

(Established under Gujarat Private Universities Act, 2009)

## Shroff S.R. Rotary Institute of Chemical Technology

Ref: UPL University /SRICT/BOS/EE/2021-22/03

Date: 17-03-2022

### Proposed Teaching Scheme for Second Year Diploma in Electrical Engineering

#### Semester-III (Electrical Engineering) Proposed 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	MH1201	Communication Skills in English	3	0	2	5	4	70	30	20	30	150
2	Program corecourses	EE1201	Electrical and Electronic Instruments & Measurements	3	0	2	5	4	70	30	20	30	150
3	Program corecourses	EE1202	Electrical Machines- I	3	0	2	5	4	70	30	20	30	150
4	Program corecourses	EE1203	Analog and Digital Electronics	3	0	2	5	4	70	30	20	30	150
5	Program corecourses	EE1204	Electrical Power Generation	3	0	0	3	3	70	30	0	0	100
6	Program corecourses	EE1205	Electric Circuit and Components	2	0	2	4	3	70	30	20	30	150
7	Audit Course	MH1202	Essence of Indian Traditional Knowledge	1	0	0	1	0	0	0	20	30	50
8	Internship	MH1203	In-Plant Training	0	0	0	0	1	0	0	50	0	50
<b>Total</b>							<b>28</b>	<b>23</b>	<b>420</b>	<b>180</b>	<b>170</b>	<b>180</b>	<b>950</b>

(Established under Gujarat Private Universities Act, 2009)

### Semester-IV (Electrical Engineering) Proposed 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	EE1206	Electrical Machines - II	3	0	2	5	4	70	30	20	30	150
2	Program core courses	EE1207	Utilization of Electrical Energy	3	0	0	3	3	70	30	0	0	100
3	Program core courses	EE1208	Electric Power Transmission and Distribution	3	0	2	5	4	70	30	20	30	150
4	Program core courses	EE1209	Fundamental of Power Electronics	3	0	2	5	4	70	30	20	30	150
5	Program Elective-1	--	Program Elective-1	3	0	2	5	4	70	30	20	30	150
6	Open Elective-1	--	Open Elective-1	3	0	0	3	3	70	30	0	0	100
<b>Total</b>							<b>26</b>	<b>22</b>	<b>420</b>	<b>180</b>	<b>80</b>	<b>120</b>	<b>800</b>

Professional Elective-1	
Course Code	Course Name
EE1210	Electrical Estimation, Costing and Wiring
EE1211	Industrial Instrumentation

Open Elective-1	
Course Code	Course Name
EE1212	Computer Aided Electrical Drawing and Simulation
EE1213	Energy Conservation in Electrical System

#### Code and Abbreviations:

Code	Abbreviation
L	Lecture
T	Tutorial
P	Practical
E	Theory External Examination Marks
M	Theory Internal Examination Marks
I	Practical Internal Examination Marks
V	Practical External Examination Marks

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: MH1201**

**Course Name: Communication Skills in English**

**Shroff S.R. Rotary Institute of Chemical Technology**

**Semester: III**

**Type of course:** Language and Communication

**Prerequisite:** Zeal to learn the Language

**Rationale:** The rationale of the curriculum is to help students to express their original ideas in English and also develop interest in language and literature with a focus on comprehension, and reading, speaking and writing skills.

**Teaching and Examination Scheme:**

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

**Content:**

Sr. No	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Prose:</b> 1) An Astrologer's Day by R. K. Narayan 2) The Portrait of a Lady by Khushwant Singh, 3) Sparrows by K.A. Abbas 4) The Night Train at Deoli by Ruskin Bond	6
2	<b>Poetry:</b> 1) My Grandmother by Elizabeth Jennings, 2) My Papa's Waltz by Theodore Roethke, 3) The Road Not Taken by Robert Frost 4) The Tyger by William Blake.	7
3	<b>Fiction:</b> Robinson Crusoe by Daniel Defoe	7
<b>SECTION-B</b>		
4	Listening Ability: Hearing & Listening, Types of Listening, Traits of an Effective Listener	6

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: MH1201**

**Course Name: Communication Skills in English**

<b>5</b>	Speaking Skills: Group Discussion, Interview, Presentation Strategies , Public Speaking	<b>6</b>
<b>6</b>	Writing :Mastering the final Skill: Paragraph Writing, Comprehension Passage Business Letters-Complaint, Enquiry, Sales, Order, Apology) Email Etiquettes	<b>7</b>

**Suggested Specification table with Marks (Theory):**

<b>Distribution of Theory Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
15	15	15	15	5	5

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

**Reference Books:**

1. Prism: Spoken and Written Communication, Prose & Poetry' published by Orient Longman
2. Robinson Crusoe, Daniel Defoe, Harper Collins, UK
3. Communication Skills by Sanjay Kumar& Pushp Lata, OUP.
4. The Most Anthologized Poems of the Last 25 Years - Literary ...

**List of Practical /Tutorials: Language**

**Laboratory Activities:**

Sr. No.	Practical/ Exercise	Apprx. Hours required
<b>1</b>	Conversation at a Clinic	<b>2</b>
<b>2</b>	Seeking Information about various Engineering Programs at an Institute	<b>2</b>
<b>3</b>	At the cinema Hall	<b>2</b>

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: MH1201**

**Course Name: Communication Skills in English**

<b>4</b>	Letter Writing	<b>2</b>
<b>5</b>	Conversing with your colleagues/Co-workers	<b>2</b>
<b>6</b>	Comprehension Passage	<b>2</b>
<b>7</b>	Picture Description & Completion of a Story	<b>2</b>
<b>8</b>	Presentation.	<b>2</b>
<b>9</b>	Group Discussion	<b>2</b>
<b>10</b>	Interview	<b>2</b>

**Course Outcomes:**

After Learning this course, students will be able to:

<b>Sr. No.</b>	<b>CO statement</b>
CO-1	Use English in day-to-day communication
CO-2	Use various forms of vocabulary in varied situations in oral and written communication.
CO-3	Comprehend the dynamics of various rules of grammar and check its validation while they speak and write language correctly
CO-4	Use grammar effectively to make themselves competent Listener, Speaker, Reader and Writer by exposing to various set of situations
CO-5	Write various formal and informal documents of day to day life
CO-6	Prepare for lifelong learning and enjoyment of English Language and literature.

**List of Open Source Software/learning website:**

- <http://www.free-english-study.com/>
- <http://www.english-online.org.uk/course.htm>

(Established under Gujarat Private Universities Act,

**Diploma of Engineering**

**Course Code: EE1201**

**Course Name: Electrical and Electronic Instruments & Measurements**

## Shroff S.R. Rotary Institute of Chemical Technology

### Semester: - III

**Type of course:** Program Core Course

**Prerequisite:** Basic Electrical Engineering

**Rationale:** Electrical installations ranging from residential consumers to huge industrial estates all are equipped with measuring instruments. In view of this, study of principles of Electrical measurements and measuring instruments becomes mandatory for all electrical engineers. This subject deals with principles of measurements, analog and measuring instruments as well as transducers.

**Course Objectives:**

**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)	
3	0	2	4	70	30	30	20	150

**Course Content:**

**Content:**

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Concepts of Measurement :</b> Philosophy Of Measurement- Methods of Measurement, Measurement System, Classification of instrument system, Methods of Measurement, Types & sources of error Static Characteristics like accuracy, precision, sensitivity, linearity, range, reproducibility, drift, threshold, dead zone etc. Introduction to measurement of speed, frequency and power factor. Measurement Standards Errors in measurement.	<b>06</b>
2	<b>Potentiometers &amp; Bridges:</b> D.C. potentiometer, principle, working and	<b>08</b>

Page 1 of 1

(Established under Gujarat Private Universities Act,

**Diploma of Engineering**

**Course Code: EE1201**

**Course Name: Electrical and Electronic Instruments & Measurements**

## Shroff S.R. Rotary Institute of Chemical Technology

	list of applications, Wheatstone bridge and Kelvin's double bridge for resistance measurement, Balanced and unbalanced bridges, Self balancing, Measurement of inductance & capacitance with the help of AC Bridges (Maxwell bridge, Anderson Bridge), LCR meter - working principle with block diagram	
<b>3</b>	<b>Calibrations &amp; Testing:</b> Need for calibration, Calibration of ammeter, Watt meter and voltmeter as per I.S. Calibration of single phase energy meter and its adjustments as per I.S.code. Introduction to NABL.	<b>04</b>
<b>SECTION-B</b>		
<b>4</b>	<b>Transducers and Sensors :</b> Definition, different types of transducers, criteria for selection, transducers for measurement of temperature ((Thermocouple and RTD), transducers for measurement of pressure, strain, transducers for measurement of displacement, speed, torque, Hall Effect transducer Sensors – basic concept – Speed and position sensors, Data transmission and telemetry – methods of data transmission	<b>08</b>
<b>5</b>	<b>Basic Parameter Measurements:</b> Differentiate between moving iron and moving coil type instruments, Measure DC and AC voltage and current using analogue meter, Extend the measuring range of the meters, Explain its working of DVM with sketches, Describe working and advantage of digital multimeter, Discriminate between energy and power, Measure energy and power using Watt meter and Energy Meter, Measure quality factor of a coil and a capacitor .	<b>08</b>
<b>6</b>	<b>Digital Measurement of Electrical Quantities:</b> Concept of digital measurement, block diagram Study of digital voltmeter, Electronic Multimeter. Digital recorders, Digital Storage Oscilloscope - Block Diagram, theory and applications, Power scope.	<b>03</b>

### Text Books:

1. Gupta J. B., "A Course in Electronics and Electrical Measurements and Instrumentation", S.K. Kataria & Sons
2. A.K.Sawhney, "Electrical and Electronic Measurements and Instrumentation", DHANPAT RAI & CO.

**(Established under Gujarat Private Universities Act,**

**Diploma of Engineering**

**Course Code: EE1201**

**Course Name: Electrical and Electronic Instruments & Measurements**

---

## Shroff S.R. Rotary Institute of Chemical Technology

---

### Reference Books:

1. Golding & Widis, 'Electrical Measurement and Measurement instrument', Wheeler Books
2. D. Patranabis, 'Sensors & Transducers', PHI.
3. H. S. Kalsi, " Electronic Instrumentation", Tata McGraw-Hill Education.
4. A.J. Bouwens, 'Digital Instrumentation', Tata Mc-Graw hill.

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

1. Measure various parameters viz. voltage, current, resistance using Digital Multimeter.
2. Investigation of source of error in measurements & observation of the value of statistical analysis.
3. Measure the value of unknown resistor using Wheatstone bridge.
4. Measurement of unknown value of low resistance by balancing the Kelvin's double bridge.
5. Measurement of unknown value of voltage, current & resistance using potentiometer.
6. Measurement of the value of unknown inductance using Anderson Bridge.
7. Measurement of the value of unknown inductance using Maxwell's Inductance.
8. Measurement of the value of unknown capacitance using Maxwell's Capacitance Bridge.
9. Measurement of energy and calibration of single phase energy meter with wattmeter.
10. Introduction to transducers and sensors.
11. Measurement of power & power factor in 3- $\phi$  load by 2- wattmeter method.
12. Measure voltage, frequency, phase and modulation index
13. (trapezoidal method) using CRO



(Established under Gujarat Private Universities Act,

**Diploma of Engineering**

**Course Code: EE1201**

**Course Name: Electrical and Electronic Instruments & Measurements**

## Shroff S.R. Rotary Institute of Chemical Technology

### Course Outcomes:

Students will be able to:

Cos	CO statement
CO.1	Comprehend the basics of electrical measurements.
CO.2	Apply AC and DC bridges for measurement of electrical parameters like resistance, inductance and capacitance and potential difference with potentiometers.
CO.3	Understanding Calibration & Testing.
CO.4	Explain basic principle, working, characteristics and applications of the various measuring instruments and transducers and sensors.
CO.5	Understand the working principal and construction of moving iron Instruments.
CO.6	Understand the working principal and construction of the Digital measuring instruments and DSO.

### List of Open Source Software/learning website:

- <http://www.scilab.org/>

- <http://www.vlab.co.in/>

### References used for designing a course:

1. SVNIT
2. GTU
3. PDEU

(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**  
**Course Code: EE1202**  
**Course Name: Electrical Machines-I**

## Shroff S.R. Rotary Institute of Chemical Technology

### Semester: III

**Type of course:** Program Core Course

**Prerequisite:** Fundamentals of Electrical Engineering is required.

**Rationale:** Electricity machines play a vital role in industries, agriculture, irrigation, domestic and almost all sectors of society. Static AC and rotating DC machines are utilized in by industries for various types of applications. This course deals with basic principles of DC machines and Transformers.

#### Course Objectives:

1. To create awareness about the basic principles, fundamental concepts, working and operating characteristics of electrical machines, such as D.C. Machines & Transformers.
2. To understand the operating characteristics and testing methods for D.C. Machines & Transformers.
3. To understand the performance analysis of different types of DC machines & Transformers
4. To have a sound knowledge about the different applications of DC machines & Transformers.

#### 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)	
3	0	2	4	70	30	30	20	150

#### Content:

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>DC Generators:</b> <b>(A) Principle of DC Machine:</b> Working Principle of DC Machines, Classification of DC Generators <b>(B) Construction and Working:</b> Construction and materials used for various parts of DC generator, Functions of various parts of DC generator: Methods of excitation- separately and self-excited – shunt, series, compound. <b>(C) DC Generators Characteristics:</b>	<b>08</b>

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1202**

**Course Name: Electrical Machines-I**

	<p>EMF equation of DC generator, Simplex lap and wave winding, Characteristics of various types DC generators,</p> <p><b>(D) Performance of DC Generators:</b> Efficiency and losses of DC Generator, Losses and efficiency, Power flow diagram, Parallel operation, Applications of DC generators</p> <p><b>(E) Armature Reaction:</b> Effects of armature reaction - demagnetizing &amp; cross magnetizing ampere-turns, compensating windings, inter poles, commutation and methods to improve commutation Numerical.</p>	
2	<p><b>DC Motors:</b> Working principle of DC motor, back emf, Classification of DC Motors- Series, Shunt and Compound DC motors, Torque equation for DC motor, Performance characteristics of DC Series, Shunt and Compound motor, Speed control of D.C. motor, Need DC motor starters, Construction and working of DC motor starters, Numerical.</p>	06
3	<p><b>Testing of DC Machines:</b> Brake Test, Swinburne's Test, Regenerative/Hopkinson's Test, Retardation/Running Down Test, Field's Test for DC Series Motors, Numerical.</p>	04
<b>SECTION-B</b>		
4	<p><b>Single Phase Transformers:</b> Single phase transformer: Working principle, construction, materials used for different parts, EMF equation and transformation ratio, Core and shell type of transformers, Phasor diagram for load and different types of loads, Equivalent circuit of single phase transformer, Equivalent circuit of single phase transformer, Losses in transformer: Iron loss, Copper loss, Hysteresis loss and eddy current loss, Efficiency Condition for maximum efficiency of single phase transformer, Voltage regulation, Numerical</p>	07
5	<p><b>Testing of Single Phase Transformers:</b> Direct load test, OC and SC test and Sumpner Test along with connection diagrams, efficiency and regulation of transformer, Derivation of equivalent circuit and its related parameters, Need of parallel operation, essential and desirable conditions for parallel operation, Need of parallel operation, essential and desirable conditions for parallel operation, Construction and working of autotransformer.</p>	04
6	<p><b>Three Phase Transformers:</b> Comparison of three phase transformer with bank of three single phase transformers, Arrangement of Core and windings in transformer, use of tap changer. Types of losses in transformers, Construction - Accessories of 3 phase</p>	07

(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1202**

**Course Name: Electrical Machines-I**

transformer: Main tank, bushings, conservator with breather, oil level gauge, radiators, buchholz relay, explosion vent, temperature indicators, junction box, Star delta connections and vector groups, Cooling of transformer: Natural cooling, Forced cooling, Parallel operation – Essential and desirable Conditions, Maintenance of different types of transformers, welding transformer and dry type of transformer-Construction and Working.
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Text Books:**

1. P.S. Bhimbra, Electrical Machinery, Khanna Publishers.
2. J. B. Gupta, Electrical Machines, S. K. Kataria & Sons, New Delhi.

**Reference Books:**

1. Theraja, B.L., Electrical Technology Vol-II, S. Chand, New Delhi.
2. Nagrath I J and Kothari D P, Electric Machines, Tata McGraw Hill.
3. MG Say, Theory, Performance & Design of A.C. Machines, CBS Publishers.

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

1. To obtain Magnetizing Characteristics, Internal & External Characteristic of Self Excited DC Shunt Generator. Also obtain the critical field resistance of the machine from magnetizing Characteristics.
2. To conduct direct load test on a D.C. compound generator with a) Shunt field alone b) Cumulative and differential compounding for short and long shunt connections.
3. To obtain Speed-Torque characteristics of DC Series Motor and DC Shunt Motor.
4. To determine the efficiency of two similar shunt machines by regenerative method. (Hopkinson's Test.)
5. To perform field test on identical D.C. series machines.
6. To determine the various losses in a D.C. machine and separation of its core losses.
7. To perform direct load test on a D.C. shunt motor and plot variation of (a) Input current (b) Speed(c) Torque (d) Efficiency versus output power.
8. To separate hysteresis and eddy current losses of a single phase transformer at rated voltage, frequency by conducting no load tests at different frequencies keeping V/f constant.
9. To operate two single phase transformers of different KVA ratings in parallel and plot the variation of currents shared by each transformer versus load current.
10. To conduct Sumpner test on two identical single phase transformers and determine their efficiency at various loads.
11. To perform Swinburne's test on DC shunt motor to find out its efficiency.
12. Speed control of DC Shunt Motor using a) Armature control and b) field control methods.

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1202**

**Course Name: Electrical Machines-I**

---

**Course Outcomes:**

Students will be able to:

<b>COs</b>	<b>CO statement</b>
CO.1	Describe the basic energy conversation principle in electrical machine field, working principle, performance, control and applications of DC Machines and Transformer.
CO.2	Illustrate the operating range and efficiency for each machine running under different operating conditions.
CO.3	Demonstrate the connection diagram, test and conduct performance experiments on DC machine and Transformer.
CO.4	Analyze. Identify, formulate and solve DC machine and Transformer related problems.
CO.5	To motivate the student towards designing of the machines by providing them Design based problems/ Open ended Problems that they can enhance the real application of machine.
CO.6	Evaluate the performance knowledge of the students by giving them open ended problems.



**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1202**

**Course Name: Electrical Machine-I**

---

## Shroff S.R. Rotary Institute of Chemical Technology

---

### **List of Open Source Software/learning website:**

- <http://www.scilab.org/>
- <http://www.vlab.co.in/>

### **References used for designing a course:**

NPTEL Course-Electrical Machines-I by Prof. Tapas Kumar Bhattacharya, IIT Kharagpur.  
Electrical Machines-I, Pandit Deendayal Energy University.  
Electrical Machines-I, Gujarat Technological University.

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1203**

**Course Name: Analog and Digital Electronics**

## Shroff S.R. Rotary Institute of Chemical Technology

### Semester: - III

**Type of course:** Program Core Courses

**Prerequisite:** Fundamental knowledge of Basic Electronics

**Rationale:** Analog and Digital electronic components and circuits are building blocks for any electronic device used in industries or in daily life. It is therefore necessary for electronics engineers to understand clearly the principles and functioning of the basic analog and digital components and circuits. This course will enable the students to understand the basics of construction, working, and applications of various types of electronic components such as Op-amp, Flip Flop, Counter, ADC, DAC and circuits. Practical exercises of this course would enable students to maintain such circuits and in turn maintain equipment having such circuits. This course is therefore one of the Program core courses which is must for every electronic and electrical engineer and hence should be taken very sincerely by students.

**Course Objective:** The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competency.

#### 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	2	4	70	30	20	30	150

#### Content:

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
<b>1</b>	<b>Diodes and Transistors and its Applications:</b> P-N junction diode, Half wave, Full wave and Bridge Rectifier. PNP and NPN transistor (working)	<b>3</b>

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1203**

**Course Name: Analog and Digital Electronics**

	principle). Transistor as switch.	
<b>2</b>	<b>Differential, multi-stage and operational amplifiers:</b> Differential amplifier; power amplifier, internal structure of an operational amplifier, Characteristics of an ideal op-amp, ideal op-amp v/s practical op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product).	<b>8</b>
<b>3</b>	<b>Linear and Non-Linear applications of op-amp:</b> Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, Differentiator, integrator, voltage regulator, oscillators (Wein bridge and phase Shift), Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector.	<b>10</b>
<b>SECTION-B</b>		
<b>4</b>	<b>Numbering System and Logic Gates:</b> Decimal, Binary, Octal, Hexadecimal. Conversion of one unit to another unit. Logic gates, Universal logic gates. Rules of Boolean algebra, De-Morgan's Theorems.	<b>3</b>
<b>5</b>	<b>Combinational Digital Circuits:</b> K-map representation in 2-Variable K-map & 3-Variable K-map, simplification of logic functions using K-map. Half & Full adder, Half & Full Subtractor, BCD-Excess 3 Conversion, 2 to 4 line & 3 to 8 line decoder, 4 to 2 line Encoder, 8 to 3 line Encoder, 4x1 Multiplexer, 1x4 De-multiplexer.	<b>10</b>
<b>6</b>	<b>Sequential circuits and systems:</b> The clocked SR flip flop, J- K-T and D types flip-flops, applications of flip-flops, shift registers, ring counter, sequence generator, ripple(Asynchronous) counters, synchronous counters, asynchronous sequential counters. A/D & D/A converter.	<b>8</b>

**Text Books:**

1. Principles of Electronics, V K Mehta, S. Chand, 2004 or latest
2. Fundamentals of Digital Circuits by Anand Kumar, PHI, Learning, 4<sup>th</sup> Edition.
3. Modern digital electronics by R. K. Jain.

**Reference Books:**

1. Op-Amps and Linear Integrated Circuits by Ramakant A Gayakwad, PHI, Learning, 4<sup>th</sup> Edition.
2. Digital Logic & Computer Design by M. Morris Mano, Pearson.
3. Digital Electronics: Principles, Devices and Applications by Anil K. Maini, Willey Publications.



**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1203**

**Course Name: Analog and Digital Electronics**

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

1. Test the inverting amplifier using Op-Amp and observe input, output waveforms on DSO.
2. Test the Non-inverting amplifier using Op-Amp and observe input, output waveforms on DSO.
3. Application of Op-Amp as Summing Amplifier
4. Application of Op-Amp as Integrator
5. Application of Op-Amp as Differentiator
6. Measurement of Operational Amplifier parameter:- Common mode gain, difference mode gain, CMRR ,slew rate.
7. Study of non-sinusoidal oscillator:-Astable Multivibrator
8. Verify the Demorgan's theorem.
9. Verify NAND and NOR as universal gates.
10. Verification of R-S and D flip-flops.
11. Verification of 4 bit binary asynchronous counting
12. Verification of 4 bit Up/Down counting
13. Verification of decoder and encoder circuit truth table.

**Course Outcomes:**

Students will be able to:

Sr. No.	CO statement
CO-1	To memorize the functioning and selection of OP-AMP and functioning of Digital components.
CO-2	To Discuss the working of different OP-AMP based and digital circuits.
CO-3	To implement Op-amp based analog circuits and Digital Combinational & Sequential logic circuits.
CO-4	To Experiment the different Op-amp and Digital circuits.
CO-5	To Evaluate the various parameters of Analog and Digital Circuits.
CO-6	To Design the different types of Op-amp based circuits and Digital circuits.

**List of Open Source Software/learning website:**

- 1) Psim software
- 2) MultiSim software

**Diploma of Engineering**

**Course Code: EE1203**

**Course Name: Analog and Digital Electronics**

---

3) website : <https://www.vlab.co.in>

**References used for designing a course:**

1) Gujarat Technological University Diploma and Degree Curriculum

(Established under Gujarat Private Universities Act, 2009)

**Diploma Engineering**

**Course Code: EE1204**

**Course Name: Electrical Power Generation**

## Shroff S.R. Rotary Institute of Chemical Technology

**Semester: III**

**Type of course:** Program core course

**Prerequisite:** Basic of Electrical Engineering

**Rationale:** Generation of Electric Power is most important activity in power system. With growing demand for electric power at one hand and depleting fossil fuel resources it has become more necessary to generate electric power more efficiently and with the help of renewal energy resources. With advancement in technology it has become possible to generate electric power commercially using wind and solar energy. This course therefore deals in detail about generation of electric power using Thermal (Coal), Hydro, Nuclear, Solar, Wind, Diesel and Other renewal energy sources. These types of power plants need highly skilled technicians who are capable of operating various control equipment to supply uninterrupted power. This course attempts to develop the basic cognitive skills required to take appropriate decisions to maintain the various generating and auxiliary equipment of power plants. Moreover, the safety precautions required to be followed by the engineering diploma holders in various power plants is also included in this course.

**Course Objectives:**

- Maintain the optimized working of the thermal power plant.
- Maintain the optimized working of large and micro hydro power plants.
- Maintain the optimized working of solar and biomass-based power plants.
- Maintain the optimized working of wind power plants.

**Teaching and Examination Scheme:**

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

(Established under Gujarat Private Universities Act, 2009)

**Diploma Engineering**

**Course Code: EE1204**

**Course Name: Electrical Power Generation**

**Course Content:**

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<p><b>Introduction:</b> Electrical energy demand and electrical energy growth in India, Electrical energy sources, Fossil fuels and nuclear fuels, Present status of Power Generation in India &amp; Gujarat.</p> <p><b>Hydro power station:</b> Schematic arrangement, advantages and disadvantages, choice of site constituents of hydro power plant, Hydro turbine. Environmental aspects for selecting the sites and locations of hydro power stations</p>	6
2	<p><b>Thermal Power Plants:</b> Selection of plant location, Block diagram of plant and its working,, Coal handling plant, Pulverizing plant, Draft system, Boilers, Ash handling plant, Turbine, Different types of condensers, Cooling towers and ponds, Feed water heater, Economizer, Super heater and Air preheater. Thermal power plants in Gujarat.</p>	6
3	<p><b>Nuclear power station:</b> Schematic arrangement, advantages and disadvantages, selection of site, types of reactors, Hazards, Environmental aspects for selecting the sites and locations of nuclear power stations</p>	6
<b>SECTION-B</b>		
4	<p><b>Solar and Biomass based Power Plants :</b> Solar Map of India: Global solar power radiation. Solar Power Technology -Concentrated Solar Power (CSP) plants, construction and working, Solar Photovoltaic (PV) power plant: layout, construction, working. Different types of solar PV systems. Solar Power Generation in Gujarat.</p> <p>Biomass-based Power Plants Layout of a Bio-chemical based (e.g. biogas) power plant, Layout of a Thermo-chemical based (e.g. Municipal waste) power plant. Plant Features of the solid, liquid and gas biomasses as fuel for biomass power plant</p>	6
5	<p><b>Wind Power Plants Wind Map of India:</b> Wind power density in watts per square meter Layout of Horizontal axis large wind power plant: Geared wind power plant. Direct-drive wind</p>	6

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1204**

**Course Name: Electrical Power Generation**

	power plant. Salient Features of electric generators used in large wind power plants: Constant Speed Electric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG) Variable Speed Electric Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSYG), permanent magnet synchronous generator (PMSG)	
6	<b>Economics of Power Generation and Interconnected Power System:</b> Related terms: connected load, firm power, cold reserve, hot reserve, spinning reserve. Base load and peak load plants; Load curve, load duration curve, integrated duration curve Cost of generation: Average demand, maximum demand, demand factor, plant capacity factor, plant use factor, diversity factor, load factor and plant load factor.	6

**Text Books:**

1. Renewable Energy Resources, J. Twidell and T. Weir, E & F N Spon Ltd, London, 1999 7.
2. Electric Power Generation: Transmission and Distribution, S. N. Singh, PHI Learning, New

**Reference Books:**

1. Nag. P. K. Power Plant Engineering, McGraw Hill, New Delhi, ISBN: 978-9339204044
2. Tanmoy Deb, Electrical Power Generation, Khanna Publishing House, Delhi (Ed. 2018)
3. Gupta, B.R., Generation of Electrical Energy, S. Chand & Co. New Delhi

**Course Outcomes:**

Students will be able to:

COs	CO statement
CO.1	Understand the hydro energy conversion process with block diagrams and identify the appropriate site for it.
CO.2	Understand the optimized working of the thermal power plant.
CO.3	Understand the optimized working of the Nuclear power plant.
CO.4	Understand the optimized working of solar and biomass-based power plants.
CO.5	Understand the optimized working of wind power plants.
CO.6	Analyze the adequate mix of power generation based on economic operation.

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1204**

**Course Name: Electrical Power Generation**

---

**List of Open Source Software/learning website: NPTEL**

**References used for designing a course:**

- GTU
- AICTE

(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1205**

**Course Name: Electric Circuit and Components**

**Shroff S.R. Rotary Institute of Chemical Technology**

**Semester: - III**

**Type of course:** Program Core Course

**Prerequisite:** Fundamental knowledge of electric circuit sources and elements, basic mathematics

**Rationale:** Electrical circuits are the heart of the power system. Analysis and response of electrical circuits for various inputs is the basic requirement to understand the behavior of the system. This subject is intended to provide the basic insight into the theory and problems related to electrical circuit analysis and circuit components.

**Course Objectives:**

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

- Maintain electrical systems applying AC and DC circuit fundamentals.

**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	2	3	70	30	30	20	150

**Course Content:**

**Content:**

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Elementary Concepts:</b> Introduction of Electrical Current, Voltage, Power and Energy; Ideal electrical circuit elements - Resistor, Inductor and Capacitor;	02
2	<b>Principles of Circuit Analysis</b> Fundamental laws of electric circuits - Ohm's Law and Kirchhoff's Laws; Analysis of series, parallel and series-parallel circuits; Star – Delta conversion; Node and Mesh analysis.	05
3	<b>Network Theorems</b> Superposition theorem, Thevenin's theorem, Norton's theorem,	05

(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1205**

**Course Name: Electric Circuit and Components**

	Maximum power transfer theorem and Reciprocity theorem for resistive circuits	
<b>SECTION-B</b>		
<b>4</b>	<b>Single Phase A.C Series Circuits</b> Generation of alternating voltage, Phasor representation of sinusoidal quantities, R, L, C circuit elements its voltage and current response R-L, R-C, R-L-C combination of A.C series circuit, Resonance in RLC circuit	<b>4</b>
<b>5</b>	<b>Single Phase A.C Parallel Circuits</b> R-L, R-C and R-L-C parallel combination of A.C. circuits. Power factor, active power, apparent power, reactive power, power triangle, Resonance in parallel R-L-C circuit.	<b>4</b>
<b>6</b>	<b>Three Phase Circuits</b> Phasor and complex representation of three phase supply, Phase sequence and polarity, Types of three-phase connections, Phase and line quantities in three phase star and delta system, Three phase power, active, reactive and apparent power in star and delta system.	<b>4</b>

**Text Books:**

1. R. P. Ajwalia, "AC Circuits", Atul Prakashan
2. R. P. Ajwalia, "DC Circuits", Atul Prakashan

**Reference Books:**

1. Ashfaq Husain, Networks & Systems, Khanna Book Publishing, New Delhi.
2. Theraja, B. L. : Theraja, A. K.; A Text Book of Electrical Technology Vol-I, S. Chand & Co. Ramnagar, New Delhi, ISBN : 9788121924405
3. Gupta, B.R; Singhal, Vandana; Fundamentals of Electrical Network, S.Chand and Co., New Delhi, ISBN : 978-81-219-2318-7

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

1. Use dual trace oscilloscope to determine A.C voltage and current response in given R, L, C circuit.
2. Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L series circuit. Draw phasor diagram.
3. Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-C series circuit. Draw phasor diagram.
4. Use voltmeter, ammeter, wattmeter to determine active, reactive and apparent power consumed in given R-L-C series circuit. Draw phasor diagram.



(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1205**

**Course Name:** Electric Circuit and Components

5. Use variable frequency supply to create resonance in given series R-L-C circuit or by using variable inductor or variable capacitor.
6. Use voltmeter, ammeter to determine current through the given branch of an electric network by applying mesh analysis.
7. Use voltmeter, ammeter to determine current through the given branch of an electric network by applying node analysis.
8. Use voltmeter, ammeter to determine current through the given branch and voltage across the given element of circuit by applying superposition theorem.
9. Use voltmeter, ammeter to determine current through the given branch and voltage across the given element of circuit by applying Thevenin's theorem.
10. Use voltmeter, ammeter to determine current through the given branch and voltage across the given element of circuit by applying Norton's theorem.
11. Use voltmeter, ammeter to determine load resistance for maximum power transfer for a given circuit by applying maximum power transfer theorem.
12. Use voltmeter, ammeter, wattmeter, p.f meter to determine line and phase quantities of voltage and current for balanced three phase star and delta connected load and calculate active, reactive, and apparent power. Draw phasor diagram.

**Course Outcomes:**

Students will be able to:

COs	CO statement
CO.1	<b>Memorize</b> the concept of basic electrical circuit element
CO.2	<b>Identify</b> the use of circuit law's and methods for circuit analysis.
CO.3	<b>Apply</b> network theorems to troubleshoot electric circuits.
CO.4	<b>Analyze</b> the operation of series and parallel AC circuit.
CO.5	<b>Summaries</b> the operation of 1 phase and 3 phase AC circuit.
CO.6	<b>Formulate</b> the resonance in ac circuits.

**List of Open Source Software/learning website:**

- E-materials available at the website of NPTEL- <http://nptel.ac.in/>

**References used for designing a course:**

1. AICTE Model Curriculum-2019
2. GTU

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Subject Code: MH1202**

**Subject Name: Essence of Indian Traditional Knowledge**

**Shroff S.R. Rotary Institute of Chemical Technology**

**Semester: III**

**Type of course:** Audit Course

**Prerequisite:** Zeal to learn the subject.

**Rationale:** At the end of the course, students will become aware of certain knowledge traditions and practices of India that are being followed in their families and society around them.

**Teaching and Examination Scheme:**

Teaching Scheme				Examination Marks				Total Marks
L	T	P	C	Theory Marks				
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	-	-	0	-	-	30	20	50

**Content:**

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Introduction to Traditional Knowledge:</b> Definition of traditional knowledge, scope and importance, kinds of traditional knowledge, traditional knowledge Vs western knowledge.	03
2	<b>Protection of Traditional Knowledge:</b> Significance of protection of traditional knowledge,	02
3	<b>Role of Government:</b> Role of Government to harness traditional knowledge.	02
<b>SECTION-B</b>		
4	<b>Education System in India:</b> Education in ancient, medieval and modern India, Aims of education, Different subjects of traditional education in India.	03
5	<b>Civilization and Culture:</b> Culture and Civilization, Cultural Heritage.	02

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Subject Code: MH1202**

**Subject Name: Essence of Indian Traditional Knowledge**

<b>6</b>	<b>Essence of Indian Culture:</b> Essence of Indian Traditional Culture.	<b>01</b>
----------	--------------------------------------------------------------------------	-----------

**Suggested Specification table with Marks (Practical):**

<b>Distribution of Practical Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
<b>10</b>	<b>10</b>	<b>5</b>	<b>5</b>	<b>10</b>	<b>10</b>

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

**Reference Books:**

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino.

**Course Outcomes:** After completing the course, students will be able to

<b>Sr. No.</b>	<b>CO statement</b>
CO-1	Understanding the concept of traditional knowledge and its importance
CO-2	Analyzing the need and importance of protecting traditional knowledge
CO-3	Understanding the traditional educational system in India
CO-4	Analyzing the Indian civilization and culture
CO-5	Understanding the basics and essence of traditional and western knowledge
CO-6	Analyzing the cultural heritage of traditional and modern India

**List of Open Source Software/learning website:**

- [https://en.wikipedia.org/wiki/Traditional\\_knowledge](https://en.wikipedia.org/wiki/Traditional_knowledge)
- <https://oufastupdates.com/essence-of-indian-traditional-knowledgeitk/>

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1206**

**Course Name: Electrical Machines-II**

## Shroff S.R. Rotary Institute of Chemical Technology

### Semester: IV

**Type of course:** Program core courses

**Prerequisite:** Fundamentals of Basic Electrical Engineering

**Rationale:** Electrical power sector is the backbone of industries, agriculture, irrigation, urban development and almost all the segments of society. In view of this, the rotating electrical equipments play a vital role for the society. This course deals with the theory and performance analysis of various electrical machines.

**Course Objective:**

- To make students conversant about the underlying energy conversion theory between electrical and mechanical systems by introducing electromechanical energy conversion principles.
- To expose the students to the concepts of various types of electrical AC machines and applications.
- To acquaint the student with the concept of generation of electricity in power plant.

**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	2	4	70	30	30	20	150

**Content:**

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Induction Machines:</b> Revision of the concept of rotating magnetic field. Construction, working and types of induction motor (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. No-load & blocked rotor test, Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for 3-ph induction motors. Double cage induction motor. Circle diagram of 3-ph induction motor. Effect of harmonics, Cogging & Crawling, Effect of unbalanced voltages on performance of 3-ph Induction motor.	12
2	<b>Single-phase induction motors:</b> Constructional features double revolving field theory, equivalent circuit, Determination of parameters. Split-phase starting	4

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1206**

**Course Name: Electrical Machines-II**

	methods and applications. Universal motor. Repulsion motor. Shaded pole single phase motor.	
<b>3</b>	<b>Induction Generator:</b> Principle of operation and application, Its load and p. f. control. Self-excitation of induction generator.	<b>2</b>
<b>SECTION-B</b>		
<b>4</b>	<b>Synchronous machines:</b> Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Methods to find voltage regulation: Synchronous impedance method, MMF method, ZPF method. Operating characteristics of synchronous machines, Salient pole machine – two reaction theory, power angle characteristics. Parallel operation of alternators - synchronization and load division.	<b>10</b>
<b>5</b>	<b>Synchronous motors:</b> Methods of starting of synchronous motors, Different torques in Synchronous motor, Stability, Synchronous condenser, Synchronous phase modifiers, V-curves and Inverted V-curves of Synchronous motors. <b>Auto Synchronous Motor:</b> Construction, principle of operation, equivalent excitation current for various rotor connections, circle diagram.	<b>6</b>
<b>6</b>	<b>Special machines:</b> Magnetic levitation principle, advantages and applications of linear induction motor. Introduction to axial flux machines. Construction, working and applications of Permanent magnet brushless DC motor, Stepper motor and Switched reluctance motor.	<b>2</b>

**Text Books:**

1. P.S. Bhimbra, Electrical Machinery, Khanna Publishers.
2. J. B. Gupta, Electrical Machines, S. K. Kataria & Sons, New Delhi.

**Reference Books:**

1. Theraja, B.L., Electrical Technology Vol-II, S. Chand, New Delhi.
2. Nagrath I J and Kothari D P, Electric Machines, Tata McGraw Hill.
3. MG Say, Theory, Performance & Design of A.C. Machines, CBS Publishers.

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

1. To study the construction of a three phase induction motor with the help of a cut section model.
2. To perform no load and blocked rotor test on a three phase induction motor to find out its performance parameters with the help of (a) Equivalent circuit (b) Circle diagram
3. To perform direct load test on a three phase induction motor to find out its performance parameters at different load conditions.
4. To study about the starters of three phase induction motors.

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1206**

**Course Name: Electrical Machines-II**

5. To perform no load and blocked rotor test on single phase induction motor to obtain its equivalent circuit.
6. To find out voltage regulation of three phase alternator by Synchronous impedance method
7. To find out voltage regulation of three phase alternator by ZPF method
8. To obtain the direct axis and quadrature axis synchronous reactance of a salient pole machine with the slip test.
9. To perform the synchronization of two three phase alternators (or one alternator with grid) using different methods. (a) Lamps dark method (b) Two bright one dark method (c) Synchroscope
10. To obtain the 'V' curves and Inverted 'V' curves to study the effect of power factor in synchronous motor.

**Course Outcomes:**

Students will be able to:

Sr. No.	CO statement
1	<b>Describe</b> the construction, working principle and applications of Induction machines and synchronous machines.
2	<b>Predict</b> correctly the expected performance of Induction motor, synchronous generator (Alternator), synchronous motor.
3	<b>Sketch</b> the various parameters' curves and characteristics of AC motors.
4	<b>Perform</b> experiments on Induction and Synchronous machines.
5	<b>Evaluate</b> the performance parameters of rotating AC machines with different operating conditions using numerical problems.
6	<b>Illustrate</b> the construction, working, applications and advantages of AC machines,

**List of Open Source Software/learning website:**

- <http://www.scilab.org/>
- <http://www.vlab.co.in/>

**References used for designing a course:**

- 1) For Syllabus - Gujarat Technological University
- 2) For Lab Manual - Gujarat Technological University

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1207**

**Course Name: Utilization of Electrical Energy**

## Shroff S.R. Rotary Institute of Chemical Technology

**Semester: IV**

**Type of course: Core Course**

**Prerequisite: Nil**

**Rationale:** Electricity is used in every walk of life whether it is home, office or industry. It is being used for lighting, heating, refrigeration, cooking, air conditioning, operating machines/computers, welding, traction, irrigation etc. Every diploma electrical engineer therefore should know to operate and maintain main electrical utilities for their efficient operations. The students will be able to make proper selection of equipment according to requirement to ensure economical and efficient use of electricity.

**Course Objectives:** This subject gives a comprehensive idea in utilization of electrical power such as drives, electric heating, electric welding and illumination, electric traction and electrolysis.

### 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)	
3	0	0	3	70	30	0	0	100

### Course Content:

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	Electric Drives and Elevators: Basic block diagram of an electric drive, Functions of each part of an electric drive, Factors affecting selection of electric motors in an electric drive, Types of drive, Advantages of an electric drive over other drives, Comparison of ac and dc drive, Steady state and transient characteristics of the drive	6
2	Electrical Heating & Cooling: Requirements of heating element materials, Resistance and Arc heating,	6



**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1207**

**Course Name: Utilization of Electrical Energy**

	Resistance heating: Direct (Salt Bath Furnace) and Indirect (Resistance Ovens), Arc heating and its applications, Types of arc furnace -Direct and Indirect, Induction heating and its applications, Types of induction furnace, Dielectric heating and its applications, Method of cooling by air, hydrogen and water, forced and natural cooling	
<b>3</b>	Electrical Welding Quality of a good weld, Welding defects, Principle of resistance welding, Types of resistance welding–spot, seam, butt, projection, percussion and flash butt welding, Principle of electric arc welding Types of arc welding machines	<b>6</b>
<b>SECTION-B</b>		
<b>4</b>	Illumination: Illumination terminology: Solid and plane angle, Luminous Flux, Luminous Intensity, Lumen, Candle Power, Lux, Lamp Efficiency, Specific Consumption, Glare, Space Height Ratio, Utilization Factor, Maintenance Factor, Absorption Factor, Reflection Factor, Law of Inverse Squares and Lambert’s Cosine Law, Incandescent lamp, Low pressure mercury vapor lamps (Fluorescent Tube), Compact fluorescent lamps (C.F.L.),Halogen lamps, L.E.D lamps and its comparative advantages.	<b>6</b>
<b>5</b>	Electric Traction: Requirements of ideal traction system, Traction mechanics, Types of services, Speed time curve, Supply system: DC system, Composite system, Single phase ac system with low and normal frequency, Three phase system.	<b>6</b>
<b>6</b>	Domestic Electrical Appliances Working of various domestic electrical appliances: Electric iron, Electric toaster, Electric water heater, Microwave oven, Fans (Ceiling and Table fan) Washing Machine, Grinder/ Mixer/ juicer, Vacuum Cleaner, Flour Mill, Air conditioner etc, Concept of Star System for energy conservation	<b>6</b>

**Text Books:**

1. J. B. Gupta – “Textbook of Utilization of Electric Power & Electric Traction”, S. K. Kataria& Sons, New Delhi, Latest edition.



**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1207**

**Course Name: Utilization of Electrical Energy**

**Reference Books:**

1. H. Partab – “Art & Science of Utilization of Electrical Energy” - Dhanpat Rai & Sons, New Delhi, Latest edition.
2. G. K. Dubey – “Fundamentals of Electrical Drives” - Narosa Publishing House, New Delhi, Latest edition.
3. J. Upadhyay, S. N. Mahendra. – “Electric Traction” - Allied Publisher Ltd., New Delhi, Latest edition.

**Course Outcomes:**

Students will be able to:

Sr. No.	CO statement
1	Understand major part of electrical drive and elevator.
2	Describe the process of heating and method for temperature control.
3	Maintain welding apparatus based on welding process knowledge.
4	Understand principle of illumination, working and construction of various lamps.
5	Apply knowledge of electrical traction and its control.
6	Operate, maintain and troubleshoot different domestic electrical appliances and can apply techniques of energy conservation.

**List of Open Source Software/learning website:**

1. [www.nptel.iitm.ac.in](http://www.nptel.iitm.ac.in)
2. [www.vlab.com](http://www.vlab.com)

**References used for designing a course:**

1. AICTE model curriculum- 2019
2. GTU

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1208**

**Course Name: Electric Power Transmission and Distribution**

## Shroff S.R. Rotary Institute of Chemical Technology

**Semester: - IV**

**Type of course: Program core courses**

**Prerequisite:** Electric Power Transmission and Distribution

### **Rationale:**

The electricity is generated in bulk at remote places near to coal mines (thermal power plants, dams (hydro power) and transmitted to long distances and then distributed in cities and villages and to industry. The transmission and distribution of electric power is a complex issue which requires knowledge of different types of transmission lines and power equipments. Technicians are required to operate and maintain the power transmission and distribution system so that electrical energy is continuously available to the consumers economically. It is therefore required that the technicians should be also able to work independently in the various area of transmission and distribution system. S/he should be able to operate various control equipments independently in normal and abnormal conditions. Essential efforts are made in this course to develop above skills in the students.

### **Course Objectives:**

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

- Maintain the proper functioning of the electrical transmission and distribution systems

### **Teaching and Examination Scheme:**

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

### **Course Content:**

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Classification of transmission lines:</b> Basics of Transmission and Distribution Single line diagrams with	6

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1208**

**Course Name: Electric Power Transmission and Distribution**

	<p>components of the electric supply transmission and distribution systems. Primary and secondary transmission; standard voltage level used in India. Classification of transmission lines: based on type of voltage, voltage level, length and others Characteristics of high voltage for power transmission. Method of construction of electric supply transmission system – 110 kV, 220 kV, 400 kV. Method of construction of electric supply distribution systems – 220 V, 400V, 11 kV, 33 kV</p>	
2	<p><b>Transmission Line Parameters and Performance Line Parameters:</b> Concepts of R, L and C of line parameters and types of lines. Performance of short line: Efficiency, regulation and its derivation, effect of power factor, vector diagram for different power factor. Performance of medium line: representation, nominal ‘T’, nominal ‘<math>\pi</math>’ and end condenser methods. Transposition of conductors and its necessity. Skin effect and proximity effect.</p>	6
3	<p><b>Extra High Voltage Transmission Extra High Voltage AC (EHVAC) transmission line:</b> Necessity, high voltage substation components such as transformers and other switchgears, advantages, limitations and applications and lines in India. Ferranti and Corona effect. High Voltage DC (HVDC) Transmission Line: Necessity, components, advantages, limitations and applications. Layout of monopolar, bi-Polar and homo-polar transmission lines. Lines in India. Features of EHVAC and HVDC transmission line.</p>	6
<b>SECTION-B</b>		
4	<p><b>A.C Distribution System AC distribution:</b> Components classification, requirements of an ideal distribution system, primary and secondary distribution system. Feeder and distributor, factors to be considered in design of feeder and distributor. Types of different distribution schemes: radial, ring, and grid, layout, advantages, disadvantages and applications. Voltage drop, sending end and receiving end voltage. Distribution Sub-Station: Classification, site selection, advantages, disadvantages and applications. Single Line diagram (layout) of 33/11KV Sub-Station, 11KV/400V sub-station, Symbols and functions of their components.</p>	6
5	<p><b>Components of Transmission and Distribution Line Overhead Conductors:</b> Properties of material, types of conductor with trade names, significance of sag. Line supports: Requirements, types of line structures and their specifications, methods of erection. Line Insulators: Properties of insulating material, selection of material, types of insulators and their applications, causes of insulator failure, derivation of equation of string efficiency for string of three suspension insulator, methods of improving</p>	6

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1208**

**Course Name: Electric Power Transmission and Distribution**

	string efficiency. Underground Cables: Requirements, classification, construction, comparison with overhead lines, cable laying and cable jointing	
6	<b>Power System Grounding or Earthing:</b> Equipment Grounding, Neutral Grounding – Different Methods, Grounding Transformer. Introduction to EHVAC & HVDC Transmission & Comparison between them, Electronic grounding, Electric Safety.	6

**Text Books:**

1. G.C. Garg, Utilization of Electric Power & Electric Traction, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-86173-355)
2. Mehta, V.K., Principles of Power System, S. Chand and Co. New Delhi, ISBN: 9788121924962
3. Soni;Gupta; Bhatnagar, A Course in Electrical Power, Dhanpat Rai and Sons New Delhi, ISBN: 9788177000207

**Reference Books:**

1. Gupta,J.B., A Course in Power Systems, S.K. Kataria and sons, New Delhi, ISBN: 9788188458523
2. Theraja, B.L.; Theraja, A.K., A Textbook of Electrical Technology Vol. III, S.Chand and Co. New Delhi, ISBN : 9788121924900
3. Uppal,S.L., A Course in Electrical Power, S.K.Khanna Publisher New Delhi, ISBN : 9788174092380

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

1. Prepare a report about types of cables used in distribution system by visiting nearby cable suppliers/industries or otherwise with the help of internet.
2. Prepare Technical Report after visit to the Load Dispatch Centre.
3. Prepare a report on different type of Transmission Towers used in the industry.
4. Prepare a report on different types of connectors used in the transmission lines.
5. Prepare a report after studying distribution system of a residential colony.
6. Interpret and explain the given Blue Print of a Sub-Station.
7. Prepare a report on substation with its layout after visiting a nearby substation.
8. Prepare a report after studying different types of Insulators.
9. Prepare a report after studying different types of distribution and transmission towers.
10. Study the concept of Earthing and Grounding.

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1208**

**Course Name: Electric Power Transmission and Distribution**

**Course Outcomes:**

Students will be able to:

COs	CO statement
CO.1	Analyze the normal operation of the electric transmission and distribution systems
CO.2	Evaluate the functioning of the medium and high voltage transmission system.
CO.3	Remember the parameters of the extra high voltage transmission system.
CO.4	Understand the functioning of the low voltage AC distribution system.
CO.5	Understand the components of the transmission and distribution lines.
CO.6	Understand the concepts of Grounding and Earthing in Power System

**List of Open Source Software/learning website: NPTEL**

**References used for designing a course:**

- GTU
- AICTE

(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1209**

**Course Name: Fundamental of Power Electronics**

## Shroff S.R. Rotary Institute of Chemical Technology

**Semester: - IV**

**Type of course:** Program Core Course

**Prerequisite:** Fundamental knowledge of solid state devices, basic electronics concepts, etc.

**Rationale:** The function of power electronics is to process and control the electric power by supplying voltage and current in a form that is optimally suited to the load. With the advancement of power electronics devices the conventional control and relays are now replaced by electronic control and relays, employing solid state power semiconductor devices. This course is designed in such a way that the diploma engineers will be able to use power electronics for controlling AC and DC power in various applications. Essential theoretical and practical knowledge to use power electronics to control electrical machines in commercial and industrial sector will be achieved by this course.

### Course Objectives:

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

- Maintain the proper functioning of power electronic devices and converters.

### 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)	
3	0	2	4	70	30	30	20	150

### Course Content:

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Power Electronic Devices:</b> Power electronic devices Power transistor: construction, working principle, V-I characteristics and uses. IGBT: Construction, working principle, V-I characteristics and uses. MOSFET: Construction, working principle, V-I characteristics and uses.	<b>05</b>
2	<b>Thyristor Family Devices</b> SCR: construction, two transistor analogy, types, working and characteristics, SCR mounting and cooling, Types of Thyristors: SCR,	<b>05</b>

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1209**

**Course Name: Fundamental of Power Electronics**

	LASCR, SCS, GTO, UJT, PUT, DIAC and TRIAC, Thyristor family devices: symbol, construction, operating principle and V-I characteristics.	
3	<b>Turn-on and Turn-off Methods of Thyristors</b> SCR Turn-On methods: High Voltage thermal triggering, Illumination triggering, dv/dt triggering, Gate triggering. Gate trigger circuits – Resistance and Resistance-Capacitance circuits. SCR triggering using UJT, PUT: Relaxation Oscillator and Synchronized UJT circuit. Pulse transformer and opto-coupler based triggering. SCR Turn-Off methods:	08
<b>SECTION-B</b>		
4	<b>Phase Controlled Rectifiers</b> Phase control: firing angle, conduction angle. Single phase half controlled, full controlled and midpoint controlled rectifier with R, RL load: Circuit diagram, working, input- output waveforms, equations for DC output and effect of freewheeling diode.	06
5	<b>Choppers</b> The working principle of Chopper and its applications, Compare the salient features of different types of choppers, Types of chopper circuits: A type to E-type	06
6	<b>DC to AC Converters</b> Working principle of inverter, Classification of inverter-1-phase and 3-phase inverters, Line commutated and forced commutated inverters, Series, Parallel and bridge inverter. PWM method and PWM inverter.	06

**Text Books:**

1. R. P. Ajwalia, “Power Electronics”, Atul Prakashan,
2. Dr. J. S. Chitode, “Power Electronics”, Technical Publication

**Reference Books:**

1. Rashid, Muhammad H., “Power Electronics”, PHI Learning, New Delhi latest edition.
2. Bimbhra, P.S., “Power Electronics”, Khanna Publisher, New Delhi latest edition.
3. Singh, M. D. K. and Khanchandani, B., “Power Electronics” Tata Mc. Graw Hill, New Delhi

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

1. Test the performance of IGBT
2. Test the performance of MOSFET



(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1209**

**Course Name: Fundamental of Power Electronics**

3. Test the performance of SCR
4. Test the variation of R, C in R and RC triggering circuits on firing angle of SCR.
5. Test the effect of variation of R, C in UJT triggering technique.
6. Use DSO to observe the output waveform of half wave controlled rectifier with resistive load and determine the load voltage.
7. Draw the output waveform of Full wave controlled rectifier with R load and determine the load voltage.
8. Draw the output waveform of Full wave controlled rectifier with RL load, without freewheeling diode and determine the load voltage.
9. Draw the output waveform of Full wave controlled rectifier with RL load, with freewheeling diode and determine the load voltage.
10. Troubleshoot chopper circuits with load.
11. Simulate chopper circuit, observe and print the various wave forms.
12. Use DSO to observe the output waveform of single phase inverter with resistive load and determine the load voltage.

**Course Outcomes:**

Students will be able to:

COs	CO statement
CO.1	<b>Recognize</b> the power electronic devices for specific applications.
CO.2	<b>Identify</b> the performance of Thyristors.
CO.3	<b>Illustrate</b> the operation of phase controlled rectifiers.
CO.4	<b>Classify</b> the chopper circuits.
CO.5	<b>Summarize</b> power electronic circuits used in various domestic and industrial applications.
CO.6	<b>Write</b> the significance of PWM techniques for inverter operation.

**List of Open Source Software/learning website:**

- E-materials available at the website of NPTEL- <http://nptel.ac.in/>

**References used for designing a course:**

1. AICTE Model Curriculum-2019
2. GTU



(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1210**

**Course Name: Electrical Estimation, Costing and Wiring**

## Shroff S.R. Rotary Institute of Chemical Technology

### Semester: IV

**Type of course:** Program Elective-1

**Prerequisite:** Basic knowledge of Electrical components

**Rationale:** Electrical wiring plays a major role in distributing the electrical energy from electric utilities to consumer. Electrical diploma holders have to work as Technicians and Supervisors for planning, installing and testing various electrical wiring Installations such as residential, commercial and Industrial electrification schemes. They should be able to understanding of the procedure of estimating and costing are desired. Knowledge of IE rules for different types of electrical Installation projects. Essential efforts are made in this course to develop above skills in the students.

**Course Objective:** To carry out wiring estimating, costing and contract of various types of installations.

#### 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)	
3	0	2	4	70	30	30	20	150

#### Content:

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Electrical Wiring Accessories and symbols:</b> Type of wires and cables used in Domestic and industrial wiring, Different types of sign and symbols used in wiring, Common Hand Tools their uses, Care and Maintenance, Wiring Accessories and functioning of protective devices such as Fuse, MCB, ELCB, RCCB	5
2	<b>Electrical Wiring system and IE Rules:</b> Types of wires, Difference between wire and cable, Standard wire gauge, wiring joints. Specifications of Different types of wiring materials, Accessories. Wiring types and circuits. Domestic and industrial panel wiring. I.E. rules for wiring, IE Act-2003.	6
3	<b>Selection of Wiring:</b> System Supply voltage, Selection of wiring, Rules of wiring, power and lighting circuits, Types of Earthing and Measurement of earth resistance.	3
<b>SECTION-B</b>		
4	<b>Estimating and Costing of Domestic Wiring:</b> Layout and single line diagram for	6

**(Established under Gujarat Private Universities Act, 2009)**

**Bachelor of Engineering**

**Course Code: EE1210**

**Course Name: Electrical Estimation, Costing and Wiring**

	domestic Wiring, Load calculation. Cable/wire selection, calculation of Phase-Neutral-Earthing, Selection of switchgear. Overall Estimating and costing table with all taxes. Related Examples.	
<b>5</b>	<b>Estimating and Costing of Industrial Wiring:</b> Layout and single line diagram for Industrial Wiring, Load calculation. Cable/wire selection, calculation of Phase-Neutral-Earthing, Selection of switchgear. Overall Estimating and costing table with all taxes. Related Examples.	<b>5</b>
<b>6</b>	<b>Contracting:</b> Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills., Types of contract system., Tendering procedure and preparation of simple tender, Earnest Money Deposit, Security Deposit., Schedule of rates (S.O.R.)	<b>3</b>

**Text Books:**

1. Electrical Wiring Estimating And Costing by S. L. Uppal, G. C. Garg, Khanna Publishers, 6<sup>th</sup> Edition.
2. Electrical Estimating & Costing by Praveen Kumar, 2<sup>nd</sup> Edition
3. Electrical Estimation and Costing by M. A. Chaudhary and S. M. Chaudhary, Nirali Prakashan.

**Reference Books:**

1. Electrical Engineering Design, Drawing & Estimation by Madhvi Gupta, Ankit Agarwal, 1<sup>st</sup> Edition, Publication of S.K. Kataria & Sons
2. Electrical Installation Estimating & Costing by Gupta, J.B., Publication of S.K. Kataria & Sons.
3. Electrical Design, estimating & Costing by Raina, K. B. and Bhattacharya, S.K., New Age International (p) Limited, New Delhi

➤ **Suggested List of Student Activities (In a Group of 2-3 students)**

- Prepare a report of Domestic load calculations and make costing table.
- Prepare a report of Industrial load calculations and make costing table.

**(Established under Gujarat Private Universities Act, 2009)**

**Bachelor of Engineering**

**Course Code: EE1210**

**Course Name: Electrical Estimation, Costing and Wiring**

**Course Outcomes:**

Students will be able to:

<b>CO</b>	<b>CO statement</b>
CO-1	To memorize the Domestic and industrial wiring following IE Rule Act-2003.
CO-2	To Discuss the estimation and costing of Residential and commercial Electrical Installations following IE Act-2003.
CO-3	To Apply the testing methods of Residential and Industrial Electrical Installation following IE Act-2003.
CO-4	To Prepare the detail estimation and costing of a Residential and Industrial project following IE Act-2003.
CO-5	To Evaluate the Costing of Residential and Industrial wiring including all marginal taxation.
CO-6	To Design the layout of Domestic and Industrial wiring according to load requirement.

**List of Open Source Software/learning website:**

1) AutoCAD

**References used for designing a course:**

- 1) Gujarat Technological University Diploma Curriculum
- 1) Gujarat Technological University Diploma Curriculum

(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1211**

**Course Name: Industrial Instrumentation**

**Shroff S.R. Rotary Institute of Chemical Technology**

**Semester: - IV**

**Type of course:** Program Elective-1

**Prerequisite:** NA

**Rationale:** Sound knowledge about various techniques used for the measurement of industrial parameters is essential for the student of diploma engineering. This subject provides the knowledge of measurement of velocity, displacement, viscosity, temperature using various types of sensors and related circuits.

**Course Objectives:**

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

- Use instrumentation equipment for measurement of industrial parameters and control.

**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)	
3	0	2	4	70	30	30	20	150

**Course Content:**

**Content:**

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
1	<b>Fundamentals of Instrumentation</b> Basic purpose of instrumentation. Basic block diagram (transduction, signal conditioning, signal presentation) and their function. Construction, working and application of switching devices- Push button, limit switch, float switch, pressure switch, thermostat, electromagnetic relay.	05
2	<b>Transducers</b> Distinguish between Primary and Secondary, Electrical and Mechanical, Analog and Digital, Active and Passive. Mechanical devices pry. And	06

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1211**

**Course Name: Industrial Instrumentation**

	sec. transducers Advantages of electric transducers, Required characteristics of transducers. Factors affecting the choice of transducers	
<b>3</b>	<b>Strain Gauge</b> Construction and principle of resistive transducer-Potentiometer –variac and strain gauges -No derivation. Only definition and formula for gauge factor Types of strain gauges like unbounded, bonded and semiconductor. Applications of strain gauges.	<b>06</b>
<b>SECTION-B</b>		
<b>4</b>	<b>Temperature and Pressure Measurement</b> Temperature measurement - Construction and Working of RTD, Thermistor and Thermocouple, radiation pyrometer, technical specifications and ranges. Pressure measurement – Construction and working of bourdon tube, bellow, diaphragm and strain gauge.	<b>6</b>
<b>5</b>	<b>Flow and Liquid Level Measurement</b> Construction and Working of Flow measurement by electromagnetic and Turbine Flow meter. Construction and Working of Liquid level measurement by resistive, inductive, Capacitive gamma rays and Ultrasonic methods.	<b>7</b>
<b>6</b>	<b>Data Acquisition System</b> Use of signal conditioners, scanners, signal converters, recorders, display devices, A/D & D/A circuits in digital data acquisition. Components of an analog Instrumentation Data Acquisition system.	<b>4</b>

**Text Books:**

1. Industrial Instrumentation & Control by S. K. Singh.TMH Publication
2. Electrical and Electronics Measurement and Instrumentation, By A. K. Shawney, Dhanpatrai & sons publications.

**Reference Books:**

1. Principles of Industrial Instrumentation, D Pat ranabis, 3rd edition, Mc Graw hill
2. Mechanical & Industrial Measurements by R. K. Jain, Khanna publication
3. Mehta, V.K. Electronics and instrumentation, Third edition-S.Chand and company Pvt Ltd Reprint, 2010, ISBN:81-219-2729-3

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

1. Identify different switches used in instrumentation system.
2. Measure linear displacement by L.V.D.T.

(Established under Gujarat Private Universities Act, 2009)

**Diploma of Engineering**

**Course Code: EE1211**

**Course Name: Industrial Instrumentation**

3. Measure the strain with the help of strain gauge.
4. To study the measurement of weight using Strain gauge.
5. Measure temperature by PT-100, thermistor, thermocouple along with simple resistance bridge.
6. To Study the measurement and control of temperature using Thermocouple.
7. Measure pressure using pressure sensor kit.
8. Measure vacuum pressure.
9. Measure the flow using flow meter
10. Demonstration of Data Acquisition System and operation and control with computer software.

**Course Outcomes:**

Students will be able to:

COs	CO statement
CO.1	<b>Select</b> relevant instruments used for measuring electrical and non-electrical quantities.
CO.2	<b>Summarize</b> relevant transducers/sensors for various applications.
CO.3	<b>Illustrate</b> the use of relevant instruments for measuring non-electrical quantities.
CO.4	<b>Explain</b> the data acquisition systems in various applications.
CO.5	<b>Choose</b> the appropriate transducer for measurement purpose.
CO.6	<b>Write</b> the advantages of instrumentation system.

**List of Open Source Software/learning website:**

- E-materials available at the website of NPTEL- <http://nptel.ac.in/>

**References used for designing a course:**

1. AICTE Model Curriculum-2019
2. GTU

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1212**

**Course Name: Computer Aided Electrical Drawing and Simulation**

## Shroff S.R. Rotary Institute of Chemical Technology

### Semester: IV

**Type of course:** Open Elective-1

**Prerequisite:** Basic knowledge of Electrical Engineering and Computer

**Rationale:** All equipment, installations, circuits and other electrical and electronic systems in commercial, power and industrial sector need drawings for their manufacturing, installation, operation and maintenance. A technician working in design and shop floor must possess the skill of reading, interpreting different drawings and simulating electrical and electronics circuit for most of the activities. With the evolution of various computer software's the role of earlier draftsman is now taken over by Computer software. The Computer Aided Drawing (AutoCAD) and simulation (MATLAB/SIMULINK/PSim/MULTISIM) software will be used to perform various practical exercises in this course. This will enable the students to become competent for working in the fast growing information technology environment by enhancing their computer aided drawing, designing and simulating skills in the field of electrical and electronics engineering.

**Course Objective:** To Draw/simulate electrical and electronics circuit using software.

#### 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)	
1	0	4	3	0	0	70	30	100

#### Content:

Sr. No.	Content	Total Hrs.
<b>SECTION-A</b>		
<b>1</b>	<b>Computer Aided Electrical Drawing:</b> Draw general graphical symbols and notations used in Electrical engineering using AutoCAD software. Draw various Electrical circuits using MATLAB/PSim/MultiSim software such as R-L, R-C, R-L-C circuits. Draw the various winding diagrams of AC and DC Electrical machines.	<b>12</b>
<b>2</b>	<b>Computer Aided Electronics Drawing:</b> Draw various electronics circuits using Auto CAD electrical and Electronics software. Draw various Electronics circuits using MATLAB/PSim/MultiSim software Half-wave, full-wave and bridge rectifier, Power amplifier and voltage amplifier and	<b>12</b>



**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1212**

**Course Name: Computer Aided Electrical Drawing and Simulation**

	different types of oscillators' circuits.	
<b>SECTION-B</b>		
<b>3</b>	<b>Simulation of Electrical Circuits:</b> Series and parallel R-L circuit, Series and parallel R-C circuit, Series and parallel R-L-C circuit, Resonance in AC Circuit, Capacitor Charging and Discharging. Graphics, Plot, sub plot, label, legend for above all circuits.	<b>12</b>
<b>4</b>	<b>Simulation of Electronics Circuits:</b> Half wave, full wave and bridge rectifier with R-L load and filter. Constant 9V & 12V Switch mode power supply with load and No load. Graphics, Plot, sub plot, label, legend for above all circuits.	<b>12</b>

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

1. Draw electrical and electronic symbols using CAD and take print out
2. Draw D.C. and A.C machine parts using CAD and take print out
3. Draw winding diagram for given DC machine using CAD and take print out of (a)Lap winding and (b)Wave winding
4. Draw different types of rectifier circuit using CAD and take print out of : (a)Single phase Half wave (b)Single phase Full wave (c)Bridge rectifier
5. Draw the following oscillator circuit using CAD and take print of (a)Hartley oscillator (b)Colpitt oscillator (c) Phase-Shift Oscillator (d) Wien Bridge Oscillator (e)Crystal Oscillator.
6. Simulate R-L series circuit and observe voltage & Current wave forms across each component.
7. Simulate R-C series circuit and observe voltage & Current wave forms across each component.
8. Simulate R-L-C series circuit and observe voltage & Current wave forms across each component.
9. Simulate single phase Half-wave rectifier circuit using MATLAB/PSim/MultiSim software.
10. Simulate single phase Full-wave rectifier circuit using MATLAB/PSim/MultiSim software.
11. Simulate single phase Bridge rectifier circuit using MATLAB/PSim/MultiSim software.
12. Using simulation prove that NAND gate is an universal gate
13. Using simulation prove that NOR gate is an universal gate.
14. Using simulation prove De Morgan's theorem.
15. Using simulation prove half adder and full adder circuit



**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1212**

**Course Name: Computer Aided Electrical Drawing and Simulation**

➤ **Suggested List of Student Activities (In a Group of 2-3 students)**

1. To Design, simulate and Develop Rectifier Hardware circuit and prepare a report.
2. To Design, simulate and Develop 5V/9V/12V SMSP hardware circuit and prepare a report.
3. Design and develop a PCB for a given project using software
4. To design and develop and costing of 1-ph Extension power supply Board and prepare a report.
5. To Design, simulate and develop a Digital counter and prepare a report.

**Course Outcomes:**

Students will be able to:

CO	CO statement
CO-1	To Memorize various symbols and notations in electrical and electronics engineering drawings.
CO-2	Interpreting the drawings, draw interferences and workout other technical details.
CO-3	Executing various electrical and electronics circuits according to standard practices using CAD software.
CO-4	Integrating the simple electrical and electronics circuits using Simulation software like MATLAB/PSim/Multisim etc.
CO-5	Testing the given mini project.
CO-6	To Design and Develop the various electrical and electronics Hardware circuits and prepare a report.

**List of Open Source Software/learning website:**

- i. Open Source Software preferred.
- ii. AutoCAD
- iii. Work bench
- iv. PSIM
- v. SPICE (Simulation Program with Integrated Circuit Emphasis).....
- vi. Orcad for PCB design.....
- vii. Circuit maker
- viii. Multi-Sim
- ix. <http://coolcadelectronics.com/coolspice/>
- x. <http://students.autodesk.com/> (register and get free student version of LATEST AutoCAD software for approximately 3 years)
- xi. <http://www.circuitstoday.com/circuit-design-and-simulation-softwares>
- xii. [http://en.wikipedia.org/wiki/List\\_of\\_free\\_electronics\\_circuit\\_simulators](http://en.wikipedia.org/wiki/List_of_free_electronics_circuit_simulators)
- xiii. <http://coolcadelectronics.com/coolspice/>
- xiv. Android applications available on Google Play store like AutoCAD 360, Circuit Builder, Electric Circuit, Circuit Simulator, WeSpice Demo, Electric Circuit Calculator, Electrical Engineering.



**(Established under Gujarat Private Universities Act, 2009)**

**Diploma of Engineering**

**Course Code: EE1212**

**Course Name: Computer Aided Electrical Drawing and Simulation**

---

**References used for designing a course:**

- 1) Gujarat Technological University Diploma Curriculum

(Established under Gujarat Private Universities Act, 2009)

**Diploma Engineering**

**Course Code: EE1213**

**Course Name: Energy Conservation in Electrical System**

**Shroff S.R. Rotary Institute of Chemical Technology**

**Semester: IV**

**Type of course:** Open Elective-1

**Prerequisite:** Basic of electrical engineering, electrical power system

**Rationale:** The consumption of energy is increasing day by day. One way to cope up with the increase in energy demand is to increase the production of energy which demands more investment and the other way is to conserve the energy because energy conserved/saved is energy generated. Energy conservation means reduction in energy consumption but not compromising with the quality or quantity of energy production. Essential theoretical and practical knowledge about the concept of energy conservation, energy management, different approaches of energy conservation in industries, economic aspects of energy conservation project and energy audit and measuring instruments in commercial and industrial sector will be achieved by this course

**Course Objectives:**

The students are expected to identify effective utilization of renewable energy sources for the difference applications & technology.

**Teaching and Examination Scheme:**

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

**Course Content:**

**Content:**

Sr. No	Contents	Total Hrs
<b>SECTION A</b>		
1	<b>Energy Scenario:</b> Classification of Energy, Indian energy scenario, Sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy conservation and its importance, energy strategy for the future.	5
2	<b>Energy conservation (EC) Act 2001:</b> Features of EC act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, ECBC code for Building Construction.	4

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1213**

**Course Name: Energy Conservation in Electrical System**

3	<b>Energy Management &amp; Audit:</b> General Philosophy, need of Energy Audit and Management. Definition and Objective of Energy Management, General Principles of Energy Management, Energy Audit, Types of energy audit, instruments used in energy audit, Energy Audit report.	12
<b>SECTION B</b>		
4	<b>Energy Conservation (EC) in Electrical Machines:</b> Efficiency and loading of transformer, Losses in transformer, EC in transformer, Efficiency & loading of Electric motor, losses in electric motors, energy saving opportunities in electrical motors, Energy Efficient Motor.	8
5	<b>Energy Conservation (EC) in Industrial electrical system:</b> understating industrial electrical power distribution system and its components, losses in electrical system, energy conservation in opportunities in industrial electrical system. Understanding electricity bills & tariff, Maximum demand controller, power factor improvement and its benefits.	10
6	<b>Energy Conservation in Lighting System:</b> types of lighting, losses in lighting system, measurement of lighting system, EC opportunities in lighting system, energy efficient lighting technology	3

**Text Books:**

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors  
Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors  
Book-3, Electrical Utilities (available online)
3. S. C. Tripathy, “ Utilization of Electrical Energy and Conservation” , McGraw Hill, 1991.

**Reference Books:**

1. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Interscience publication
2. Bureau of Energy Efficiency Reference book: No.1 & 3, 4
3. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press
4. G. G. Rajan, “Optimizing Energy Efficiencies in Industry”, Tata McGraw Hill, 2001
5. IEEE Recommended “Practice for Energy Management in Industrial and Commercial Facilities”, IEEE std 739 – 1995. (Bronze book).

**(Established under Gujarat Private Universities Act, 2009)**

**Diploma Engineering**

**Course Code: EE1213**

**Course Name: Energy Conservation in Electrical System**

6. C.S. Solanki, Renewal Energy Technologies: A Practical Guide for Beginners PHI Learning.

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

**Course Outcomes:**

Students will be able to:

COs	CO statement
CO-1	To Understand the current energy scenario and importance of energy conservation.
CO-2	To understand role significance of EC act 2001
CO-3	To learn energy audit and uses of instruments
CO-4	To Understand the concepts of energy management in Electrical system.
CO-5	To know the energy saving opportunities in electric machine, electrical system and lighting system.
CO-6	To Understand the methods of improving energy efficiency in different electrical systems

**List of Open Source Software/learning website:**

1. <http://nptel.iitm.ac.in/>
2. [www.bee.com](http://www.bee.com)
3. [www.powermin.nic.in](http://www.powermin.nic.in)
4. [www.teriin.org](http://www.teriin.org)
5. <https://geda.gujarat.gov.in/>