

Maharashtra State Board of Vocational Examination, Mumbai 400 051.

1	Name of Course	DIPLOMA COURSE IN LINEMAN (Revise W.E.F.2017-18)											
2	Course Code	302404											
3	Max no. of Students	25											
4	Duration	2 year											
5	Course Type	Full Time											
6	No. of Days per week	6 days											
7	No. of hours per day	7 Hrs											
8	Space require	Theory Class Room – 200 sqft, Lab Sub.– 800 sqft, Lab Elective - 400 sqft Total = 1400 Sq.Ft.											
9	Entry qualification	S.S.C. Pass											
10	Objective of syllabus	To develop professional competence in the field of electrical. To train the students to acquire skills and mastery in the use of electric circuits. To train the students to repair or rewinding and test the different electrical equipment. To prepare for self and wage employment. To prepare competent electrical technicians for the small-scale industry.											
11	Employment opportunities	The students can get job in industries; with work experience he could start his own business.											
12	Teachers Qualification	1) For Vocational subject - B.E. in Electrical Engineering 2) For Non Vocational Subject - Master Degree in Concern subject											
13	Teaching Scheme –												
		Sr.	Subject	Subject Code	Clock Hours / Week			Total					
						Theory	Practical						
1			English (Communication Skill)	90000001	2 Hrs	1 Hrs	3 Hrs						
2			Elective – I		2 Hrs	1 Hrs	3 Hrs						
3			Elective – II		2 Hrs	1 Hrs	3 Hrs						
4			BASIC ELECTRICAL WORKSHOP PRACTICE AND ENGG DRAWING	30240001	3 Hrs	8 Hrs	11 Hrs						
5			FUNDAMENTALS OF ELECTRICAL ENGINEERING	30240002	3 Hrs	8 Hrs	11 Hrs						
6			TRANSMISSION & DISTRIBUTION	30240006	3 Hrs	8 Hrs	11 Hrs						
		Total							42 Hrs				
14	Internship	Two Month Summer Internship from 1 st May to 30 th June is Compulsory.											
15	Examination Scheme – Final Examination will be based on syllabus of both years.												
		Paper	Subject	Subject Code	Theory			Practical			Total		
						Duration	Max	Min	Duration	Max	Min	Max	Min
1			English (Communication skill)	90000001	3 Hrs	70	25	3 Hrs	30	15	100	40	
2			Elective – I		3 Hrs	70	25	3 Hrs	30	15	100	40	
3			Elective – II		3 Hrs	70	25	3 Hrs	30	15	100	40	
4			BASIC ELECTRICAL WORKSHOP PRACTICE AND ENGG DRAWING	30240001	3 Hrs	100	35	3 Hrs	100	50	200	85	
5			FUNDAMENTALS OF ELECTRICAL ENGINEERING	30240002	3 Hrs	100	35	3 Hrs	100	50	200	85	
6			TRANSMISSION & DISTRIBUTION	30240006	3 Hrs	100	35	3 Hrs	100	50	200	85	
		Total										900	375
16	Teachers – Three Teachers per batch for vocational component. For English, Elective-I & II guest faculty on clock hour basis.												
17	a) For Elective I – Student can choose any one subject						b) For Elective II – Student can choose any one subject						
		Code	Subject Name			Code	Subject Name						
		90000011	Applied Mathematics			90000021	Applied Sciences (Physics & Chemistry)						
		90000012	Business Economics			90000022	Computer Application						
		90000013	Physical Biology (Botany & Zoology)			90000023	Business Mathematics						
		90000014	Entrepreneurship										
		90000015	Psychology										

THEORY - I**BASIC ELECTRICAL WORKSHOP PRACTICE AND ENGG DRAWING – 1st year****(Subject Code – 30240001)**

Sr.No.	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Safety Precautions	1 Introduction to shop discipline	Familiarization to shop discipline Safety precautions and practice while working in shop	6	4
		2 Electric shock	Electric shock and causes of electric shock Causes of Electric fire		
		3 First aid	Various safety measures involved in the Industry. Elementary first Aid. Artificial respiration methods Precautions against electric burn Precautions to prevent electric shock and electric fire		
		4 Fire Extinguishers	Introduction to fire extinguishers, types and uses		
2	Hand Tools	1 Introduction	Introduction and identification of hand tools used in electric shop	12	7
		2 Application	Use of Tools. – Pliers, Neon Tester, connector, Screw driver, Knife, S.W.G. Hammers, Hand drill machine, Mallet, Spanners, Bench vice, Test lamp. etc Marking, use of chisels and hacksaw on flats		
		3 Safety precautions and care and maintenance	Safety precautions while using tools care and maintenance of tools		
3	Soldering Materials	1 Introduction	Introduction to soldering and necessity of soldering, Solders, flux, types of flux	6	3
		2 Soldering	Soldering technique, soldering equipment, precautions		
4	Fuse materials	1 Fuse materials	Copper, Lead, Tin, Silver and their alloys as fuse materials, their properties and applications	3	3
5	Electrical Accessories	1 Introduction to common electrical accessories	Introduction Common Electrical Accessories, their specifications,	12	6
		2 Common electrical accessories	Types of switches, lamp holders, plugs and sockets .Developments of domestic circuits, Alarm & switches, lamp, fan with individual switches, two way switches. Required accessories, Ceiling rose, Socket outlet, Plug, connector, Adopter, Terminal block, D. B. and application of Electrical Accessories		

6	Sheet metal	1 Introduction sheet metal	Sheet metal filing practice, filing true to line.	12	3
		2 Sheet metal practice	Practice in using snips, marking & cutting of straight & curved pieces in sheet metals. Bending the edges of sheets metals. Riveting practice in sheet metal. Practice in making different joints in sheet metal in soldering the joints.		
7	Sawing and planning	Introduction to sawing and planning	Sawing and planning practice. Practice in using firmer chisel and preparing simple half lap joint.	8	3
8	Drilling	Introduction to drilling	Drilling practice in hand drilling & power drilling machines. Grinding of drill bits.	8	3
9	Tapping and Threading	Introduction to tapping and threading	Practice in using taps & dies, threading hexagonal & square nuts etc. cutting external threads on stud and on pipes, riveting practice.	8	3
10	Engineering Drawing	Introduction to engg drawing	Definition of Engineering Drawing. Uses of Engineering Drawing.	30	15
		2 Geometrical construction	Geometrical construction of Square, Rectangle, Triangle, Circle, Ellipse, Polygons, etc.		
		3 Lettering	Lettering		
		4 Types of Lines	Different types of line.		
		5 Orthographic Views, Isometric views	1st angle projection, 3rd angle projection. Orthographic views, Isometric views. Drawing of plan, elevation & side views from isometric views		

PRACTICAL - I**BASIC ELECTRICAL WORKSHOP PRACTICE AND ENGG DRAWING – 1st year
(Subject Code – 30240001)**

Sr no	Practical	Skills to be achieved	Time allotted
1	Implementation in the shop floor of the various safety measures.	1 Safety, 2 precautions, 3 identification of switches 4 housekeeping 5 application of firefighting equipment	8
2	Visit to the different sections of the Institute	1 Layout of the institute, 2 introduction to other sections	4
3	Demonstration on elementary first aid.	1 application of first aid	4
4	Artificial Respiration	1 Rescue a person from live wire 2 apply respiratory resuscitation	8
5	Demonstration of Trade hand tools.. Use, care & maintenance of various hand tools.	1 identification of the tools 2 use different hand tools 3 care and maintenance	8
6	Identification of simple types- screws, nuts & bolts, chassis, clamps, rivets etc	1 identify screws nut, bolts, clamps, rivets	8
7	Practice in using cutting pliers, screw drivers etc. skinning the cables, and joint practice on single strand.	1 Use of cutting pliers & screw driver 2 Skinning of cable	12
8	Demonstration & Practice on bare conductors joints--such as Britannia, straight	1 Mark the length of insulation to be removed 2 To join single strand conductor 3 To join bare conductor 4 prepare Britannia joint 5 prepare straight joint	12
9	Demonstration & Practice on bare conductors joints--such as, Tee, Western union joints	1 Mark the length of insulation to be removed 2 To join single strand conductor 3 To join bare conductor 4 prepare tee joint 5 prepare western joint	8
10	Types of soldering irons-their proper uses. . Soldering materials, fluxes and process.	1 solder the joints 2 use of flux	12

11	Practice in soldering	1 soldering practice	8
12	Measurement of Resistant and Measurement of specific Resistant.	1 connection of voltmeter 2 connection of ammeter 3 measure the resistance 4 measurement of specific resistance	12
13	Application of Wheatstone bridge in measurement of Resistance	1 Connection Wheatstone bridge 2 measure the resistance by Wheatstone bridge	8
14	Practice on installation and overhauling common electrical accessories. - Identification and use of wiring accessories	1 identification of specified electrical accessories 2 use of electrical accessories	16
15	Fixing of switches, holder plugs etc. in T.W. boards.	1 select the correct size of boards 2 position the accessories 3 wire up and test the board	16
16	Introduction of fitting trade. Safety precautions to be observed use of files, hammers, chisels steel rule try square - their specification Care & maintenance of tools	1 safety in fitting shop 2 use of hand tools as files, hammers, chisels etc 3 care and maintenance	16
17	Safety precautions to be observed use hacksaw frames & blades-their specification & grades. Care & maintenance of tools.	1 use of hacksaw 2 specification and grades hacksaw blades 3 care and maintenance	12
18	Marking tools description & use. Description of carpenter's common hand tools such as saws planes, chisels mallet claw hammer, marking, dividing & holding tools-their care and maintenance.	1 identification of marking tools 2 use of marking tools 3 care and maintenance	12
19	Holding tools-their care and maintenance.	1 identification of holding tools 2 use of holding tools 3 care and maintenance	8
20	Types of drills description & drilling machines, proper use, care and maintenance.	1 use of drill machines 2 care and maintenance of drill machine	16
21	Description of taps & dies, types in rivets & riveted joints. Use of thread gauge.	1 use of tap & dies 2 types of rivets & riveted joints 3 use of thread gauge	8
22	Description of marking tools such as snubs shears punches & other tools like hammers mallets etc. used by sheet metal workers. Use of different bench	1 identification of marking tools 2 use of marking tools 3 care and maintenance 1 identification of cutting tools	16

	tools used by sheet metal worker	2 use of cutting tools 3 care and maintenance of cutting tools 4 use different bench tools	
23	Freehand sketching of straight lines, rectangles, squares, circle polygons etc.	1 Freehand sketching of straight lines , 2 Freehand sketching of rectangles 3 Freehand sketching of squares 4 Freehand sketching of circle 5 Freehand sketching of polygons	12
24	Lettering practice	1 use of drawing instruments 2 lettering	12
25	Drawing of different types of line	1 drawing of lines, 2 use of sets square	8
26	Drawing of different blocks	1 drawing of blocks 2 use of sets square	8
27	Practice on Geometrical construction of Square, Rectangle, Triangle, Circle, Ellipse, , etc	1 construct Square, Rectangle, Triangle, Circle, Ellipse, , etc	16

Theory - I

BASIC ELECTRICAL WORKSHOP PRACTICE AND ENGG DRAWING - 2nd Year (Subject Code – 30240001)

Sr no	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Conducting Materials	1 Introduction	Introduction to conducting materials	6	3
		2 Classification	Copper and aluminum as low resistively materials their electrical characteristics and application		
		3 Application	Electric resistance materials. Materials for lamp filaments and Brushes. Tungsten, Nichrome, Eureka, Selenium and Carbon as high resistively materials, their electrical characteristics and application.		
2	Insulating materials	1 Introduction	Introduction to insulating materials, Distinction between conductor, insulator and semi conductor, definitions of insulation resistance, dielectric strength breakdown voltage	6	3
		2 Classification	Classification of insulating materials according their insulating resistance, temperature withstanding capacity		
		3 Application	Various insulating Materials : Paper, plastic coated Paper. Empire cloth Leatherwood Cotton and silk, Rubber, PVC Porcelain, Bitumen, Micro, Bakelite, Ebonite, Marble,		

			Glass Asbestos, Fiber glass-their uses and applications insulating tapes, Sleeves, insulating and impregnating Varnishes and paints- Their uses and application.		
3	Magnetic Materials	1 Introduction	Introduction of Magnetic Materials	6	4
		2 Classification	Classification of materials as Ferromagnetic materials, soft and hard magnetic material		
		3 Application	Various magnetic materials- Mild steel, silicon steel, Mu-metal, Permalloy, Alnico as magnetic materials their properties and uses.		
4	Structure Materials	1 Introduction	Introduction of structure materials	3	4
		2 Application	Various structural materials- Iron Steel, Brass, Gun Metal and Aluminum as structural materials, their properties and applications.		
5	Semiconductor materials	1 Introduction	Introduction of semiconductor materials	9	4
		2 Application	Electric properties of semi-conducting elements and compounds and their application. Zone refining and crystal growth.		
6	Lubricants	1 Introduction	Introduction to lubricants	6	4
		2 Application	Lubricants : Solid, semi-solid and liquid lubricants- uses and applications.		
7	Wire joints and their importance	1 Importance of wire joints,	Importance of wire joints, reasons for failure of joint, methods of minimizing joint failures.	12	4
		2 Importance of lugs	Importance of lugs in joints, bus bars, methods of reducing the contact/joint resistance,		
		3 Types of wires	Size of wires, different Types of wires, Single & multi conductor cables.		
		4 wire joints	Wires & wire splicing & termination - Wire splicing & termination , Twist splice four steps Married joint , Tap joint , Double Branch splice , Tap joint , Flexible cord Splicing , Pigtail , Termination of wires at terminal screws.		
8	Engg Drawing	1 Two-dimensional geometrical construction	Two-dimensional geometrical construction – conic sections, involutes and cycloids	18	8
		2 Representation of three-dimensional objects	Representation of three-dimensional objects – principles of projections – standard codes of principles.		

		3 Orthographic Views, Isometric views	Practice of drawing Orthographic Views, Isometric views		
9	Hardware	1 Introduction to hardware	Introduction to Hardware – display technology	15	6
		2 Introduction to software	Software – introduction to drafting software.		
10	Shop Problems	1 Basic workshop based problems	1 units and conversions 2 ratios and proportion, percentage, 3 Algebra-simultaneous, quadratic equations 4 Mensuration-Area of plane figures, volume of solid figures 5 Trigonometry	24	10
		2 Work, Power and Energy and workshop science	1 Work, Power & Energy – Their units and related problems 2 Dynamics-speed, velocity, angular velocity, laws of motions, laws of forces, graph etc 3 simple machines- lever, pulley, screw jack, etc 4 friction- types, laws of friction 5 density and sp gravity etc		

Practical - I

BASIC ELECTRICAL WORKSHOP PRACTICE AND ENGG DRAWING - 2nd Year (Subject Code – 30240001)

Sr no	Practical	Skills to be achieved	Time allotted
1	Study of conducting materials	1 identification of the conducting material . 2 use different conducting	12
2	To make coil of nichrome and ureka wire of equal resistance	1 making coil of nichrome and ureka wire 2 measure resistance of both wire of equal length	24
3	measurement of current and power at given voltage	1 connection of wattmeter 2 connection of ammeter 3 measure the current 4 measure the power	20
4	Identification of insulating materials	1 study of insulating of material 2 properties of insulating material	12
5	Use of insulating materials in electric field	1application of insulating materials	12
6	Study of magnetic materials	1 study of magnetic of material 2 properties of magnetic material	12
7	Identification of magnetic and non magnetic materials	1identification of magnetic materials 2identification of non-magnetic materials	8
8	Study of structural materials	1 study of structural of material 2 properties of structural material 3 use of structural material	12
9	Study of semi-conducting materials	1 study of semi-conducting of material 2 properties of semi-conducting material	16
10	Application of semiconducting materials	1 use of semi-conducting material. 2 properties of semi-conducting material	8

11	Study of lubricating materials	1 study of lubricating material 2 properties of lubricating material 3 use of lubricating material	8
12	Application of lubricants	1 use of lubricating material	8
13	Making of different types of wire joints, fixing of lugs.	1 Mark the length of insulation to be removed 2 To join single strand conductor 3 To join bare conductor 4 prepare joints 5 crimping the lugs	28
14	Practice on Geometrical construction of involutes	1 construction of involutes	20
15	Practice on Geometrical construction of cycloids	1 construction of cycloids	20
16	To study of hardware display	1 introduction of hardware 2 application	20
17	To study of drafting software	1 introduction of drafting software 2 use of drafting software	40

THEORY - II**FUNDAMENTALS OF ELECTRICAL ENGINEERING – 1st year
(Subject Code – 30240002)**

SR NO	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Current Electricity	1 Introduction to electricity	Introduction to electricity, electricity and its sources Nature of electricity types, Generation of electricity	12	6
		2 Electron Theory	Electron theory- free electron. Structure of an atom		
		3 Effects of electric current	Effects of electric current		
		4 Laws of Resistance	Factors affecting resistance of a conductor. Temperature coefficient of resistance, sp resistance		
		5 Definitions	Definition of Resistance, Voltage, Current, Power, Energy and their units, . Difference between ac and dc voltage Electric circuit, types of electric circuit		
2	D.C. Circuits	1 Ohms law	Ohm's Law Relation between voltage and current in a dc circuit.	12	6
		2 Series and parallel circuits	Series and Parallel resistance circuits and their equivalent resistance. Series-Parallel Resistance circuits, calculation of equivalent resistance		
		3 Kirchhoff's laws	Kirchhoff's laws and Their applications.		
3	Batteries	1 Introduction	Introduction of cells and batteries, production of emf by chemical action primary and secondary cells	12	4
		2 Grouping of cells	series and parallel, series- parallel connection of cells.		
		3 Secondary cells	Lead acid cell- construction, discharging and recharging of battery, efficiency, charging methods, precautions, application, alkaline cells- construction application		
		4 Care and maintenance	Testing, care and maintenance of battery,		
4	Heating and Lighting Effects of Current	1 Heating effect	Heating effect of electric current: Joule's Laws of electric heating and its applications, heating efficiency	9	6
		2 Lighting effect	Lighting effect of electric current, Filaments used in lamps, lamps and gas Discharge lamps, their specifications, working and applications.		

5	Capacitors	1 Introduction of capacitors	Introduction to Capacitors, capacitance, energy stored in capacitor, application. Charging and discharging of capacitors.	6	4
		2 Combination of capacitors	Types of capacitors and their use in circuits. Series and parallel connection of capacitors		
6	Electromagnetism	1 Introduction	Introduction, definitions of magnet and properties of magnet, types of magnet, fundamental magnetic terms	12	6
		2 Electromagnetism	Permanent magnets and electromagnets their construction and application. Electromagnetism, magnetic rules electromagnetic induction, Faraday's Laws of electromagnetic induction, dynamically induced emf, and statically induced emf, direction. Self induction, mutual induction, Flemings left hand rule, Lenz's law		
7	A.C. Circuits	1 Introduction	Introduction to generation of A.C .Definitions, Principles of Generation of A.C. voltage and wave shape Cycle, frequency, peak Value (maximum value) average value, instantaneous value, R.M.S.value, phase, phase difference	12	6
		2 Different types of ac circuits	Introduction to resistance, capacitance and inductance, inductive reactance and capacitive reactance, impedance power factor (Leading and lagging). A.C Circuits with R, L and C ,A.C Circuits with (i) resistance and inductance, (ii) resistance and capacitance (iii) resistance, inductance and capacitance in series. Introduction of ac parallel circuit of R L C		
		3 polyphase system	Three phase system, phase sequence, definitions, star and delta connections of windings		
8	Measuring instruments	1 Introduction	Introduction of Measuring instruments, types of measuring instruments, deflecting torque, controlling torque & damping torque	12	5
		2 Working, construction of various instruments	Working principles of moving iron and moving coil voltmeters and ammeters, extension of instrument range, dynamometer type wattmeter, Ohm meter,		
		3 Types of Measuring Instruments	Working and application of P.F. meter - Energy meter --Energy meter digital -Frequency meter -Phase Sequence indicator -Multimeter –Analog and Digital - C.R.O, megger.		

9	Electrical Wiring	1 Introduction of electrical wiring	Introduction to electrical wiring, wiring systems, selection of wiring	18	7
		2 Types of wiring	Types of wiring - Introduction to casing and capping conduit wiring, raw material required for all types of wiring, procedure. Method of Installing wiring for domestic installations - Cleat, T .R .S Metal Sheathe conduit . All system comparison Testing of wiring, faults, their causes and remedies. Methods of finding numbers of circuits and circuit distribution by distribution board system. Indian Electricity Rules (IER) related to wiring. Introduction of inverter wiring.		
		3 Earthing	Earthing purpose, General Specifications of as per I .S .I .		
		4 methods	Methods – Pipe earthing, Plate earthing ,		
		5measuring earth resistance	Methods of Measuring Earth Resistance. – Potential drop & Earth tester .		
		6 factors affecting earth resistance	Factor affecting Earth Resistance .Points considered as per I.E.E. Testing by megger.		
		7 ELCB	Introduction of ELCB, working, application		
		8 Solar electricity	Solar Electricity Need of Solar Energy, Solar Photovoltaic (SPV) Technology, and advantage of SPV system, Solar Constant, formation of Solar Cells, SPV Module, Array and Applications of Solar Photovoltaic System.		

PRACTICAL - II
FUNDAMENTALS OF ELECTRICAL ENGINEERING – 1st year
(Subject Code – 30240002)

Sr no	Practical	SKILLS TO BE ACHIEVED	Time allotted
1	Measurement of current, voltage and resistance of the help of millimeter	1. Measurement of current with millimeter 2. Measurement of voltage with millimeter 3. Measurement of resistance with multimeter	8
2	Verification of Ohm's Law.	1.Connect meters in proper sequence 2.reading the meter 3.Verify ohm's law experimentally	8
3	Measurement of equivalent resistance of series combination of resistors.	1. Connect resistances in series 2.Calculate equivalent resistance of series combination of resistors.	8
4	Measurement of equivalent resistance of parallel combination of resistors	1. Connect resistances in parallel 2.Calculate equivalent resistance of parallel combination of resistors.	8
5	Measurement of equivalent resistance of series-parallel components of resistors.	1. Connect resistances in series parallel 2.Calculate equivalent resistance of series parallel combination of resistors.	8
6	To verify Kirchhoff's current laws.	1.Connect meters in proper sequence 2.reading the meter 3.Verify Kirchhoff's law experimentally	8
7	Charging a lead acid battery and to test its state of charge.	1. Connect battery for charging 2.Test the charging with hydrometer 3. Use of hydrometer	8
8	Study of series and parallel capacitor circuits.	1.Connection of capacitor in series & parallel 2.calculation of capacitive reactance with formulae	8
9	Study of series and parallel resistor circuits/lamps.	1.Connection of resistor/lamp in series & parallel 2.calculation of equivalent resistance with formulae	8
10	Study of R.L. series circuit and measurement of impedance, power and power factor.	1. Connection of R-L in series 2. Calculate impedance 3.calculate power 4. Calculate power factor	8
11	Study of R.C. series circuit and measurement of impedance, power and power factor.	1. Connect R-C in series 2. Calculate impedance 3.calculate power 4. Calculate power factor	8
12	Study of R.L.C. series circuit and measurement of impedance, power and power factor.	1. Connect R-L-C in series 2. Calculate impedance 3.calculate power 4. Calculate power factor	12

13	To test a single phase energy meter with the help of standard wattmeter and stop watch with resistive load.	1. Connect single phase energy meter 2. Connect standard wattmeter 3. Use of stop watch 4. Find out the error	8
14	Controlling low voltage lamps in series	1. Connect low voltage lamps in series 2. Calculate no. of lamps	8
15	Controlling lamps from two or three places	1. Choose proper switches 2. Selection of proper wiring system	12
16	Drawing schematic diagram of single phase supply to consumers.	1. Identify single phase supply. 2. Draw schematic diagram 3. Connection of single phase supply to consumer	8
17	Drawing schematic diagram of three phase supply to consumers.	1. Identify three phase supply. 2. Draw schematic diagram 3. Connection of three phase supply to consumer	8
18	Practice on CTS/TRS (Batten) wiring with 2 fans, 4 lamps, 2 tubes and 4 plug points.	1. Marking the wiring diagram 2. Mark the position of fans 3. Mark the position of lamps 4. Mark the position of tubes 5. Select the proper size of link clips	16
19	Practice on conduit wiring	1. Marking the wiring diagram 2. Mark the position of accessory 3. Cutting of Conduit 4. Selection of conduit size	16
20	Polarity test of wiring installation (means phase and neutral testing).	1. Use of neon tester 2. Check polarity of wiring installation	8
21	Measurement of insulation resistance of wiring installation by megger.	1. Use of megger 2. Measure insulation resistance with megger	8
22	Testing of wiring installations with the help of megger.	1. Use of megger 2. Test the wiring installation for continuity or open ckt 3. Test wiring	12
23	Installation of pipe earthing for wiring installation.	1. Prepare pipe earthing 2. Install pipe earthing	16
24	Study of plate earthing for wiring installation.	1. Prepare plate earthing 2. Install plate earthing	12
25	Testing faults of wiring installation and rectification.	1. Test wiring installation 2. Rectify the faults 3. Repair the faults	12

26	Installation of a sub-meter between a given electrical wiring.	1.Use of sub meter 2.install sub meter in wiring system	12
27	Measurement of open Circuit Voltage and short circuit current of a PV Module	1.measuring open ckt voltage 2 measuring of short ckt voltage	8
28	To study/Install a Solar Street light System.	1 solar system awareness 2 installation of solar system 3 commissioning of solar system	16

THEORY - II

FUNDAMENTALS OF ELECTRICAL ENGINEERING - 2nd year

(Subject Code – 30240002)

SR NO	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	1. D.C. Machines	1 Introduction	D.C. Machines – General concept of Electrical machines. Principle of D.C. generator. Construction of generator parts of generator, armature, Field coil, Yoke, and commutator, slip ring brushes, core.	15	6
		2 Types of generators	D.C. Generators-. E.M.F. equation- types -self excited and separately excited Generators-application. Brief description of series, shunt and compound generators		
		3 Armature reaction	Armature reaction, interpoles and their uses, connection of interpoles, commutation.		
2	DC Motors	1 Introduction	Introduction to DC Motors – Terms used in D.C. motor-Torque, speed, Back-e.m.f. etc. their relations practical application. Related problems, change of DOR	15	6
		2 Types of dc motors	Types, characteristics and application of dc. motors. Special precaution to be taken in dc Series motors. Testing fault finding of dc motor		
		3 DC motor starters	Starters used in D.C. motors, necessity, types, working		
		4Speed control methods	Methods of speed control of DC motors Word-Leonard control, Thyristor/electronic controls.		
3	Transformer	1 Introduction	Introduction to Transformer construction, classification	15	10
		2Working principle, construction	Working principle of Transformer, E.M.F. equation, Regulation and efficiency, Cooling of transformer, protective devices. Specifications, simple problems on e.m.f. Equation, turn ratio, regulations and efficiency.		

			Oil field Transformer - construction cores winding shielding, auxiliary parts breather, conservator buckholtz relay, other protective devices cooling of transformer Transformer oil testing and Tap changing off load and on load. Transformer bushings and termination		
		3Types of transformer	C.T., P.T. Instrument and Auto Transformer/Variac Construction, Single phase and Poly phase.		
		4Parallel operation	Parallel operation of transformer, their connections.		
4	Alternator	1 Introduction	Introduction of Alternator –, working principle, parts of alternator, rating of alternator, prime mover, losses in alternator,	18	6
		2 Types	Types, regulations, phase sequence, specification of alternators and brushless alternator, synchronizing of alternators		
6	Induction motor	1 Introduction	Introduction of Induction motor – Working principle	15	8
		2 Types of motors, construction	Squirrel Cage Induction motor , Slip-ring induction motor- Construction and characteristics, starting and speed control. Speed regulation of A .C . 3 phase I .Motor change of DOR		
		3 Starters	D.O.L Starter, Star /Delta starter, Autotransformer starter. Working, construction Installation of A .C . I .Motor		
7	Single phase induction motor-	1 Introduction	Introduction of Single phase induction motor- Working principle,	9	5
		1 Types	Different method of starting and running (capacitor start/capacitor run, shaded pole technique). FHP motors. Application change of DOR		
8	Universal motor	1Introduction	Universal motor-advantages working Principle, characteristics change of DOR	9	5
		2 Application	Universal motor- applications in domestic appliances and industry, Fault Location and Rectification.		
9	Basic electronic Components and Devices	1Introduction	Introduction Basic electronic Components and Devices	9	4
		2Basic electronic Components	Diodes and Types of Diodes Introduction of electronic devices. Silicon diode, Zener diode Light emitting diode Rectifier (Half wave, full wave, bridge rectifier)Introduction of Transistor Construction and working of Transistor Testing and terminal identification of diode, transistor, SCR, Diac, Triac		

PRACTICAL - II**FUNDAMENTALS OF ELECTRICAL ENGINEERING - 2nd year****(Subject Code – 30240002)**

Sr no	Practical	SKILLS TO BE ACHIEVED	Time allotted
1	Identification and study of the parts of a D.C.machine.	1. Identify parts of d.c. machine 2.function of parts of d.c. machine	4
2	Practicing dismantling and assembling in D.C. Machine.	1. Dismantle d.c. machine 2.Assemble d.c. machine	4
3	Connection of shunts Generators, Measurement of voltages-Demonstration on field excitation.	1. Connect shunt generator 2.identify field winding 3. Identify terminals of shunt generator 4.measure voltages	4
4	Connection of compound Generator-Voltage measurement-cumulative and differential	1. Connect compound generator 2.identify field winding 3.Identify terminals of compound generator 4.measure voltages	4
5	No Load & Load characteristics of Series, Shunt & Compound Generator.	1. Connect the generator 2.verification of no load & load characteristics of generator	4
6	Controlling and protecting DC Generator	1.To control D.C. generator 2.To protect D.C. generator	4
7	Demonstration and practice on identification of parts and terminals.	1. identify terminals of d.c. motor 2.To identify parts of d.c. motor	4
8	Study of the characteristics of DC motors.	1.connection of dc motors 2 verify the characteristics of d.c. motor	8
9	Study of 3 point starters.	1. Connections of starter 2 identification of parts of starter 3function of parts of starter 4. connect three point starter to motor	4
10	Study of 4 point starters.	1. Connections of starter 2 identification of parts of starter 3function of parts of starter 4. connect three point starter to motor	8
11	-Connection, starting, running, speed control of motors. Testing of D.C. motors	1. Connection of dc motors 2 to run dc motors 3 Control speed of d.c. motor 2. test d.c. motors	8
12	Testing of D.C. motors	1 testing of dc motors 2.trace the armature & field terminals.	8
13	Study of Thyristor/electronic control of DC motor.	1 study of thyristor 2 electronic control of dc motors	8

14	Routine maintenance of dc motor.	1. testing of dc motor 2 maintenance d.c. motor	12
15	Identification of types of transformers. Connection of transformers	1. Identify types of transformers 2. connect transformer	12
16	Efficiency of transformers	1. Calculate losses in transformer 2. calculate efficiency of transformer	8
17	Use of C.T. & P.T. use of Instrument transformer.	1.Use of C.T. 2.Use of P.T.3 connection of CT/PT in the ckt	8
18	Parallel operation of transformer.	1. Connections for parallel operation 2 perform parallel operation of transformer 2. Need of parallel operation 3.Condition for parallel operation	12
19	Conducting No-load and short circuit tests.	1. Conduct no load test 2. Conduct short circuit test 3. calculate losses in transformer	8
20	Testing of transformer. Testing of single phase and Three Phase. Transformers -	1. identify single phase & three phase transformer	12
21	Cleaning and maintenance of Transformers, Changing of oil	1.Clean the transformer 2.maintain the transformer 3.change the oil of transformer	8
22	Demonstration on alternators, voltage Building, load characters & regulation	1. identify the terminals of alternator 2.study the load characteristics & regulation	16
23	. Practice on installation, running and maintenance of Alternators.	1. install & connect the alternator 2.run the alternator 3. Maintain the alternator	12
24	-Study of M.C.P.M. meter Study of Multimeter	1. identify & connect the terminals of different meters 2.To connect different types of meters	8
25	Study of Wattmeter, P F meter	1. identify & connect the terminals of different meters 2.To connect different types of meters	8
26	Study of Energy meter Study of Frequency meter Study of Maximum Demand meter	1. identify & connect the terminals of different meters 2.To connect different types of meters	8

27	Study of Calibration of meter	1. identify & connect the terminals of different meters 2.To connect different types of meters 3.Calibrate the meter	8
28	Study of C.R.O.	1. Study C.R.O.	8
29	- Study Phase sequence indicator -Study Digital Instruments	1. Study phase sequence indicator 2.Study digital instruments	8
30	Induction Motors - Study of Squirrel cage.	1. identify types of induction motor 2.Study the different parts of motor	8
31	Induction Motors - Study of Slip ring Induction motor ,	1. Identify parts of Slip ring Induction motor 2.function of parts of Slip ring Induction motor	8
32	Induction Motors Measurement of slip, P.F. at various loads.	1. measurement of slip 2 measurement of p.f. at various loads	8
33	Induction Motors - Study of and Practice on connection of D.O.L Starter	1. Connections of starter 2 identification of parts of starter 3function of parts of starter 4. connect D.O.L starter to motor	4
34	Induction Motors study of Star /Delta starter	1. Connections of starter 2 identification of parts of starter 3function of parts of starter 4. connect D.O.L starter to motor	4
35	Induction Motors - Study of Autotransformer starter starting, running & speed control.	1. Connections of starter 2 identification of parts of starter 3function of parts of starter 4. connect D.O.L starter to motor	4
36	Induction Motors - starting, running & speed control.	1 connections of induction motor 2 to run the motor 3 measurement of speed of IM	4
37	Connection of single phase motor, identification, testing, running, and reversing.	1. Connections of single phase motor 2 identification of parts of single phase motor 3function of parts of single phase motor 4. connect single phase motor 5 reversing of single phase motor	4
38	Identification, connection, testing, running and reversing of universal motor.	1. Connections of universal motor 2 identification of parts of universal motor 3function of parts of universal motor 4. connect universal 5 reversing of universal	8

THEORY - III

TRANSMISSION & DISTRIBUTION - 1st Year

(Subject Code – 30240006)

SR NO	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Tools and Accessories	1 Tools and Accessories	Tools and Accessories – Hand Glows. Gum Boot , Safety belt, ladder, Pulley, Crane	6	4
2	Electrical symbols	1 Symbols	Electrical symbols Electrical drafting and abbreviations, Graphical symbols- supply , conductor , switches , lamps , fitting , electrical appliances , parameters , instruments, machines, transformer , electrical panel , star / delta	6	3
3	Fuse	1 Introduction	Introduction of Fuses. Importance Definitions working	6	3
		2 Types of fuses	Main types of Fuses Fuse fitting arrangement		
4	Line Supports	1 Introduction	Line Supports – Wooden pole, Reinforced cement concrete, Pole, steel tower. O .H. Lines & U. G. Cables compare, Material for O .H. Lines & Properties. Line supports properties	12	4
		2 Main components of overhead Lines	Main components of overhead Lines -Conductors, Supports , Insulators , Cross arms , danger plate , lightning arrestors , anti- climbing wires etc .		
5	Generating Stations	1 Introduction	Types of Power Generating Stations-Introduction ,	18	10
		2 Diesel power station	Working , Layout , Advantages & Disadvantages of ---- - Diesel power station ,		
		3 Hydro –Electric	Working , Layout , Advantages & Disadvantages of ., Hydro –Electric,		
		4 Thermal Power station	Working , Layout , Advantages & Disadvantages of ---- - , Thermal Power station ,		
		5 Nuclear power station	Working , Layout , Advantages & Disadvantages of ---- - Nuclear power station,		
		6 Wind power station	Working , Layout , Advantages & Disadvantages of ---- - , Wind power station,		
		7 Tidal power station,	Working , Layout , Advantages & Disadvantages of Tidal power station,		
		8 Gas Turbine power	Working , Layout , Advantages & Disadvantages of Gas Turbine power		
		9 Solar power station	Working , Layout , Advantages & Disadvantages of , Solar power station		
6	Transmission voltage Transmission	1 Introduction	Transmission voltage Transmission Lines – Low, medium, high, extra high voltages	6	4
		2 Types of transmission	Two wire, Three wire , Four wire, Six wire, Seven wire. Lay out of transmission line – Transmission line in maharashtra. Transmission line of national grid		

7	Sub –stations	1 Introduction	Sub –stations - Introduction,	12	4
		2 A .C. substations types	A .C. substations types - pole –mounted , outdoor type , indoor type , one line diagram of generating station to distribution of supply , Ring mains system & Interconnected system of Distribution , Under ground Sub-station sketch & important points . Symbols for equipment in Sub-station - Bus- bar, Single –break isolating switch , Double break switch , O .C .B . , Arcing horn, etc. Bus –bar arrangement in Sub –stations		
		3 Maintenance of Sub Station	Maintenance – Maintenance of Sub Station. Maintenance of Panel board. Testing of earthing. Protection of Trans. Buchholz Relay, Earth faults Relays etc . Sketch , Advantages & disadvantages		
8	Underground cable system	1 Introduction	Underground cable system – Introduction , Classification according to Voltage ,	12	5
		2 Types of 3 ph. Cables, construction	Construction of Paper –insulated Lead Covered Cables, Types of 3 ph. Cables, Cable type Designation, Installation of Cable Lines – General, laying cables in Trenches – Laying Conduit – built & tier –by – method		
		3 Underground PVC Cables	Underground PVC Cables- construction , range selection current rating of Aluminium, power cable , short circuit rating , Bending ,radius , Load factor ,Cable jointing, Faults in the under ground cable Method of locating faults		
9	Relay –	1 Introduction	Relay – Introduction , Protective Relays –circuit Terms – Pick up current , Current setting , P .S .M .	12	6
		2 Types	Functional Relay Types – Sketches of Induction Type- Over current Relay , Directional power Relay ,Impedance Relay , Current , Voltage Differential Relay .Types of Protection - Primary & Back – up		
10	Switchgear	1Introduction	Switchgear - Introduction, Define,	15	7
		2 Switchgear Equipment	Switchgear Equipment –1) Switches - Air-break, Isolator, Oil .2) Fuses 3) C .B. 3) Relays. Switchgear Accommodation – Outdoor type, Indoor type.		
		3 Causes of Short –circuit Faults	Causes of Short –circuit Faults in Three phase System - Definition - Symmetrical & Unsymmetrical		

PRACTICAL - III**Subject: TRANSMISSION & DISTRIBUTION – 1st Year****(Subject Code – 30240006)**

Sr no	Practical	SKILLS TO BE ACHIEVED	Time allotted
1	To study different line supports.	1. To study different line supports.2.types of line supports.	8
2	To study the main components of over head line.	1.To study components required for over head line.2.study the properties of the components	8
3	To install lightening arrestor.	1.To study function of lightening arrestor.2.installation of L.A.	4
4	Study the tools required for transmission line.	1. To study the different tools.2.use of these tools for transmission line.	8
5	To study power generating station.	1. Study different types of generating stations.2.differentiate between generating stations.	12
6	To study the construction of M.C.B.	1.Function of M.C.B.2.Use of M.C.B.	4
7	To study the construction of O.C.B.	1.Function of O.C.B.2.Use of O.C.B.	4
8	Find out the all day efficiency of three phase transformer.	1. Calculation of losses.2.calculation of efficiency of transformer.	8
9	Synchronizing of alternator by Bright lamp method.	1. Need of synchronizing.2.conditions for synchronization.	8
10	Synchronizing of alternator by Synchroscope method	1. Need of synchronizing.2.conditions for synchronization.	8
11	Western union joint of A.C.S.R. conductor.	1. Need of joining conductor.2.preparation of joint.3.complete the joint.	8
12	Britannia joint of A.C.S.R. conductor.	1. Need of joining conductor.2.preparation of joint.3.complete the joint.	8
13	Installation of Pin type over head insulator.	1. Function of insulator.2.install the insulator.	8
14	Installation of Shackle type over head insulator.	1. Function of insulator.2.install the insulator.	12
15	Installation of Suspension type over head insulator	1. Function of insulator.2.install the insulator.	12
16	Study the voltage grade of Transmission line.	1. Measure the voltage of line.2.differentiate between the lines according to voltage.	8

17	Installation of service wire.	1. Skinning of service wire.2.install the service wire.	8
18	Installation of low and medium voltage transmission line.	1. Purpose of transmission.2.study the material required for line.3.install the line.	12
19	Safety measures while working on transmission line.	1. Discharge the line.2.climbing on the pole/line supports.	16
20	Installation of stay wire.	1. Trace the position of pole.2.digging in the ground.3.install the stay.	12
21	Practice of changing the D.O.	1.Use of safety hand tools.2.change the D.O.	4
22	Study the major Transmission lines in Maharashtra.	1. Connectivity of major transmission line.2.study the loop of lines in our state.	8
23	Study the layout of national grid.	1. Connectivity of major transmission line.2.study the loop of lines in our Nation.3.requirement of grid system.	8
24	To study I.E. rules of transmission.	1. Study the rules.2.I.E.rules to be followed for transmission.	8
25	To study the types of substations.	1. Study the types of substations.2.need of substation.3.working of substations.	8
26	Maintenance of Generator	1. Study the parts of generator.2.test & maintain the generator.	8
27	Maintenance of Alternator	1. Study the parts of alternator.2.test & maintain the alternator.	8
28	Maintenance of Power station	1. Study the different accessories in the power station.2.test & maintain the accessories.	8
29	Maintenance of Battery	1. Test the battery.2.check the charging status.3. Replace the faulty parts.	4
30	Maintenance of Synchronous motor	1. Study the parts of synchronous motor.2.test & maintain the synchronous motor.	8
31	Maintenance of Substation	1. Study the different accessories in the sub station.2.test & maintain the accessories.	8
32	Maintenance of panel board	1. Study the parts of panel board.2.test & maintain the panel board.	8
33	Testing of ear thing in substation	1. Purpose of earthing.2.measure earth resistance.	8
34	Study different types of switchgears used in sub-station.	1. Study the different accessories in the sub station.2.test & maintain the accessories.	8

THEORY - III

TRANSMISSION & DISTRIBUTION - 2nd Year

(Subject Code – 30240006)

SR NO	UNIT	SUB UNIT	SCOPE & LIMITATION	Hours	Marks
1	Tariff	1 Introduction	Tariff -Introduction ,Define of Tariff , Types -- Define & their comparison --- simple , flat rate , two part – maximum demand etc .	6	3
		2 Types	Types -- Define & their comparison --- simple , flat rate, two part –maximum demand etc.		
2	I.E. Rules	1 Introduction	I.E. Rules - I.E. Rules of pertaining to O.H. lines I.E. Rules of pertaining to ground clearance Sag and its affecting factors, conductor spacing	6	3
3	System reliability	1 System reliability	System reliability: Introduction, definition of reliability, failure, probability, concepts, power quality variation, reliability measurements, power supply quality survey, reliability aids, and recent development.	6	3
4	Reliability concepts	1 Reliability concepts	Reliability concepts: Measures of reliability rules for combining probabilities, Mathematical Expectation, Distributions, Reliability theory series and parallel systems, Markov processes. Static generating capacity reliability.	6	3
5	Outage definition	1 Introduction	Outage definition: Loss of load probability methods. Loss of energy probability method. Load forecast,	12	4
		2 System Design and planning	System Design and planning, Strategies for generation,		
		3 Transmission & Distribution networks	Transmission & Distribution networks. Transmission system reliability evaluation – Average interruption rate method. The frequency and duration method..		
6	Interconnected system	1 Introduction	Interconnected system: Generating capacity reliability evaluation introduction. The loss of load approach, reliability evaluation in two and more than two interconnected systems, Interconnection benefits.	12	5
7	Load forecasting	1 Introduction	Load forecasting: Necessity,	6	4
		2 Types	short-term forecasting by preliminary analysis control, medium term forecasting by field survey method, and long-time forecasting by statistical method.		
		3 Regression analysis	Regression analysis, Analysis of time series. Factors in power system loading. factors, conductor spacing		
8	Conversion from A .C. To D .C.	1 Introduction	Conversion from A .C. To D .C. - Necessary	12	6
		2 Methods of conversion	Methods of conversion		
		3 advantages & disadvantages	Comparison of their advantages & disadvantages.		
		4 Three phase rectifiers	Three phase rectifiers(mercury arc)		

9	Panel board	1 low voltage distribution	Installation of panel board of low voltage distribution, maintenance of it	12	4
		2 medium voltage distribution	Installation of panel board of medium voltage distribution, maintenance of it		
9	Maintenance	1 Introduction	Maintenance – Maintenance of Power station	12	5
		2 Generator Alternator Synchronous motor.	Maintenance of Generator, Maintenance of Alternator Maintenance of Synchronous motor.		
		3 Battery	Maintenance of Battery		
10	Power transformer	1 capacity	General description of power transformer, maintenance and repairing of such transformer	9	6
		2 parallel operation	parallel connection of Three phase transformer, transformer oil changing		
11	Lighting arresters	1 types of Lighting arresters	Lighting arresters working, types of Lighting arresters, installation of Lighting arresters	6	4

PRACTICAL - III

Subject: TRANSMISSION & DISTRIBUTION – 2nd Year

(Subject Code – 30240006)

Sr no	Practical	SKILLS TO BE ACHIEVED	Time allotted
1	Maintenance of power Transformer.	1. Test the transformer. 2. maintain the transformer. 3. run the transformer.	12
2	Perform parallel connection of Three phase transformer.	1. Need of parallel connection. 2. condition of parallel connection. 3. connection & run the transformer.	8
3	Practice of changing the transformer oil.	1. Test the oil. 2. filtration of oil. 3. replacement of oil.	8
4	Installation of panel board of low voltage distribution	1. Requirement of panel board .2. install & test the panel board.	8
5	Repairing of panel board of low voltage distribution	1. Requirement of panel board. 2. Test & repair the panel board.	8
6	Installation of panel board of medium voltage distribution	1. Requirement of panel board. 2. install & test the panel board.	8
7	Repairing of panel board of medium voltage distribution.	1. Requirement of panel board. 2. Test & repair the panel board.	8
8	Laying the Underground cable normal condition.	1. Conditions of laying the cable .2. study the types of laying the cables.	8

9	Laying the underground cable across road.	1. Conditions of laying the cable. 2.study the types of laying the cables.	12
10	Fixing the gland to the cable.	1. Remove the armour of cable. 2.skinning of cable. 3. Fixing of gland.	8
11	Fault finding of the underground cable.	1. Study the methods of fault finding. 2.test & repair the faults.	12
12	Practice of jointing the underground cable.	1. Study the types of joining the cables. 2.join the cable.	12
13	Fault finding, repairing of circuit breaker.	1. Study the function of circuit breaker. 2.test & repair the circuit breaker.	8
14	Replacement of transformer from sub-station	1. Dismantle the transformer from foundation. 2.check the technical specifications. 3.replace the transformer.	12
15	To study the construction of cable.	1. Study the formation of cable. 2.function of each part of cable.	12
16	Installation of single phase energy meter for domestic purpose.	1. Calculate the load. 2. requirement of accessories required for installation of meter. 3.install the meter.	12
17	Installation of Three phase energy meter for commercial purpose.	1. Calculate the load. 2.requirement of accessories required for installation of meter. 3.install the meter.	12
18	To measure the power of single phase induction motor.	1. Connection of meters .2.measurement of power.	12
19	To measure the frequency of given supply.	1. Connection of meters. 2.measurement of frequency.	4
20	To measure the power factor of given load.	1. Connection of meters. 2.measurement of power factor.	4
21	To measure the earth resistance by earth tester.	1. Connection of meters. 2.measurement of earth resistance .3.use of earth tester.	4
22	To prepare plate ear thing.	1. Requirement of earthing. 2.prepare the earthing. 3.install the ear thing.	8
23	To prepare pipe ear thing.	1. Requirement of earthing. 2.prepare the earthing. 3.install the ear thing.	8
24	Calculate the voltage ratio of given single phase transformer.	1. Connection of meters. 2.read the meters. 3.calculate the ratio.	8
25	Calculate the current ratio of given single phase transformer.	1. Connection of meters. 2.read the meters .3.calculate the ratio.	8

26	Find out the iron losses of given single phase transformer	1. Connection of meters. 2. take open ckt. Test. 3. calculate iron losses.	8
27	Find out the copper losses of given single phase transformer	1. Connection of meters. 2. take short ckt. Test. 3. calculate copper losses.	8
28	Find out the voltage regulation of given single phase transformer.	1. Connection of meters. 2. read the meters. 3. calculate the voltage regulation.	8
29	Find out the all day efficiency of single phase transformer.	1. Find out iron losses. 2. find out copper losses. 3. calculate the efficiency.	8
30	To study the construction of M.C.B.	1. Function of M.C.B. 2. Use of M.C.B.	8
31	To study the construction of O.C.B.	1. Function of O.C.B. 2. Use of O.C.B.	8
32	Find out the all day efficiency of three phase transformer.	1. Find out iron losses. 2. find out copper losses. 3. calculate the efficiency.	8

LIST OF MATERIALS FOR 25 STUDENTS.

BASIC ELECTRICAL WORKSHOP PRACTICE AND ENGG DRAWING

Sr. No	Details of Materials	Quantity
1	Voltmeter a.c. 0—250v	4 no
2	Ammeter A.C. 0—5 Amp.	4 no
3	Wattmeter 0—250W	1 no
4	Energy meter 5-15Amp.	1 no
5	Three phase main switch 16 amp.	2 no
6	Three phase main switch 32 amp.	2 no
7	Rain coats	10 no
8	Multi meter	4 no
9	Hacksaw with blade	6 no
10	Hand Drill machine	2 no
11	Screw Driver	20 no
12	Hammer	10 no
13	Pocker	8 no
14	Files	10 no
15	Wire stripper	10 no
16	Tester	10 no
17	Pliers	10 no
18	Electrician knife	10 no
19	Mallet	6 no
20	Rope 5meter, 10meter, 15meter	4 each
21	Ladder	4 no
22	Hand Gloves	10 no
23	Safety belts	10 no
24	Fire fighting Extinguisher	4 no
25	First aid box	2 no

26	Soldering Iron	5 nos
27	Wheatstone bridge	1 no
28	Electrical wiring accessories. E.g. Switch,socket ,holders etc	5 nos each
29	Portable Drill Machine	1 no
30	Tap & die Set	1 set
31	Bench Vice	5 nos
32	Working Table	2 nos
33	Drawing Board	25 nos
34	Drawing Instrument Box	1 Box
35	Mini Drafter	1 no
36	T Square	1 no
37	Desk top Computer	1 no
38	Auto Cad Software	1 no

LIST OF MATERIALS FOR 25 STUDENTS.

FUNDAMENTALS OF ELECTRICAL ENGINEERING

Sr. No	Details of Materials	Quantity
1	Voltmeter a.c. 0—250v	4 no
2	Voltmeter a.c. 0—500v	4 no
3	Ammeter A.C. 0—5 Amp.	4 no
4	Speedometer	1 no
5	Wattmeter 0—250W	1 no
6	Wattmeter 0—500W	1 no
7	Energy meter 5-15Amp.	1 no
8	Power Factor meter	1 no
9	Frequency meter	1 no
10	D.C. power supply 30V—1Amp.	2 no
11	Emergency light	2 no
12	Lead acid battery	2 no
13	Three phase main switch 16 amp.	2 no
14	Three phase main switch 32 amp.	2 no
15	Gum boot	10 no
16	Rain coats	10 no
17	Multi meter	4 no
18	Hacksaw with blade	6 no
19	Hand Drill machine	2 no
20	Spanner Set (Double Ended)	2 no
21	Screw Driver	20 no
22	Hammer	10 no
23	Pocker	8 no
24	Files	10 no
25	Wire stripper	10 no
26	Tester	10 no
27	Pliers	10 no
28	Electrician knife	10 no
29	Mallet	6 no
30	Tennon saw	6 no
31	Firmer chisel	10 no
32	Ring spanner	5 sets
33	Box spanner	5 sets

34	Rope 5meter, 10meter, 15meter	4 each
35	Ladder	4 no
36	Hand Gloves	10 no
37	Safety belts	10 no
38	Fire fighting Extinguisher	4 no
39	First aid box	2 no

LIST OF MATERIALS FOR 25 STUDENTS.

TRANSMISSION & DISTRIBUTION

Sr. No	Details of Materials	Quantity
1	Voltmeter a.c. 0—250v	4 no
2	Voltmeter a.c. 0—500v	4 no
3	Ammeter A.C. 0—5 Amp.	4 no
4	Speedometer	1 no
5	Wattmeter 0—250W	1 no
6	Wattmeter 0—500W	1 no
7	Energy meter 5-15Amp.	1 no
8	Power Factor meter	1 no
9	Frequency meter	1 no
10	D.C. power supply 30V—1Amp.	2 no
11	Emergency light	2 no
12	Lead acid battery	2 no
13	Three phase main switch 16 amp.	2 no
14	Three phase main switch 32 amp.	2 no
15	Gum boot	10 no
16	Rain coats	10 no
17	Multi meter	4 no
18	Hacksaw with blade	6 no
19	Hand Drill machine	2 no
20	Spanner Set (Double Ended)	2 no
21	Screw Driver	20 no
22	Hammer	10 no
23	Pocker	8 no
24	Files	10 no
25	Wire stripper	10 no
26	Tester	10 no
27	Pliers	10 no
28	Electrician knife	10 no
29	Mallet	6 no
30	Tennon saw	6 no
31	Firmer chisel	10 no
32	Ring spanner	5 sets
33	Box spanner	5 sets
34	Rope 5meter, 10meter, 15meter	4 each
35	Ladder	4 no
36	Hand Gloves	10 no
37	Safety belts	10 no
38	Fire fighting Extinguisher	4 no
39	First aid box	2 no

REFERANCE BOOKS

No	Name of the book	Author
1	Basic Electrical Engineering	M.L. Anwani
2	Basic Electrical Engineering	Sharma
3	Electrical wiring Estimating and costing	S.L. Uppal
4	Electrical Wiring Estimating and costing	J.B. Gupta
5	Basic Electrical Engineering vol- 1,2,3,4	P.P.Shah
6	Basic Electrical Engineering vol.1,2,3,4	B.L. Thareja
7	Electrical Machine	V.K.Mehata
8	Indian Electricity Rules	Nausheer Bharucha D.B. Taraporewala sons and co.
9	Vidyutshastra vol.1,2,3,4	P.P.Shah
10	Electrical Technology	Edwardm Hughes
11	Electrical Technology	Bhatnager
12	Electrical Technology	B.L.Thareja
13	Fundamentals of Electrical Technology	V.K. Mehata
14	How to repair major appliances	Ernest Tricomi
15	Electrical Appliances: Installation and Maintenance (Second Edition)	E.Molloy
16	Basic Electronics	Berard Grob
17	Electrical Technology	H.Cotton
18	Elementary Electrical Engineering	M.L.Gupta
19	Principle of Generation System	Bhatia,
	<ol style="list-style-type: none"> 1. Roy Billinton & Ronald N. Allan –Reliability Evaluation of Power System, Volume –I 2. Roy Billinton & Ronald N. Allan –Reliability Evaluation of Power System, Volume –II 3. J. Endreny –Reliability Modeling in Electric Power System 4. A. S. Pabla –Electric Power Distribution 	
