Up operation Two quadrant converters; multi quadrant converters	7
SECTION-B		
4	DC-AC Inverter & Motors for EV: Principle of operation of half bridge DC-AC inverter (R load, R-L load) Single phase Bridge DC-AC inverter with R load, R-L load Electric Machines used in EVs, principle of operation, working & control.	7
5	Batteries: Battery Parameters, types of batteries, Schematics of hybrid drive train, control architecture Regenerative braking in EVs.	4
6	Vehicle fundamentals: Vehicle resistance, Types: Rolling Resistance, grading resistance, Calculating The Acceleration Force, maximum speed, Finding The Total Tractive Effort, Torque Required On The Drive Wheel.	7

(Established under Gujarat Private Universities Act, 2009)

Diploma of Engineering

Course Code: EE1328

Course Name: Electric Vehicles

Text Books:

1. A.K. Babu, Electric & Hybrid Vehicles, Khanna Publishing House, New Delhi (Ed. 2018)
2. Husain, I. Electric and Hybrid Electric Vehicles, CRC Press

Reference Books:

1. Ehsani, M. Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press
2. Lechner G. and H. Naunheimer, Automotive Transmissions: Fundamentals, Selection, Design and Application, Springer

List of Practical: NA

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	To explain the basic of Electric vehicles and its major parts.
CO-2	To define the functionality and working principles of different types of Electric vehicles
CO-3	To illustrate the working of various Power Electronics Converters for EVs.
CO-4	To explain vehicle fundamentals of various subsystem
CO-5	To illustrate the working of motors and conversions.
CO-6	To identify and illustrate the various electric vehicles and their different modes of operations.

List of Open Source Software/learning website:

1. MultiSim
2. PSim
3. Matlab (Simulink)
4. ORCAD

References used for designing a course:

- 1) Gujarat Technological University Diploma Curriculum

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: MH1303

Course Name: Project

Shroff S.R. Rotary Institute of Chemical Technology

Semester: VI

Type of course: Major Project

Prerequisite: Electrical Engineering courses (Basic science, Engineering Science and core courses)

Rationale: This course enables the students to exercise some of the knowledge and/or skills developed during the programme to new situation or problem for which there are number of engineering solutions. This course include planning of the tasks which are to be completed within the time allocated, and in turn, helps to develop ability to plan, , use, monitor and control resources optimally and economically. By studying this course abilities like creativity, imitativeness and performance qualities are also developed in students. Leadership development and supervision skills are also integrated objectives of learning this course.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
0	0	18	9	00	00	100	100	200

Content:

Student will select a topic for project work in consultation with the guiding teacher and/or expert from industries. The student will have to do literature survey & experimental work on that topic. At the end of the semester he/she will have to submit a report on his/her works. The student will present his/her topic in front of experts and staff. His/her performance will be assessed on the basis of his/her project report and presentation.

(Established under Gujarat Private Universities Act, 2009)

Diploma Engineering

Course Code: MH1303

Course Name: Project

Course Outcomes:

At the end of the course, the student will be able to:

Sr. No.	CO statement
CO-1	Demonstrate a sound technical knowledge of their selected project topic
CO-2	Develop innovative and creative ideas.
CO-3	Undertake problem identification, formulation and solution
CO-4	Design engineering solutions to complex problems utilising a systems approach and team work
CO-5	Communicate with engineers and the community at large in written and oral forms
CO-6	Demonstrate the knowledge and understanding of engineering and management principle and apply it to assigned project

List of Open Source Software/learning website:

- <http://nptel.iitm.ac.in>
- World Wide Web
- Google Search Engine etc.