

**MAHARASHTRA STATE BOARD OF VOCATIONAL EDUCATION EXAMINATION, MUMBAI**

1	Name of Syllabus	<b>C.C. in Automobile Electrical &amp; Electronics Mechanic (306109)</b>																																								
2	Max. Nos of Student	25 Students																																								
3	Duration	6 Month																																								
4	Type	Part Time																																								
5	Nos Of Days / Week	6 days																																								
6	Nos Of Hours /Days	4 hrs.																																								
7	Space Required	1) Workshop = 400 sqfeet 2) Class Room = 200 sqfeet ----- <b>TOTAL = 600 sqfeet</b>																																								
8	Entry Qualification	8 <sup>th</sup> Passed																																								
9	Objective Of Syllabus/ introduction	Successful candidate would be able to Repairing of Auto Electrical & Electronics Systems																																								
10	Employment Opportunity	Self Employment / May get job in Establishment																																								
11	Teacher's Qualification	Diploma in Automobile, Diploma in Electrical, I.T.I., N.C.V.T.(Electrical) With one year experience																																								
12	Training System	<b>Training System Per Week</b>																																								
		<table border="1"> <tr> <td>Theory</td> <td>Practical</td> <td>Total</td> </tr> <tr> <td>6 hrs</td> <td>18 hrs</td> <td>24 hrs</td> </tr> </table>						Theory	Practical	Total	6 hrs	18 hrs	24 hrs																													
Theory	Practical	Total																																								
6 hrs	18 hrs	24 hrs																																								
13	Exam. System	<table border="1"> <thead> <tr> <th>Sr. No.</th> <th>Paper Code</th> <th>Name of Subject</th> <th>TH/PR</th> <th>Hours</th> <th>Max. Marks</th> <th>Mini. Marks</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30610911</td> <td>Auto Electrical &amp; Electronics Systems</td> <td>TH-I</td> <td>3 Hrs</td> <td>100</td> <td>35</td> </tr> <tr> <td>2</td> <td>30610921</td> <td>Checking of Electrical wiring and equipments</td> <td>PR-I</td> <td>6 Hrs</td> <td>200</td> <td>100</td> </tr> <tr> <td>3</td> <td>30610922</td> <td>Fault finding and replacement of electronics equipment</td> <td>PR-II</td> <td>3 Hrs</td> <td>100</td> <td>50</td> </tr> <tr> <td></td> <td></td> <td align="center"><b>TOTAL</b></td> <td></td> <td></td> <td><b>400</b></td> <td><b>185</b></td> </tr> </tbody> </table>						Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Mini. Marks	1	30610911	Auto Electrical & Electronics Systems	TH-I	3 Hrs	100	35	2	30610921	Checking of Electrical wiring and equipments	PR-I	6 Hrs	200	100	3	30610922	Fault finding and replacement of electronics equipment	PR-II	3 Hrs	100	50			<b>TOTAL</b>			<b>400</b>	<b>185</b>
Sr. No.	Paper Code	Name of Subject	TH/PR	Hours	Max. Marks	Mini. Marks																																				
1	30610911	Auto Electrical & Electronics Systems	TH-I	3 Hrs	100	35																																				
2	30610921	Checking of Electrical wiring and equipments	PR-I	6 Hrs	200	100																																				
3	30610922	Fault finding and replacement of electronics equipment	PR-II	3 Hrs	100	50																																				
		<b>TOTAL</b>			<b>400</b>	<b>185</b>																																				

## Theory - I - Auto Electrical & Electronics Systems

1. Safety precautions and first aid. Care and maintenance of tools.
2. Signs and symbols used in Electrical & electronics
3. Voltage, Current and Resistance and its units. Effects of resistance on the length and cross sectional area of a conductor, conductors and insulators
4. Cumulative resistance of parallel and series connected circuits, Exercises on series and parallel circuits. The parts of a simple electrical circuit
5. Ohm's law – Exercises on Ohm's law.
6. Introduction on Magnetism
7. Usage of multimeter, Method of using AVO meter
8. Semiconductor
9. Type of solder and flux required for soldering aluminum and copper conductor. Introduction to equipment used for soldering.
10. Description/working principles, types, uses, location & checking of – switches, Circuit protectors, relays, solenoids, resistors, diodes, connectors, spark plugs (explain radio interference suppression) & condensers
11. Description / working principles, types, uses, location, maintenance & checking of various automobile electrical equipments – starter motor, alternator, wiper motor, horn & battery
12. Cables colour codes & sizes.
13. Function, types, uses, location & checking of – Basic electronics devices such as transistors, ICs, Thyristors, Triac, Diac, etc. Simple electronics circuits such as oscillators amplifiers, rectifier circuits, & power supplies
14. Principles of Digital electronics. Number systems and Truth table concept and application, logic gates and their applications, Simple digital circuits.
15. Demonstration of digital trainer kits
16. Demonstration on micro processor kits and familiarization with different related devices  
Demonstration and familiarization with automobile micro processor system
17. Working principle of instruments and gauges
18. Working principle of sensors – throttle position (Potentiometer), Air temperature (Thermistor), Engine coolant temperature, Air temperature, manifold absolute pressure (Piezo-Resistive & Piezo-electric type), vehicle speed, Camshaft and crank shaft position sensors (magnetic pick up type)
19. Construction and working principle of actuators –idle air control valve, injector & EGR cutout solenoid valve (explain duty cycle)
20. Basic structure and operation of a microcomputer Explanation of simple electronic circuits  
Different strategies/ modes available in the ECA

## **Practical – I - Checking of Electrical wiring and equipments**

1. Practice Health & Safety – familiarize, select, use, maintain & store – tools, equipments, consumables & clothing safely
2. Identify different tools & equipments
3. Identify different electrical parts of a vehicle
4. Make joints on simple strapped conductors, sieving or taping with insulation tape, Measure conductor using wire gauge
5. Practice Soldering on wire joints,
6. Solder and crimp of lugs with wire ends
7. Measure voltage drop, total resistance, current flow in different line by connecting two or three resistors in parallel and series using a battery, bulb / motor / resistors – reconcile Ohm's law.
8. Check blowing of fuse with wires short-circulated.
9. Identify various electrical equipments on the mock up wiring board i.e. starter motor, dynamo control box etc., Follow up starting system wiring, Identify marking on terminal joints, Remove and repeat connections. Do Similar practice on charging system wiring.
10. Checking of circuit breakers and relays
11. Construct simple circuit by using relay
12. Test / check –alternator output voltage, circuit voltage drop, and trouble shooting in a charging system.
13. Dismantling alternators and components tests –diodes, rotor condition, rotor winding insulation & rotor condition.
14. Trace starter circuit in a vehicle Dismantle starter and check each components, Repair the faults, Assemble and check starter motor on a test rig.
15. Check spark plugs, HT leads, ignition coil and condenser
16. Test the batteries with Hydrometer and cell tester, prepare electrolyte (follow safety rules), top up battery with distilled water, Connect batteries for charging.

## **Practical - II - Fault finding and replacement of electronics equipment**

1. Construct a simple electronic circuits using electronic trainer kit (to study the components functions). Assemble and study rectifier circuits and power supplies- measure outputs
2. Construct simple logic circuits using digital trainer kit
3. Check ignition coil of E-DIS (Electronic distributor less Ignition system)
4. Check sensors & actuators using engine scanner / DMM
6. Check the different modes/ strategies of Electronic Control Assembly, Reset keep alive memory/ ECA
7. Check different wiring / circuits and rectify the defect

<b>s.n</b>	<b>Item</b>	<b>s.n</b>	<b>Item</b>
<b>a) TRAINEES TOOL KIT</b>			
1	Ball Peen Hammer 0.75 Kg	6	Steel rule 30mm
2	Cold Flat Chisel 19mm	7	Plier combination 15cm
3	Centre Punch 10 mm dia x 100mm	8	Steel tool box with lock & key ( folding type ) size 400x200x150mm
4	Insulated Screw driver 30 cm x 9mm blade	9	Hand file 20 cm second cut
5	Insulated Screw driver 20 cm x 9mm blade	10	Ring spanner set of 12mm
<b>b) SHOP OUTFIT &amp; MEASURING INSTRUMENTS</b>			
1	Electric testing screwdrivers 12 Hand vice 37 mm	25	Stud extractors
2	Allen key set of 12 pieces ( 2mm – 14 mm)	26	Poker 2 Nos
3	Circlip plier (External and Internal) 150mm & 200mm	27	Double ended Spanner 6 to 32 mm - set of 12 nos
4	Philips Screw Driver set of 5 pieces 100mm – 300mm	28	Double ended off- set Spanner (W. W) – 3 to 13.5 mm –set of 7 nos.
5	Star Allen keys	29	Double open ended ignition spanner set (of BA- 0 x 1 to 8x9 set of 5)
6	Prick punch 15 cm	30	Spanner Clyburn 15 cm
7	Chisel cross cut 200mm x 6 mm	31	Adjustable spanner 20 cm
8	Ball Peen Hammer 0.5 Kg	32	Spark plug spanner 14 mm 1 No.
9	Hammer copper 1 Kg with handle	33	Magneto spanner set with 8 spanners 1 set
10	Hack saw frame for 30 cm blade	34	Socket spanner set with handle, T- bar and ratchet
11	Hollow punch 6,7,8,9,10 and 12 mm set	35	Drift copper (10 mm x 150 mm) 1 No.
12	Flat File 35 cm bastard	36	Double open ended spanner set (10.5mm x 12 mm; 10.5mm x 18 mm set of four) 1 set
13	Flat File 25 cm second cut	37	Hydrometers
14	Micrometer Outside 0- 25mm, 25- 50mm	38	Spring tension tester
15	Soldering iron 120 watts	39	A. V. O. meters
16	Nose Pliers (round and straight) 150 mm and 200mm	40	Alternator regulator tester
17	Circlip pliers	41	Distributor tester
18	Thread pitch gauge	42	Continuity meter
19	Stud remover	43	Clip on meter Digital and Analog 1 each
20	Spanner T. flocks for screwing up and up-screwing inaccessible positions	44	Tachometer
21	Cleaning tray 45 x 30cm	45	Spark Plug tester “NEON” type
22	Oil can 0.5 litres	46	High rate discharge tester
23	Smp (straight & bent)	47	Multimeter digital and Analog 1 each
24	General purpose puller	48	Starter motor, alternator, dynamo & cut out 2 each
<b>s.n</b>	<b>Item</b>	<b>s.n</b>	<b>Item</b>
<b>c) GENERAL INSTALLATION / MACHINERIES</b>			
1	Drilling Machine ( Bench) 12 mm dia	18	Grease Gun
2	Growler	19	Pulley set universal for bearing & bushes (set)
3	Battery charger 6V – 24 V	20	Pulley puller
4	AC alternator slip ring puller	21	Glow plug
5	AC alternator slip ring press tool	22	Alternator
6	Executive Auto Electrical tool kit	23	Glow plug tester
7	Electrical test bench	24	Torque wrenches 5035 Nm, 12- 68 Nm
8	Car stereo 1 No	25	Starter test bench
9	Battery 12V (Lead acid & Alkaline)	26	Dynamo and voltage regulator
10	Electronic engine control module	27	Alternator and inbuilt regulator
11	Starter motor axial type, pre- engagement type & Co- axial type 1 each	28	Horn and Horn relay
12	Electrical horn( different types )	29	Air conditioned MPFI vehicle with accessories
13	Wiper motor assemblies	30	Engine control sensors 8 types
14	Engine Scanner	31	Five Point relays 4 nos
15	Anti theft devices	32	Four Point relays 4 nos
16	Melting pot	33	Bearing puller set ( 100- 300mm for extracting both outer and inner races with box containing (a) 8 internal extractors (b) counter stays (c) Pulling chuck of capacity 5 x 32 mm (d) 2 arm cooler, capacity 80 and 160 mm (e) Slide hammer 2 sets
17	Paraffin pressure Gun		

\*\*\*\*\*

