



# Shri Vaishnav Vidyapeeth Vishwavidyalaya

## Bachelor of Technology (Electrical Engineering)

### SEMESTER III

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
<b>BTEE 301</b>		<b>CIRCUIT THEORY</b>	2	1	2	4	60	20	20	30	20

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objectives:

To introduce the students with the concept of circuit elements lumped circuits, waveforms, circuit laws and network reduction. To solve the electrical network using mesh and nodal analysis by applying network theorems, analyze the transient response of series and parallel A.C. circuits and to solve problems in time domain using Laplace Transform.

#### Course Outcomes:

Upon completion of this course students will be able to:

1. Apply the nodal and mesh methods of circuit analysis.
2. Apply linearity and superposition concepts to analyze RL, RC, and RLC circuits in time and frequency domains.
3. Express complex circuits in their simpler Thévenin and Norton equivalent forms.
4. Analyze circuits both in time and frequency domains.
5. Construct and make time and frequency domain measurements on elementary RL, RC, and RLC circuits.

#### Syllabus:

##### UNIT I

Practical Voltage & current sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh. Analysis of magnetically coupled circuits, Dot convention, coupling coefficient, tuned circuits, Series and parallel resonance, frequency-response of series and Parallel circuits, Q –factor, Bandwidth.

Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks.

##### UNIT II

Transient analysis- Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations. Steady state analysis- Concept of phasor & vector, impedance & admittance,

##### UNIT III

Network Theorems for AC & DC circuits-Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's

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theorem, problems with dependent & independent sources.

#### UNIT IV

Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain

#### UNIT V

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, terminated two port networks.

#### Text Books:

1. A K Chakrabarti :Circuit theory: Dhanpat Rai

#### Reference Books:

1. M.E. Van Valkenburg, Network Analysis, (PHI)
2. F.F.Kuo, Network Analysis.
3. Mittal GK; Network Analysis; Khanna Publisher
4. Mesereau and Jackson; Circuit Analysis- A system Approach; Pearson.
5. Sudhakar & Pillai; Circuit & Networks- Analysis and Synthesis; TMH
6. Hayt W.H. & J.E. Kemmerly; Engineering Circuit Analysis; TMH

#### List of Practical's: (If Practical Credit Shown in Syllabus)

1. Verification of Thevenin Theorem.
2. Verification of Superposition Theorem.
3. Verification of Reciprocity Theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Verification of Millman's Theorem.
6. Determination of Open Circuit parameters of a Two Port Network.
7. Determination of Short Circuit parameters of a Two Port Network.
8. Determination of A,B, C, D parameters of a Two Port Network
9. Determination of Frequency Response of RLC Series Circuit.
10. Determination of Frequency Response of RLC parallel Circuit.

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**Shri Vaishnav Vidyapeeth Vishwavidyalaya**  
**Bachelor of Technology (Electrical and Electronics Engineering)**  
**SEMESTER III**

COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 307		ELECTRICAL INSTRUMENTATION	2	1	2	4	60	20	20	30	20

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**Course Objectives:**

1. To enable the students to learn in detail about the various instruments available for monitoring/measuring electrical parameters encountered in domestic / industrial applications.
2. To introduce the fundamental concepts of electrical instrumentation.

**Course Outcomes:**

1. To test and calibrate ammeter, voltmeter, wattmeter and energy meter.
2. Learn the measurement of magnetic parameters.
3. Understand the operating principles of energy and power meters.
4. Measure low, medium & high Resistances using suitable bridges.
5. To select proper instrument for measurement various electrical elements

**Syllabus:**

**UNIT I**

**Introduction:** SI units, static and dynamic characteristics of electrical instruments, measurement and error, accuracy and precision, sensitivity resolution, error & error analysis, effect of temperature, internal friction, stray field, hysteresis and frequency variation & method of minimizing them, loading effects, due to shunt connected and series connected instruments, testing & calibration of instruments.

**Galvanometers:** Galvanometer equation dc and ac measurement, theory & operation of D'arsonal galvanometer, ballistic galvanometer and vibration galvanometer, definition of analog & digital instruments, classification of analog instruments, their operating principle, operating force, types of supports, damping, controlling.

**UNIT II**

**Ammeters and Voltmeters:** PMMC, moving iron, electrostatic meter, hotwire, rectifier and, electro-dynamometer, expression for control & deflection torque, their advantages, disadvantages & error, extension of range of instruments using shunt & multiplier.

**Wattmeters:** Electro-dynamometer and induction wattmeters, construction, theory, operation, errors and their compensation, measurement of power in three phase circuit, one, two & three wattmeter method, low power factor & UPF wattmeter, measurement of reactive power, double element and three element dynamometer wattmeter.

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### SEMESTER III

#### UNIT III

**Energy Meters:** Single phase induction type energy meter –construction & operation, driving and braking torques, calibration devices, errors and their compensation, polyphase energy meter, Testing by phantom loading, Smart energy meter -construction, operation and advantages. Prepaid meter.

**Special Meters:** Maximum demand indicator, bi-vector and Tri-vector meter, power factor and Frequency meter –Vibrating reed, Resonance type & Weston type, synchronoscope.

#### UNIT IV

**Resistance Measurement:** Classification of resistance, measurement of low, medium and high resistances, voltmeter and ammeter method, Wheatstone bridge, Kelvin's double bridge & loss of charge methods for resistance measurement, Ohmmeter –series & shunt type, multi-meter, Megger, earth resistance measurement.

**Potentiometer:** DC potentiometer, application of DC potentiometer, AC polar type and coordinate type potentiometer, their construction and applications.

#### UNIT V

**Instrument Transformers:** Potential and current transformers, construction, phasor diagrams, ratio and phase angle errors, difference between CT and PT, errors and reduction of errors, testing of instrument transformers.

**Magnetic Measurements:** Magnetic Measurement –B-H Curve, Hysteresis Loop determination.

#### Text Books:

1. Golding E. W. and Widdis F. C., "Electrical Measurements and Measuring Instruments", 5<sup>th</sup> Ed., A.H. Wheeler and Company, 1994
2. A.K. Sawhney "A course in Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co., 2012
3. K. S. K. Weranga and D. P. Chandima "Smart Metering Design and Applications" Springer, 2014
4. Stout M. B., "Basic Electrical Measurements", Prentice Hall of India Private Limited, 2013

#### Reference Books:

1. Helfrick and Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice-Hall of India, Reprint 1988.
2. Jones, B.E., "Instrumentation Measurement and Feedback", Tata McGraw-Hill, 1986.
3. Golding, E.W., "Electrical Measurement and Measuring Instruments", 3<sup>rd</sup> Edition, Sir Issac Pitman and Sons, 1960.

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COURSE CODE	CATEGORY	COURSE NAME	L	T	P	CREDITS	TEACHING & EVALUATION SCHEME				
							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
<b>BTEE 303</b>		<b>ANALOG ELECTRONICS</b>	2	1	2	4	60	20	20	30	20

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objectives:

Any electronic trade has its basis on a certain number of components and some basic standard circuits. These common circuits are applied in all sections of the Electronics technology. To learn the basic methods for the design of digital circuits and provide the fundamental Concepts used in the design of digital systems. To introduce basic postulates of Boolean algebra and shows the correlation between.

#### Course Outcomes:

After the successful completion of this course students will be able to

1. Understand the basic physics of carrier transport in bulk semiconductors and real device structures.
2. Understand the fundamentals of operation of the main semiconductor electronic devices.
3. Understand the basic parameters of electronic devices, their performance, and limiting factors.
4. Understand the basic principles of electronic device operation with emphasis on bipolar transistors, and unipolar microwave devices.
5. To introduce the concepts and techniques associated with the number systems and codes. To minimize the logical expressions using Boolean postulates.
6. To design various combinational and sequential circuits

#### Syllabus:

##### UNIT I

##### Semiconductor Diode

PN junction diode theory, forward and reverse-biased junctions, reverse-bias breakdown, Zener and avalanche breakdown, load line analysis, behavior of PN junction characteristics, temperature dependence, concept of junction capacitance in forward and reverse bias conditions, diode characteristics, diode applications: rectifier, Clipper and clamper circuit, different types of diodes: zener diodes, varactor diodes, Tunnel diode, photo-diodes, LED, Schottky diode, Laser diodes.

##### UNIT II

Transistors: BJT, FET, MOSFET, Types, working principle, characteristics, and region of operation, load line, biasing methods (fixes biasing, self biasing), early effect.

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#### UNIT III

Transistors Amplifier: Small Signal BJT amplifiers: AC equivalent circuit, hybrid, re model and their use in amplifier design. Multistage amplifiers, frequency response of basic & compound configuration, Power amplifiers: Class A, B, AB, C and D stages, push-pull amplifier (their efficiency and power Dissipation).

#### UNIT IV

Feedback & Oscillator Circuits: Effect of positive and negative feedbacks, basic feedback topologies & their properties, Analysis of practical feedback amplifiers, Sinusoidal Oscillators, Operation of oscillators, types of transistor oscillators (RC, LC and Crystal), Multivibrators: Monostable and Astable Multivibrator, basic operation of the 555 timer.

#### UNIT V

Operational Amplifiers: Op-Amp Basics, ideal and practical Op-Amp circuits, differential and common mode operation, Inverting & Non Inverting Amplifier, OpAmp applications: Summing amplifier, Integrators and differentiators, Instrumentation amplifier.

#### List of Practical's: (If Practical Credit Shown in Syllabus)

1. V-I Characteristics of different types of Diodes.
2. Design of various clipping and clamping circuits.
3. Design half & full wave rectifier
4. Design & Analysis of transistor amplifier in CE, CB & CC configuration.
5. Design & Analysis of JFET Amplifier.
6. Design & Analysis of MOSFET Amplifier.
7. Study of power amplifiers of various classes.
8. Study of various oscillators.
9. Char. of Op-Amp (input offset voltage, slew rate CMRR, BW, Input bias current )
10. Study of Op-Amp as a comparator.

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 305		ELECTRICAL ENGINEERING MATERIALS	3	0	0	3	60	20	20	0	0

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

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#### Course Objectives:

To introduce the concepts of different electrical engineering materials. To gain the concepts of conducting, semiconducting, dielectric and insulating materials with their properties and application. It will also provide the various phenomena such as Magnetostriction, Hall Effect, Super conductivity etc.

#### Course Outcomes:

Upon completion of this course the students will be able to:

1. Apply core concepts in materials science to solve engineering problems.
2. Select the material for design and construction
3. Understand the importance of life -long learning
4. Evaluate the insulating, conducting and magnetic materials used in electrical machines.
5. Understand the properties of liquid, gaseous and solid insulating materials.

#### Syllabus:

##### UNIT I

##### Insulating Materials and their Applications:

Plastics- Definition and classification, thermosetting materials, Thermo-plastic materials; Natural insulating materials, properties and their applications; Gaseous materials – Ceramics- properties and applications.

##### UNIT II

##### Semi-Conducting Materials:

Introduction - Semi-conductors and their properties, Different semiconducting materials (silicon and germanium) used in manufacture of various semiconductor devices (i.e. p-type and n-type semiconductors), Materials used for electronic components like resistors, capacitors, diodes, transistors and inductors etc.

##### UNIT III

##### Materials For Electrical Applications

Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetal fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid Liquid and Gaseous insulating, materials. Effect of moisture on insulation.

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#### UNIT IV

##### Magnetic Materials

Introduction and classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, Diamagnetism, magnetically soft and hard materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis. B-H curve, magnetic saturation, hysteresis loop (including coercive force and residual magnetism, concept of eddy current and hysteresis loss, Curie temperature,

#### UNIT V

##### Special Purpose Materials

Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI.

#### Text Books:

1. SK Bhattacharya: "Electrical and Electronic Engineering Materials" 1<sup>st</sup> edition Khanna Publishers, New Delhi, 2006.
2. A.J. Dekker "Electrical Engineering Materials", PHI, 2006.

#### Reference Books:

1. TTTI Madras: "Electrical Engineering Materials" TMH.
2. R K Rajput: "A course in Electrical Engineering Materials", Laxmi Publications. 2009.
3. T K Basak: "A course in Electrical Engineering Materials" New Age Science Publications 2009.
4. C. S. Indulkar and S. Thruvengadem: "Electrical Engineering Materials" S. Chand.
5. John Allison "Electrical Engineering Material s & Devices" TMH.
6. V. Raghvan: "Material Science & Engineering" PHI.
7. S.P. Seth & P.V. Gupta: "A course Electrical Engineering Materials" Dhanpat Rai & Sons.

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### ML307 ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

SUBJECT CODE	CATEGORY	SUBJECT NAME	TEACHING & EVALUATION SCHEME									
			THEORY			PRACTICAL			L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment <sup>nt</sup>	END SEM University Exam	Teachers Assessment <sup>nt</sup>					
ML-307	Compulsory	Environmental Management and Sustainability	60	20	20	0	0	4	0	0	4	

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit;

\*Teacher's Assessment shall be based upon following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objective

1. To create awareness towards various environmental problems.
2. To create awareness among students towards issues of sustainable development.
3. To expose students towards environment friendly practices of organizations.
4. To sensitize students to act responsibly towards environment.

#### Examination Scheme

The internal assessment of the students' performance will be done out of 40 Marks. The semester Examination will be worth 60 Marks. The question paper and semester exam will consist of two sections A and B. Section A will carry 36 Marks and consist of five questions, out of which student will be required to attempt any three questions. Section B will comprise of one or more cases / problems worth 24 marks.

#### Course Outcomes

1. The course will give students an overview of various environmental concerns and practical challenges in environmental management and sustainability.
2. Emphasis is given to make students practice environment friendly behavior in day-to-day activities.

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## COURSE CONTENT

### Unit I: Introduction to Environment Pollution and Control

1. Pollution and its types (Air, Water, and Soil): Causes, Effects and Control measures
2. Municipal Solid Waste: Definition, Composition, Effects
3. Electronic Waste: Definition, Composition, Effects
4. Plastic Pollution: Causes, Effects and Control Measures

### Unit II: Climate Change and Environmental Challenges

1. Global Warming and Green House Effect
2. Depletion of the Ozone Layer
3. Acid Rain
4. Nuclear Hazards

### Unit III: Environmental Management and Sustainable Development

1. Environmental Management and Sustainable Development: An overview
2. Sustainable Development Goals (17 SDGs)
3. Significance of Sustainable Development
4. Environment Friendly Practices At Workplace and Home (Three Rs' of Waste Management, Water Conservation, Energy Conservation)

### Unit IV: Environmental Acts

1. The Water (Prevention and Control of Pollution) Act, 1974: Objectives, Definition of Pollution under this act, Powers and Functions of Boards
2. The Air (Prevention and Control of Pollution) Act, 1981: Objectives, Definition of Pollution under this act, Powers and Functions of Boards
3. The Environment (Protection) Act, 1986: Objectives, Definition of important terms used in this Act, Details about the act.
4. Environmental Impact Assessment: Concept and Benefits

### Unit V: Role of Individuals, Corporate and Society

1. Environmental Values
2. Positive and Adverse Impact of Technological Developments on Society and Environment
3. Role of an individual/ Corporate/ Society in environmental conservation
4. Case Studies: The Bhopal Gas Tragedy, New Delhi's Air Pollution, Arsenic Pollution in Ground Water (West Bengal), Narmada Valley Project, Cauvery Water Dispute, Fukushima Daiichi Disaster (Japan), Ozone Hole over Antarctica, Ganga Pollution, Deterioration of Taj Mahal, Uttarakhand flash floods

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### Suggested Readings:

1. Rogers, P.P., Jalal, K.F. , Boyd, J.A.(Latest Edition) . **An Introduction to Sustainable Development.** Earthscan
2. Kalam, A.P.J. (Latest Edition) .*Target 3 Billion: Innovative Solutions Towards Sustainable Development.* Penguin Books
3. Kaushik , A. and Kaushik (Latest Edition).*Perspectives in Environmental Studies.* New Delhi: New Age International Publishers.
4. Dhameja. S.K. (Latest Edition). *Environmental Studies.* S.K. Kataria and Sons.New Delhi
5. Bharucha,E. (Latest Edition). *Environmental Studies for Undergraduate Courses.* New Delhi: University Grants Commission.
6. Wright. R. T. (Latest Edition). *Environmental Science: towards a sustainable future* .New Delhi: PHL Learning Private Ltd.
7. Rajagopalan, R. (Latest Edition). *Environmental Studies.* New York: Oxford University Press.

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							THEORY		PRACTICAL		
							END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*
BTEE 308		ELECTRICAL INSTALLATION TESTING AND MAINTENANCE	2	1	2	4	60	20	20	30	20

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\*Teacher Assessment shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

#### Course Objectives:

The course covers topics on general principles of electrical installations, testing of transformers, induction motor & various electrical equipments. It also covers topics on earthing system for safety and practical aspects of condition monitoring and maintenance of various electrical equipments.

#### Course Outcomes:

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

1. Apply Indian Electricity safety Rules and Regulations for design of electrical systems.
2. Understand the maintenance of various electrical equipments.
3. Test and install electrical apparatus and HVAC systems for commercial and industrial applications.
4. List the conditions for Install of electrical equipments.
5. Analyze the different earthing systems and design electrical systems as per the requirements for residential and commercial purposes.

#### Syllabus:

##### UNIT I

**Electrical Safety Management:** Safety Management during Operation and Maintenance, India Electricity rules, workmen's safety devices. Electric Shock, treatment for electric shock, Clearance and Creepages.

Need of Earthing, different methods of Earthing, Equipment for Earthing and System Grounding, Earthing Procedure - Building installation, Domestic appliances, Industrial premises.

##### UNIT II

**Electrical Maintenance:** Importance and necessity of maintenance, Requirement of electrical maintenance department, Maintenance: Types of maintenance, maintenance schedules, procedures, Maintenance of Transmission lines. Maintenance of Distribution Transformers: Checking of insulation Resistance, Checking and maintenance of busbars, isolating switches, lightning arrestors, and relay panels, Power Transformers. Maintenance of Motors: Over hauling of motors. Preventive Maintenance of circuit breakers, underground cables. Trouble Shooting: Causes for failure of electrical equipments.

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#### UNIT III

**Electrical Installation System:** Tools/Instruments necessary for installation, Technical report, Inspection, site testing and checking, Installation of electrical equipments like induction motors, DC machines, transformers, switch gears, transmission and distribution lines. Precautions while installation is in progress. Testing of installation before declaring it to be fit for energizing.

**Domestic installation:** Introduction, testing of electrical installation of a building, IE rules for domestic installation

#### UNIT IV

**Testing of transformers:** Type tests, Routine tests and Special tests. Determination of mechanical stress under normal & abnormal conditions. Trouble shooting, faults, causes and remedies.

#### UNIT V

**Testing of various electrical equipments:** Testing of Power cables – Causes of cable failure, fault location methods and Remedial actions. Testing of CT, PT, generator, testing of switchgear & other protective devices like circuit breaker, relay and lighting arrester. Testing of Capacitor banks.

#### Text books:

1. Paul Gill, "Electrical Power Equipment Maintenance And Testing", CRC Press, 2008.
2. Rao, S., "Testing, Commissioning, Operation and Maintenance of Electrical Equipment", 6/E., Khanna Publishers, New Delhi.

#### Reference books:

1. M. Subbarao, "Installation Commissioning & Testing Of Electrical Engineering Equipments", Khanna Publishers.
2. Singh Tarlok, "Installation, Commissioning And Maintenance Of Electrical Equipment", S.K. Kataria And Sons, New Delhi.
3. Philip Kiameh, "Electrical Equipment Handbook: Troubleshooting And Maintenance", McGraw-Hill, 2003.
4. Preventive Maintenance of Electrical Apparatus: SK Sharotri, Katson Publishing House Ludhiana.

#### List of Practical's: (If Practical Credit Shown in Syllabus)

1. Introduction of tools, electrical materials, symbols and abbreviations.
2. To study earthing of electrical installation.
3. To study types of insulators.
4. To study maintenance schedule for distribution transformer, testing, maintenance and protection of distribution transformer.
5. To study of measurement of insulation resistance and capacitance.
6. To study of maintenance schedule for storage battery switchgear and control equipment.
7. To study types of neutral earthing and substation earthing.
8. To study construction and types of plate earthing.
9. To study construction and types of pipe earthing.
10. Testing of CT and PT.

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