

MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI - 51

1	Name of Course	Certificate Course in Basic Electronics Engineering (301208)																																																													
2	Max. Nos. of Student	25 Students																																																													
3	Duration	1 Year																																																													
4	Type	Full Time																																																													
5	Nos. of Days / Week	6 Days																																																													
6	Nos. of Hours /Days	7 Hrs																																																													
7	Space Required	Theory Class Room – 200 sqft Practical – 1600 sqft																																																													
8	Entry Qualification	S.S.C. Passed																																																													
9	Objective Of Syllabus/ introduction	1) Awareness of Safety precautions 2) Knowledge of soldering techniques, use of tools in assembly. 3) Knowledge of Engineering Tools 4) Knowledge of electronic component used in Various Electronics Instrument. 5) Knowledge of Analog & Digital Electronics, Instrumentation. 6) Ability to read schematic layouts / diagrams.. 7) Maintenance of Electronics Instruments Computers, Engineering Tools.																																																													
10	Employment Opportunity	The trainee will either to be able to take up jobs with agencies which maintain and repair such equipments or with working experience will be in a position to start his own independent Business.																																																													
11	Teacher’s Qualification	1. Diploma in Electronics Engg. With 3 year Teaching experience in Electronics Field. 2. Diploma or Degree in Electronics Engineering or equivalent profession Qualification. With 1 year Teaching experience in Electronics Field.																																																													
12	Training System	<table><tr><th colspan="7">Training System Per Week</th></tr><tr><td colspan="2">Theory</td><td colspan="2">Practical</td><td colspan="3">Total</td></tr><tr><td colspan="2">18 Hours</td><td colspan="2">24 Hours</td><td colspan="3">42 Hours</td></tr></table>						Training System Per Week							Theory		Practical		Total			18 Hours		24 Hours		42 Hours																																					
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SYLLABUS

Theory & Practical – I

Part – I

Basic Engineering

Theory	Practical
<p>Fitting and Wood work : Safety precautions and elementary</p> <p>First aid ,Introduction of Fitting Trade, familiarise with various Hand tools used in fitter workshop and their general uses. Methods of measuring and marking. Description of files, hammers , chisels, hacksaw frames, blades-their specifications and uses. Different Metals and alloys- their characteristics and uses, Types of drills, description and working of machines, use of Vernier calipers, Micrometer, height gauge etc., use of tap & dies, various types of threads and their specific applications, different types of nuts & bolts.</p> <p>Common hand tools used in carpentry workshop, marking, cutting and planing. Types of woods & their uses, Types of joints.</p>	<p>Safety precaution and elementary & First aid</p> <p>Familiarise with the tools ,Filing practice on marking, hack sawing, filing to size.</p> <p>Drilling practice, fitting exercises on various shapes, Tapping and Chipping</p> <p>Practice on cutting, planing and making different joints</p>
<p>Sheet Metal ,Wiring & Soldering:</p> <p>Familiarise with different hand tools used in sheet metal workshop , various types of joints used in sheet metal, Rivet and its types and uses. Making of rectangular box.</p> <p>Wires and cables : specification , selection & used in electrical wiring ,connectors, lugs, various types of wire joints, crimping ,protective devices and their uses, SWG.</p> <p>Soldering : various composition of solder wires, fluxes and their uses.</p> <p>Characteristics ,properties and uses of : Bakelite, PVC, Porcelaine etc</p>	<p>Practice on shearing, bending and making various joints.</p> <p>Making rectangular boxes. Riveting exercises.</p> <p>Selection of wires and cables. Simple wiring practice, Exercises on wire joints and crimping</p> <p>Simple exercise on Tinning, soldering etc</p>

Part - II

Computer Operating Skill

Theory	Practical
<p>Safety precautions and elementary First aid</p> <p>Introduction of Analog, Digital and Binary signals, Logic levels & pulse wave form ,Basic logic functions, Basic logic gates (AND,OR & Invert)</p> <p>Number system: Decimal, Binary, Octal, Hexa decimal system and their arithmetic.</p>	<p>Verification of Logic levels</p> <p>Verification of truth table of AND,OR INVERT gate.</p>
<p>Concept of combinational & sequential Logic circuits., Boolean algebra concept Verification of Boolean laws (Associative, Commutative, Distributive), De-morgan's theorem, Universal logic gates (NAND,NOR)</p> <p>Realization of basic gates using universal logic, Ex-Or / Ex-NOR gate</p>	<p>Verification of Boolean laws, Construct the basic gates using NAND & NOR gates & verify the truth table ,Verify the truth table of Ex-OR /EX-NOR gate.</p>
<p>Basic blocks of a computer, Hardware and software, I/O devices, HDD,FDD, different types of printers and their advantages, function and inter-connection, Booting concept, Windows O.S., various types of files , folder concept, various ports in the compute, saving ,copying, deleting & retrieving files , mouse operation , POST</p>	<p>Identification of System unit and I/O devices, Identify connectors, Identify components on desk top identify drives and capacity, Create folder and files, Drawing pictures using paint, using menus of paint.</p>
<p>MS widows: Starting windows and its operation, file management using explorer, Display & sound properties, screen savers, font management installation of program, setting and using of control panel., application of accessories, various IT tools and applications, Components of desk top</p>	<p>Use start menu, check available programs in computer, use search, settings, run and options. Creation of short cuts, changing screen savors.</p>
<p>Concept of word processing,: MS word -Menu bar, standard tool bar, page setting, editing, formatting ,advance features i.e. highlighting ,cut & paste, subscript & super subscript ,drawing features, mail merging , tables and borders, printing of document etc. Introduction to power point</p>	<p>Editing the text, saving the text, changing the font and size of text. Creation of brochures. Use of mail merge and taking the printouts.</p>
<p>Concept of Internet, Browsers, Web sites, search engines, email, chatting and messenger service. Downloading the files etc.</p>	<p>Use of search engines, Creation of email accounts, sending and receiving the mails configuration of email clients.</p>

List of Tools & Equipment

Sr.No.	Name of Tool & Equipment	Quantity
1	Rule steel 15 Cm (metric graduations)	10
2	Square try 10 Cm blade	10
3	Caliper outside 15 Cm spring	10
4	Caliper in side 15 Cm spring	10
5	Divider spring	10
6	Scriber	10
7	Punch center	10
8	Screw Driver	10
9	Chisel cold	10
10	Hammer ball pin .45 Kg with handle	10
11	Hammer ball pin .22 Kg	10
12	File flat 25 Cm 2 nd cut	10
13	File Flat 25 smooth	10
14	File half round 2nd cut 15 Cm	10
15	Hacksaw frame adjustable 20-30 Cm	10
16	Safety goggles	10
17	Dot slot punch	10
18	Pincer	10
19	Electrical double bladed knife	10
20	Cross pin hammer 115 gms with handle	10
21	Neon tester	10
22	Heavy duty Screw driver 200 mm	10
23	Gimlet 6mm	10
24	18" Hand saw	10
25	9" Smooth Plainer	10
26	18' Jack Plainer	10
27	Marking gauge 6"	10
28	Carborandum stone	10
29	Dow tail saw	10
30	9 mm Mortice Chisel	10
31	6 mm Mortice Chisel	10
32	Triangular File 4 "	10
33	%" Dow tail Chisel	10

Theory & Practical – II

Part – I

Basic Electrical/ Electronics

Theory	Practical
Safety precautions and elementary First aid, Identification, uses and maintenance of hand tools, DC & AC current, terms and definitions used in circuits , frequency, waveform	Identification of various Hand tools used Identification of different types of cables, SWG practice.
Measurement of AC & DC using Ammeter / Voltmeter , AC power, power factor, work, power & Energy - their units and measurements Identification of AC / DC meters, Kirchoff's law, Ohms law, electric power and dissipation in resistance, IR voltage drops. Define magnetism, unit of measurement, types of magnetic properties, Magnet and its classification, materials used & its application, mutual & self inductance, unit of measurement, BH curve .	Measure the power , power factor and energy in different circuits. Construct & verify Ohm's law. Construct and verify Kirchoffs voltage law. Tracing the magnetic field of Bar magnet using compass.
Passive Components : Resistor -definition, types of resistors, their construction & specific use, color-coding, power rating,. Series /parallel combination of resistances and measurement of current in branches. Capacitance - define, construction, types of capacitors, color coding charge/energy stored in capacitor, capacitive reactance, series/ parallel combination of capacitors Inductors-define ,types & their application, series and parallel combination, Q factor, Current carrying conductor, Fleming rule Electromagnets -define, Solenoids & relays define ,construction & its application.	Identification of different resistors i.e. carbon, wire-wound, variable, pot., preset, Rheostat etc. Color-coding of resistors ,Construct a series & parallel resistor circuits Identification of capacitor and their codes, construct the series /parallel circuit of capacitor Identification of inductor , construct the series /parallel circuit of inductor. Identification of capacitor and their codes, construct the series /parallel circuit of capacitor
Working principle , construction of Transformers & their types, various losses of transformers	Construct an electromagnet and test it.
Identification and testing of different types of transformers, measure the O/P voltage. RC,RL, RLC Circuits, Series and parallel resonance	Testing and construction of different types relays.
electron, Conductors, Insulators, Semiconductors, charge in motion-current, units, electron flow, motion of +ve charge, Semiconductors, Crystal structure and bonds, Intrinsic & extrinsic semiconductors, N- type,	Identification of anode, cathodes of different types of diodes. Study the specifications of a semiconductor diode using a data sheet Construct a forward bias and a reverse bias

P-type, Free electron & Hole charges, Fixed ion charges, The P-N junction, Barrier potential, Forward & Reverse voltage, Effect of temp., V-I characteristic, Special purpose diodes and symbols	circuit and plot V-I characteristic of diode Electrons and protons in an atom, Structure of atom, valance & conduction
Rectifier types i.e. Half-wave, full-wave & bridge rectifiers, measurement of different currents i.e. I_m , I_{dc} , I_{rms} , d.c. out put voltage, efficiency, filter circuits and their types, i.e. capacitor input filter, Choke input filter, etc, Junction break down, Zener break down, Zener diode, Forward & Reverse bias, Voltage regulation using Zener diode ,Zener regulators	Construct a half wave rectifier, full wave (center tapped) rectifier and full wave (Bridge) rectifier. Observe wave forms with/ without using filter. Study the specifications of zener diode using data sheet.
	Construct the Zener regulator circuit
	Series parallel combination of batteries Charging of batteries, maintenance of batteries Calculate the shorted load and matched load current for given cell Battery: Electrochemical action, define symbol, types of cell, construction, principle charging, specific gravity (Amp-hr capacity) specification of battery classification of battery, application, service needs, storage, , lead acid battery, ideal voltage source, real voltage source, shorted load current, matched load current, Current source.

Part – II

Measuring Instruments

<p>Verification of Faraday's law of electromagnetic induction.</p> <p>Verification of Lenz law</p> <p>Demonstration of Fleming's fingre rules</p>	<p>Safety precautions and elementary First aid</p> <p>Introduction to measurement basics: Accuracy, precision, errors and its types, calibrations etc., Faradays law of Electromagnetic induction, Lenz's law of hysteresis & eddy currents, Flemings rule, Introduction to various types of instrument</p>
<p>Study of Galvanometer</p> <p>Study of MI Voltmeter & Ammeter</p> <p>Study of Watt meter</p> <p>Study of 1-phase Energy meter</p>	<p>Different types of Galvanometers , construction & working of PMMC D'Arsonol Galvanometer, Moving iron instruments, Principle & operation of Voltmeter, Ammeter, Errors in Ammeters & Voltmeters, Sensitivity, and their loading effect, Conversion of Galvanometer into voltmeter, extension of ranges ,Advantages & disadvantages of Moving coil & moving iron instruments Wattmeter, Energy meters</p>
<p>Study of Multi meter and measure the various parameter of a given circuit</p> <p>Study of VTVM</p>	<p>Different types of electronic voltmeters, Conventional Multimeter , VTVM,</p>
<p>Bridge type of instruments: Wheatstone bridge, resistance ration bridge,maxwell bridge, schering bridge ,LCR meter,</p>	<p>Set up the circuit on Whetstone bridge, Resistance ratio, Maxwell Bridge and Schering Bridge and measure the various parameter</p>
<p>Study the different function using Trainer</p> <p>Measure the Voltage, current and frequency</p>	<p>Oscilloscope: Electrostatic & Electromagnetic deflection, block diagram, working of oscilloscope, measurement of voltage, current & frequency using oscilloscope, applications multiple trace oscilloscope & digital storage oscilloscope, various oscilloscope probes.</p>
<p>Study the Tachogenerator, Strain gauge, Microphone etc. and measure the different parameters</p>	<p>Special instruments and transducers-Power factor meter, Tachometer, Strain gauge, Microphones, Speakers</p>

List of Tools

Sl. No.	Item	Qty.
1.	Measuring Tape Steel 100cm	10 Nos.
2.	Rule Steel 300mm	10 Nos.
3.	Screw Driver heavy duty 200mm insulated thick stem	10 Nos.
4.	Screw Driver heavy duty 250mm with insulated thick stem handle	10 Nos.
5.	Plier Insulated combination 200 mm	10 Nos.
6.	Knife double blade electrician 100mm	10 Nos.
7.	Pincer 150mm	10 Nos.
8.	Scriber 150mm x 4mm	10 Nos.
9.	Punch center 150mm x 8mm	10 Nos.
10.	Hammer ball peen 0.75kg with handle	10 Nos.
11.	Hammer cross peen 115gms with handle	10 Nos.
12.	Saw Tenon 250mm	10 Nos.
13.	Firmer chisel wood 12mm	10 Nos.
14.	Gimlet 6mm	10 Nos.
15.	Bradawl 100mm	10 Nos.
16.	Wire stripper 150 mm	10 Nos.
17.	Voltage sensor (pencil type) / Electronic Tester	10 Nos.
18.	Screw Driver Kit (Set of six blades with common	10 Nos.
19.	insulated handle with neon tester)	10 Nos.
20.	Plier insulated 150 mm	10 Nos.
21.	Multimeter	10 Nos.
22.	Soldering iron, 25W, 230 V	10 Nos.
Sl. No.	Items	Qty.
1.	Screw Driver 100 mm with handle	10 Nos.
2.	Screw Driver 150 mm with insulated handle	10 Nos.
3.	Plier Gas 200 mm	10 Nos.
4.	Plier round nose 100 mm	10 Nos.
5.	Plier flat nose 150 mm	10 Nos.
6.	Side cutting plier 150mm.	10 Nos.
7.	Tweezer 100 mm	10 Nos.
8.	Scissor blade 150 mm	2 Nos.
9.	Blow lamp 1 pint capacity	5Nos.
10.	Melting pot	2 Nos.
11.	Soldering iron 65 watt ,125 watt, 250 watt	8 Nos. each
12.	Soldering gun/Desoldering gun	2 Nos.
13.	Chisel wood firmer 25 mm x 6mm	10 Nos.
14.	Chisel wood firmer 19 mm x 6 mm	10 Nos.
15.	Mallet hard wood 0.5 Kg.	10 Nos.
16.	Hammer hard plastic with handle	10 Nos.
17.	Spanner 150mm adjustable as clay burns	2 No.
18.	Drill machine hand 0 to 6mm capacity	10 Nos.
19.	Drill machine electric portable 0 to 6mm capacity	2 Nos.

20.	Drill machine pillar 0 to 12mm capacity	1 No.
21.	Allen Key	2 set.
22.	Oil can 1/2 litre	4 Nos.
23.	Grease gun	2 Nos.
24.	Micrometer outside 0-25mm (Analog & Digital)	2 Nos.each
25.	Grinder Bench Motorised	1 No.
26.	Rawl plug tool and Bit	5 Nos.
27.	Hacksaw frame 300mm, 200mm	5 Nos each.
28.	Try square 150mm blade	10 Nos.
29.	Plum bob (Brass)	10 Nos
30.	Snip straight 200mm	5 Nos.
31.	Snip curved 150mm	5 Nos.
32.	Gauge wire (Imperial)	4 Nos.
33.	File flat 200mm 2 nd cut	8 Nos.
34.	File flat 250mm Bastard	8 Nos.
35.	File flat 250mm smooth	8 Nos.
36.	File round 200mm 2 nd cut	4 Nos.
37.	File half round 2 nd cut 200mm.	4 Nos.
38.	File round 100mm 2 nd cut	4 Nos.
39.	File triangular 150mm	4 Nos.
40.	File flat 150mm rough	4 Nos.
41.	File Rasp, Half round 200mm Bastard	8 Nos.
42.	Vice hand 50mm jaw	8 Nos.
43.	Stock and die conduit (for 1" to 2x1/4")	2 Nos.
44.	Vice table 150 mm jaw	5 Nos.
45.	Vice Pipe	2 Nos.
46.	Multimeter (Digital)	4 Nos.
47.	Ammeter MC 0 - 500 mA	2 Nos.
48.	Ammeter 0 -1 A	2 Nos.
49.	Ammeter M I , 0 - 1 A	4 Nos.
50.	Power factor meter single phase	2 Nos.
51.	Power factor meter three phase	1 No.
52.	Energy meter 1KW DC	2 Nos.
53.	Tong tester (0 to 25 A, 0 - 50 A multi range)	1 No .each
54.	Milli voltmeter center zero (100 - 0 - 100 mV)	1 No.
55.	Ammeter MC 0 - 25 A	2 Nos.
56.	Ammeter MC 0 - 5 - 10 - 15 A	2 Nos.
57.	Ammeter AC 0 - 25 A	2 Nos.
58.	Ammeter AC 0 - 5 - 10 - 15 A	2 Nos.
59.	Voltmeter DC 0 - 150 - 300 - 600 V	2 Nos.
60.	Voltmeter AC 0 - 150 - 300 - 600 range	2 Nos.
61.	Wheat stone Bridge (complete with galvanometer and Battery)	1 No.
62.	Meggar 500 ohm	2 Nos.
63.	Earth fault locator	1 No.

64.	Energy meter AC 5A 250V (Induction Type)	2 Nos.
65.	Energy meter 3 phase 4 wire 5 A (Induction Type)	2 Nos.
66.	Watt meter single phase 1 KW	1 No.
67.	Watt meter 3 phase 2 element 5A	2 Nos.
68.	Crimping tool	2 Nos.
69.	B A taps and dies 0 - 2 - 4 - 6 - 8 sizes	2 set
70.	Pipe cutter	2 Nos.
71.	Desoldering pump.	4 Nos.
72.	VAR meter 1 KVAR	1 No.
73.	Laboratory type induction coil 6V to 800 - 10000V	1 No.
	Magnetic flux meter	
74.	Fixed resistance 5 Q 20 watt	2 Nos.
75.	Fixed resistance 10 Q 20 watt	2 Nos.
76.	Fixed resistance 50 Q 25 watt	2 Nos.
77.	Fixed resistance 100 Q 100 watt	2 Nos.
78.	Fixed resistance 100 Q 200 watt	2 Nos.
79.	Fixed resistance 500 Q 200 watt	2 Nos.
80.	Fixed resistance 1000 Q 200 watt	2 Nos.
81.	Rheostat 84 Q 3. 5 watt	2 Nos.
82.	Rheostat 280 Q 3.5 watt	2 Nos
83.	Watt meter single phase, single element (Flush	2 Nos
84.	mounting type) multi Range: 0-750-1500 Watt. rectangular shape.	10 Nos.
	Ammeter MI type, Rectangular shape, flush	
85.	mounting,size106x84mm, multi range, 0-5-10 A.	10 Nos.
	Voltmeter MC type AC, Rectangular shape, flush	
86.	mounting, size 106x 84mm, multi range, 0-150-300 V.	10 Nos.
87.	Auto Transformer, continuous variation, single phase, flush mounting type, 0- 270 V, 5 A.	10 Nos.
88.	Transformer single phase 1KVA 230/ 115V 50 Hz core type, air cooled	6 Nos.
89.	Transformer three phase 2.5 KVA 400/ 230V 50 Hz delta and star oil cooled	4 Nos.
90.	Current transformer	2 Nos
91	Potential Transformer	2 Nos.
92.	Variable auto transformer 0 - 270V 5A -10A single	2 Nos
	Phase	each
93.	Variable auto transformer 0 -440V 3 phase 5-10A	2 Nos. each
94.	U shape /Bar magnet	As reqd.

List of Measuring Instrument Tools & Equipment

1	Oscilloscope Trainer (20 MHz) along with -necessary facility to study the various function, test points to check the voltages, and check the wave shapes
2	LCR meter
3	Oscilloscope 0-20M Hz Single beam
4	Oscilloscope 0-20M Hz double beam
5	Oscilloscope 100 MHz with probes
6	Storage Oscilloscope
7	Electronic Multimeter
8	Wheatstone bridge setup
9	Resistance ratio bridge setup
10	Maxwell bridge setup
11	Shearing bridge setup
12	Galvanometer
13	MI Ammeter 0-1 Amp Panel Type
14	MI Ammeter 0-5 Amp Panel Type
15	MI Ammeter 0-1 Amp Box Type
16	MI Ammeter 0-10 Amp BoxType
17	MI Volt meter 0-300 V Panel Type
18	MI Voltmeter 0-250 V Panel Type
19	MI Voltmeter 0-100 V Box Type
20	MI Voltmeter 0-50V box type
21	Volt meter Dynamo meter type 050 V
22	Power factor meter
23	X-Y recorder
24	Single phase energy meter
25	Watt meter various types
26	Tacho generator AC & DC
27	FET Millivoltmeter
28	Multimeter Big
29	500 VA Inverter
30	Auto Transformer I/P 230/250V,O/P 0-270 V,5 Amp
31	VTVM (solid state)
32	Soldering & Desoldering station

Theory - III

Part – I

Basic Analog

<p>Safety precautions and elementary First aid</p> <p>Introduction to Semiconductors and review of P N junction diodes,</p> <p>Definition, types, construction, symbol, pin configuration, biasing, application,</p> <p>configuration of common emitter, common base, common collector transistor, their definition characteristics and application, different packages of transistors, out of circuit test, in-circuit test</p> <p>Transistor biasing circuits- types</p>	<p>Study the specification of different diodes using data sheet</p> <p>Using the data sheet identify the application of given transistor</p> <p>Check the transistor (resistance) using Multimeter, identify the NPN/PNP transistor</p>
<p>CE ,CB,CC amplifier ,circuit and their characteristics</p> <p>Alpha ,beta, voltage gain, Concept of dB ,dBm</p> <p>Darlington amplifier- circuit, & application</p> <p>Various Classification of amplifiers , RC Coupled amplifier, DC Amplifier , power amplifiers - circuit, operation, & application, transistor power rating & use of heat sink.</p>	<p>Test a common emitter, common base amplifier</p> <p>Construct an emitter follower, RC coupled amplifier and plot the graph the chart.</p> <p>Test Darlington amplifier</p> <p>Identify the use of various types of heat sink based upon use</p>
<p>Feedback concepts , feedback connection types and their circuits, oscillator - definition, types, circuit and application (phase shift oscillator, wein bridge oscillator, colpitts oscillator, Hartley oscillator, crystal oscillator etc), multivibrator- definition, types, circuits and application.</p>	<p>Construct and test the :Hartley , phase shift oscillator , multivibrator circuits</p>
<p>Introduction to Differential amplifier : construction & working Op-Amp: importance, characteristics mode gain, common-mode schematic diagram of 741, symbol, Non-inverting voltage amplifier, inverting voltage amplifier, , linear and nonlinear applications of 741,Comparator using op-amp ,other popular op-amps</p>	<p>Study the pin diagram of 741 IC</p> <p>Construct and test the Inverting & Non Inverting Amplifier</p> <p>Construct the comparator using OP-AMP</p>
<p>Regulated Power supply using transistor, 78XX series, 79XX series, Op-amp regulator, 723 regulator , Block diagram of a S.M.P.S., Working principle, and its application (Transistorized & IC based) voltage regulation, error correction and amplification etc.</p>	<p>Construct a + ve /-ve regulator using 78XX & 79XX series IC</p> <p>Construct a regulator using op-amp. Draw layout of the SMPS power supply. Identify different sections of the SMPS power supply & measure voltages at different testing points.</p>

<p>Definition of pulse amplitude, duration, repetition, rise time, Step & Ramp Voltage</p> <p>Exponential voltage, Clipping & Clamping circuits, their types and uses,</p> <p>Integrator & differentiator circuits and their applications</p> <p>Special devices: Construction, working and application:</p> <p>FET, UJT, SCR, DIAC, TRIAC, MOSFET, Optocouplers, LDR, VDR, Thermistor, infrared LEDs</p>	<p>Construct and verify +ve, -ve biased clipper circuits and observe the wave form shapes.</p> <p>Construct and verify clamper circuit and observe wave form,</p> <p>Construct, test and plot the characteristics of FET, UJT, SCR, TRIAC, DIAC</p>
<p>Block diagram, working and applications of : Sine wave generators, signal generators, pulse & square wave generator, audio frequency generators, Function generators</p>	<p>Verify the different shapes with the help of CRO.</p>

Part - II

BASIC DIGITAL ELECTRONICS

Practical	Theory
<p>Verify the truth table of AND, OR INVERT, NAND, NOR, EX-OR, EX-NOR gates</p>	<p>Safety precautions and elementary First aid</p> <p>Introduction to Digital Electronics, Basic gates & Universal gates.</p> <p>Digital code: Excess 3 code, grey code, BCD code, ASCII code</p>
<p>Construct the circuit of Half adder & Full adder and verify the truth table, Construct the Adder cum Subtractor and verify the result.</p> <p>Verify the truth table of RS, D, JK Flip flop</p>	<p>Arithmetic circuits: 1's & 2's complement</p> <p>Half adder & Full adder, 4 bit adder Half & Full subtractor, Adder cum Subtractor.</p> <p>Flip-Flop: Basic RS Flip Flop, D Flip Flop, JK Flip Flop, T Flip Flop Clocked Flip Flop, Timing diagram</p>
<p>Construct the shift register using RS/D/JK flip flop and verify the result</p> <p>Construct the Asynchronous & Asynchronous counter using D FF /JK Flip flop</p>	<p>Shift Register: Serial to parallel and vice versa, Parallel to parallel and serial to serial, Timing diagram, important applications</p> <p>Counters: Requirement of Flip Flops, MOD of counter Synchronous and Asynchronous counter Timing diagram, Specialised counter i.e Ring counter, Johnson counter</p>
<p>Construct the display circuit using the drivers and verify the result.</p>	<p>Display devices: Various display devices: LED, 7 segment, LCD, Display drivers, monitors, encoding & decoding</p>
<p>Study the Analog to Digital conversion process using a practical setup.</p>	<p>Analog to digital conversion using various methods</p> <p>Digital to Analog conversion</p> <p>Block diagram and working of DVM</p> <p>Logic families: Working of standard TTL & CMOS gates</p> <p>Concept of ECL, Schottky arrangement etc.</p> <p>Handling of CMOS Integrated circuits.</p>

List of Tool & Equipment

Digital Electronics Trainer with board facility for conducting practical on TTL & CMOS ICs along with -necessary P/S, facility to provide 16 Logical I/P and display O/P , provision to provide Clock I/P 1Hz,100 Hz,1 KHz , 7 segment display along with drivers so that I/P may be connected to drivers to get O/P, current & Volt meters may also be provided
Logic Analyzer
Logic probe
Logic clip
5 V DC Power supply
Bread board
Oscilloscope 100 MHz with probes (1:1,1:10)
Digital Multimeter
Function generators 0.1 Hz to 100KHz
Sine Square,Triangular
Magneto scope
Soldering iron 25Watt
1200 VA Inverter
Auto Transformer I/P 230/250V,O/P 0270 V,5 Amp
Computer system PIV with 40 GB HDD,CD Drive,31/2"FDD,256 MB RAM
PCB Design software i.e circuit maker or equivalent
Artwork film maker
Thru hole plating system
Dry film laminator
Art work table
Roller Tinning machine
Photo resistive DIP coating Machine
Etching Machine
PCB curing Machine
Double sided U-V exposure unit
PCB shearing Machine
PCB Drilling machine
Soldering & Desoldering station
Plotter
