

MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI

1	Name of Syllabus	C.C. In Basic Of Electronic (301120)						
2	Max. Nos of Student	25 Students						
3	Duration	6 Month						
4	Type	Full Time						
5	Nos Of Days / Week	6 Days						
6	Nos Of Hours /Days	7 Hrs						
7	Space Required	Workshop / Laboratory = 1000 Sq feet <u>Class Room = 200 Sq feet</u> TOTAL = 1200 Sq feet						
8	Entry Qualification	S.S.C.						
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 Basic, Analog & Digital Electronics, Instrumentation. 6. Ability to read schematic layouts / diagrams.. 7. Maintenance of Electronics Appliances, Instruments						
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	Diploma / Certificate course in Electronics						
12	Training System	Training System Per Week						
		Theory		Practical		Total		
		12 Hours		30 Hours		42 Hours		
13	Exam. System	Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Mark	Min. Mark
		1	30112011	Basic Electronic	TH-I	3 hrs	100	35
		2	30112012	Analog & Digital Electronic	TH-II	3 hrs	100	35
		3	30112021	Basic Electronic	PR-I	3 hrs	100	50
		4	30112022	Analog & Digital Electronic	PR- II	3 hrs	100	50
				TOTAL			400	170

Syllabus :- Basic Electronic

Theory - I - Basic Electronic	Practical - I - Basic Electronic
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, 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	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 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. Im, Idc, Irms, 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
	<p>Series parallel combination of batteries</p> <p>Charging of batteries, maintenance of batteries</p> <p>Calculate the shorted load and matched load current for given cell</p> <p>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.</p>
<p>Verification of Faraday's law of electromagnetic induction.</p> <p>Verification of Lenz law</p> <p>Demonstration of Fleming's finger rules</p>	<p>Safety precautions and elementary First aid</p> <p>Introduction to measurement basics:</p> <p>Accuracy, precision, errors and its types, calibrations etc., Faraday's law of Electromagnetic induction, Lenz's law of hysteresis & eddy currents, Fleming's 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'Arsonval 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</p> <p>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 ratio bridge, Maxwell bridge, Schering bridge, LCR meter,</p>	<p>Set up the circuit on Wheatstone 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 Tacho generator, Strain gauge, Microphone etc. and measure the different parameters</p>	<p>Special instruments and transducers-Power factor meter, Tachometer, Strain gauge, Microphones, Speakers</p>

Theory - II - Analog & Digital Electronic	Practical - II - Analog & Digital Electronic
CE ,CB,CC amplifier ,circuit and their characteristics Alpha ,beta, voltage gain, Concept of dB ,dBm Darlington amplifier- circuit, & application Various Classification of amplifiers , RC Coupled amplifier, DC Amplifier , power amplifiers - circuit, operation, & application, transistor power rating & use of heat sink.	Test a common emitter, common base amplifier Construct an emitter follower, RC coupled amplifier and plot the graph the chart. Test Darlington amplifier Identify the use of various types of heat sink based upon use
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.	Construct and test the :Hartley , phase shift oscillator , multivibrator circuits
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	Study the pin diagram of 741 IC Construct and test the Inverting & Non Inverting Amplifier Construct the comparator using OP-AMP
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.	Construct a + ve /-ve regulator using 78XX & 79XX series IC Construct a regulator using op-amp. Draw layout of the SMPS power supply. Identify different sections of the SMPSpower supply & measure voltages at different testing points.
Definition of pulse amplitude ,duration, repetetion, rise time, Step & Ramp Voltage Exponential voltage ,Clipping & Clamping circuits , their types and uses, Integrator & differentiator circuits and their applications Special devices: Construction ,working and application: FET,UJT,SCR,DIAC,TRIAC,MOSFET, Optocouplers,LDR,VDR,Thermistor,inf rared LEDs	Construct and verify +ve, - ve biased clipper circuits and observe the wave form shapes. Construct and verify clamper circuit and observe wave form, Construct, test and plot the characteristics of FET, UJT, SCR, TRIAC, DIAC
Block diagram, working and applications of : Sine wave generators, signal generators, pulse & square wave generator, audio frequency generators, Function generators	Verify the different shapes with the help of CRO.
Verify the truth table of AND, OR INVERT, NAND, NOR, EX-OR, EX-NOR gates	Safety precautions and elementary First aid Introduction to Digital Electronics, Basic gates & Universal gates. Digital code: Excess 3 code, grey code, BCD code, ASCII code

Construct the circuit of Half adder & Full adder and verify the truth table, Construct the Adder cum Subtractor and verify the result. Verify the truth table of RS, D, JK Flip flop	Arithmetic circuits: 1's & 2's complement Half adder & Full adder, 4 bit adder Half & Full subtractor, Adder cum Subtractor. Flip-Flop: Basic RS Flip Flop, D Flip Flop, JK Flip Flop, T Flip Flop Clocked Flip Flop, Timing diagram
Construct the shift register using RS/D/JK flip flop and verify the result Construct the Asynchronous & Asynchronous counter using D FF /JK Flip flop	Shift Register: Serial to parallel and vice versa, Parallel to parallel and serial to serial, Timing diagram, important applications Counters: Requirement of Flip Flops, MOD of counter Synchronous and Asynchronous counter Timing diagram, Specialised counter i.e Ring counter, Johnson counter
Construct the display circuit using the drivers and verify the result.	Display devices: Various display devices: LED, 7 segment, LCD, Display drivers, monitors, encoding & decoding

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 Box Type
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 0-50 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

Basic Electronics: - *Tools & Equipment*

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 cane 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.
73.	VAR meter 1 KVAR	1 No.
74.	Laboratory type induction coil 6V to 800 - 10000V Magnetic flux meter	1 No.
75.	Fixed resistance 5 'Q 20 watt	2 Nos.
76.	Fixed resistance 10 Q 20 watt	2 Nos.
77.	Fixed resistance 50 Q 25 watt	2 Nos.
78.	Fixed resistance 100 Q 100 watt	2 Nos.
79.	Fixed resistance 100 Q 200 watt	2 Nos.
80.	Fixed resistance 500 Q 200 watt	2 Nos.
81.	Fixed resistance 1000 Q 200 watt	2 Nos.
82.	Rheostat 84 Q 3. 5 watt	2 Nos.
83.	Rheostat 280 Q 3.5 watt	2 Nos.
84.	Watt meter single phase, single element (Flush	2 Nos.
85.	mounting type) multi Range: 0-750-1500 Watt. rectangular shape. Ammeter MI type, Rectangular shape, flush	16 Nos.
86.	mounting,size106x84mm, multi range, 0-5-10 A. Voltmeter MC type AC, Rectangular shape, flush	16 Nos.
87.	mounting, size 106x 84mm, multi range, 0-150-300 V.	16 Nos.
88.	Auto Transformer, continuous variation, single phase, flush mounting type, 0-270 V, 5 A.	16 Nos.
89.	Transformer single phase 1KVA 230/ 115V 50 Hz core type, air cooled	6 Nos.
90.	Transformer three phase 2.5 KVA 400/ 230V 50 Hz delta and star oil cooled	4 Nos.
91.	Current transformer	2 Nos.
92.	Potential Transformer	2 Nos.
93.	Variable auto transformer 0 - 270V 5A -10A single phase	2 Nos each
94.	Variable auto transformer 0 -440V 3 phase 5-10A	2 Nos. each
95.	U shape /Bar magnet	As reqd.
