

7. TRADE SYLLABUS

SYLLABUS FOR ELECTRONICS MECHANIC TRADE			
FIRST YEAR			
Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 65 Hrs; Professional Knowledge 10 Hrs	Perform basic workshop operations using suitable tools for fitting, riveting, drilling etc. observing suitable care & safety following safety precautions. (Mapped NOS: ELE/N1002)	Trade and Orientation <ol style="list-style-type: none"> 1. Visit to various sections of the institute and identify location of various installations. (05 Hrs.) 2. Identify safety signs for danger, warning, caution & personal safety message. (03 Hrs.) 3. Use of personal protective equipment (PPE). (05 Hrs.) 4. Practice elementary first aid. (05 Hrs.) 5. Preventive measures for electrical accidents & steps to be taken in such accidents. (02 Hrs.) 6. Use of Fire extinguishers. (05 Hrs.) 	Familiarization with the working of Industrial Training Institute system. Importance of safety and precautions to be taken in the industry/shop floor. Introduction to PPEs. Introduction to First Aid. Response to emergencies e.g. power failure, fire, and system failure. Importance of housekeeping & good shop floor practices. Occupational Safety & Health: Health, Safety and Environment guidelines, legislations & regulations as applicable. (05 Hrs.)
		Hand tools and their uses <ol style="list-style-type: none"> 7. Identify the different hand tools. (05 Hrs.) 8. Selection of proper tools for operation and precautions in operation. (05 Hrs.) 9. Care & maintenance of trade tools. (05 Hrs.) 10. Practice safety precautions while working in fitting jobs. (10 Hrs.) 	Identification, specifications, uses and maintenance of commonly used hand tools. State the correct shape of files for filing different profiles. Riveting of tags and lugs, cutting and bending of sheet metals, chassis and cabinets. (05 Hrs.)

		<p>11. Workshop practice on filing and hacks awing. (05 Hrs.)</p> <p>12. Practice simple fitting and drilling. (10 Hrs.)</p>	
Professional Skill 50 Hrs; Professional Knowledge 15 Hrs	Select and perform electrical/ electronic measurement of single range meters and calibrate the instrument. ELE/N9401	<p>Basics of AC and Electrical Cables</p> <p>13. Identify the Phase, Neutral and Earth on power socket, use a testers to monitor AC power. (02 Hrs.)</p> <p>14. Construct a test lamp and use it to check mains healthiness. (03 Hrs.)</p> <p>15. Measure the voltage between phase and ground and rectify earthing. (04 Hrs.)</p> <p>16. Identify and test different AC mains cables. (03 Hrs.)</p> <p>17. Prepare terminations, skin the electrical wires /cables using wire stripper and cutter. (03 Hrs.)</p> <p>18. Measure the gauge of the wire using SWG and outside micrometer. (03 Hrs.)</p> <p>19. Refer table and find current carrying capacity of wires. (02 Hrs.)</p> <p>20. Crimp the lugs to wire end. (03 Hrs.)</p> <p>21. Measure AC and DC voltages using multi meter. (03 Hrs.)</p>	<p>Basic terms such as electric charges, Potential difference, Voltage, Current, Resistance. Basics of AC & DC.</p> <p>Various terms such as +ve cycle, -ve cycle, Frequency, Time period, RMS, Peak, Instantaneous value.</p> <p>Single phase and Three phase supply.</p> <p>Terms like Line and Phase voltage/ currents.</p> <p>Insulators, conductors and semiconductor properties.</p> <p>Different type of electrical cables and their Specifications.</p> <p>Types of wires & cables, standard wire gauge (SWG).</p> <p>Classification of cables according to gauge (core size), number of conductors, material, insulation strength, flexibility etc.</p> <p>(08 Hrs.)</p>
		<p>22. Identify the type of meters by dial and scale marking/ symbols. (03</p>	<p>Single range meters</p> <p>Introduction to electrical and electronic measuring</p>

		<p>Hrs.)</p> <p>23. Demonstrate various analog measuring Instruments. (04 Hrs.)</p> <p>24. Find the minimum and maximum measurable range of the meter. (03 Hrs.)</p> <p>25. Carryout mechanical zero setting of a meter. (04 Hrs.)</p> <p>26. Check the continuity of wires, meter probes and fuse etc. (05 Hrs.)</p> <p>27. Measure voltage and current using clamp meter. (05 Hrs.)</p>	<p>instruments.</p> <p>Basic principle and parts of simple meters.</p> <p>Specifications, symbols used in dial and their meaning. (07 Hrs.)</p>
<p>Professional Skill 25 Hrs; Professional Knowledge 06 Hrs</p>	<p>Test & service different batteries used in electronic applications and record the data to estimate repair cost.</p> <p>(Mapped NOS: ELE/N7001)</p>	<p>Cells & Batteries</p> <p>28. Identify the +ve and -ve terminals of the battery. (02 Hrs.)</p> <p>29. Identify the rated output voltage and Ah capacity of given battery. (01 Hrs.)</p> <p>30. Measure the voltages of the given cells/battery using analog/ digital multimeter. (03 Hrs.)</p> <p>31. Charge and discharge the battery through load resistor. (05 Hrs.)</p> <p>32. Maintain the secondary Battery. (05 Hrs.)</p> <p>33. Measure the specific gravity of the electrolyte using hydrometer. (03 Hrs.)</p> <p>34. Test a battery and verify whether the battery is ready for use or needs</p>	<p>Cells & Batteries</p> <p>Construction, types of primary and secondary cells/battery. Materials used, Specification of cells and batteries.</p> <p>Charging process, efficiency, life of cell/battery.</p> <p>Selection of cells / Batteries etc.</p> <p>Use of Hydrometer.</p> <p>Types of electrolytes used in cells and batteries.</p> <p>Series/ parallel connection of batteries and purpose of such connections. (06 Hrs.)</p>

		recharging. (06 Hrs.)	
Professional Skill 60 Hrs; Professional Knowledge 10 Hrs	Measure AC/DC using proper measuring instruments and compare the data using standard parameter. ELE/N9402	AC & DC measurements 35. Use the multi meter to measure the various functions (AC V, DC V, DC I, AC I, R). (10 Hrs.) 36. Identify the different types of meter for measuring AC & DC parameters. (10 Hrs.) 37. Identify the different controls on the CRO/DSO front panel and observe the function of each control. (14 Hrs.) 38. Measure DC voltage, AC voltage, time period using CRO/DSO sine wave parameters. (14 Hrs.) 39. Identify the different controls on the function generator front panel and observe the function of each control. (12 Hrs.)	Introduction to electrical measuring instruments. Importance and classification of meters. MC and MI meters. Characteristics of meters and errors in meters. Multi meter, use of meters in different circuits. Care and maintenance of meters. Use of CRO/DSO, Function generator, LCR meter (10 Hrs.)
Professional Skill 25 Hrs; Professional Knowledge 09 Hrs	Measure the various parameters by DSO and execute the result with standard one. ELE/N9403	Digital Storage Oscilloscope 40. Identify the different front panel control of a DSO. (05 Hrs.) 41. Measure the Amplitude, Frequency and time period of typical electronic signals using DSO. (06 Hrs.) 42. Take a print of a signal from DSO by connecting it to a printer and tally with applied signal. (07 Hrs.) 43. Construct and test function generator using IC 8038. (07 Hrs.)	Advantages and features of DSO. Block diagram of Digital storage oscilloscope (DSO)/CRO and applications. Applications of digital CRO. Block diagram of function generator. Differentiate a CRO with DSO. (09 Hrs.)

<p>Professional Skill 25 Hrs; Professional Knowledge 05 Hrs</p>	<p>Plan and execute soldering & de-soldering of various electrical components like Switches, PCB & Transformers for electronic circuits.</p> <p>(Mapped NOS: ELE/N7812)</p>	<p>Soldering/ De-soldering and Various Switches</p> <p>44. Practice soldering on different electronic components, small transformer and lugs. (04 Hrs.)</p> <p>45. Practice soldering on IC bases and PCBs. (04 Hrs.)</p> <p>46. Practice de-soldering using pump and wick. (04 Hrs.)</p> <p>47. Join the broken PCB track and test. (04 Hrs.)</p> <p>48. Identify and use SPST, SPDT, DPST, DPDT, tumbler, push button, toggle, piano switches used in electronic industries. (04 Hrs.)</p> <p>49. Make a panel board using different types of switches for a given application. (05 Hrs.)</p>	<p>Different types of soldering guns, related to Temperature and wattages, types of tips. Solder materials and their grading. Use of flux and other materials. Selection of soldering gun for specific requirement. Soldering and De-soldering stations and their specifications. Different switches, their specification and usage. (05 Hrs.)</p>
<p>Professional Skill 100 Hrs; Professional Knowledge 25 Hrs</p>	<p>Test various electronic components using proper measuring instruments and compare the data using standard parameter.</p> <p>(Mapped NOS: ELE/N5804)</p>	<p>Active and Passive Components</p> <p>50. Identify the different types of active electronic components. (06 Hrs.)</p> <p>51. Measure the resistor value by colour code and verify the same by measuring with multimeter. (06 Hrs.)</p> <p>52. Identify resistors by their appearance and check physical defects. (06 Hrs.)</p> <p>53. Identify the power rating of carbon resistors by their size. (06 Hrs.)</p> <p>54. Practice on measurement of parameters in</p>	<p>Ohm's law and Kirchhoff's Law. Resistors; types of resistors, their construction & specific use, color-coding, power rating. Equivalent Resistance of series parallel circuits. Distribution of V & I in series parallel circuits. Principles of induction, inductive reactance. Types of inductors, construction, specifications, applications and energy storage concept.</p>

		<p>combinational electrical circuit by applying Ohm's Law for different resistor values and voltage sources. (06 Hrs.)</p> <p>55. Measurement of current and voltage in electrical circuits to verify Kirchhoff's Law. (06 Hrs.)</p> <p>56. Verify laws of series and parallel circuits with voltage source in different combinations. (06 Hrs.)</p> <p>57. Measure the resistance, Voltage, Current through series and parallel connected networks using multi meter. (06 Hrs.)</p> <p>58. Identify different inductors and measure the values using LCR meter. (06 Hrs.)</p> <p>59. Identify the different capacitors and measure capacitance of various capacitors using LCR meter. (06 Hrs.)</p> <p>60. Identify and test the circuit breaker and other protecting devices. (06 Hrs.)</p> <p>61. Dismantle and identify the different parts of a relay. (06 Hrs.)</p> <p>62. Connect a timer relay in a circuit and test for its working. (06 Hrs.)</p> <p>63. Connect a contactor in a circuit and test for its working. (06 Hrs.)</p>	<p>Self and Mutual induction. Behaviour of inductor at low and high frequencies. Series and parallel combination, Q factor. Capacitance and Capacitive Reactance, Impedance. Types of capacitors, construction, specifications and applications. Dielectric constant. Significance of Series parallel connection of capacitors. Capacitor behaviour with AC and DC. Concept of Time constant of a RC circuit. Concept of Resonance and its application in series and parallel circuit. Properties of magnets and their materials, preparation of artificial magnets, significance of electromagnetism, types of cores. Relays, types, construction and specifications etc (25 Hrs.)</p>
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<p>Professional Skill 60 Hrs; Professional Knowledge 10 Hrs</p>	<p>Assemble simple electronic power supply circuit and test for functioning.</p> <p>(Mapped NOS: ELE/N5804)</p>	<p>Power Supply Circuits</p> <p>67. Test the given diode using multi meter and determine forward to reverse resistance ratio. (05 Hrs.)</p> <p>68. Measure the voltage and current through a diode in a circuit and verify its forward characteristic. (05 Hrs.)</p> <p>69. Identify different types of transformers and test. (05 Hrs.)</p> <p>70. Identify the primary and secondary transformer windings and test the polarity. (05 Hrs.)</p> <p>71. Construct and test a half wave, full wave and Bridge rectifier circuit. (05 Hrs.)</p> <p>72. Measure ripple voltage, ripple frequency and ripple factor of rectifiers for different load and filter capacitors. (05 Hrs.)</p> <p>73. Construct and test Zener based voltage regulator circuit. (05 Hrs.)</p> <p>74. Calculate the percentage</p>	<p>Semiconductor materials, components, PN Junction, Forward and Reverse biasing of diodes.</p> <p>Forward current and Reverse voltage.</p> <p>Packing styles of diodes.</p> <p>Different diodes, Rectifier configurations, their efficiencies, Filter components and their role in reducing ripple.</p> <p>Working principles of Zener diode, varactor diode, their specifications and applications.</p> <p>Working principle of a Transformer, construction, Specifications and types of cores used.</p> <p>Step-up, Step down and isolation transformers with applications. Losses in Transformers. (07 Hrs.)</p>

		regulation of regulated power supply. (05 Hrs.)	
		<p>IC Regulators</p> <p>75. Construct and test a +12V fixed voltage regulator. (05 Hrs.)</p> <p>76. Identify the different types of fixed +ve and – ve regulator ICs and the different current ratings (78/79 series). (04 Hrs.)</p> <p>77. Observe the output voltage of different IC 723 metal/ plastic type. (04 Hrs.)</p> <p>78. Construct and test a 1.2V – 30V variable output regulated power supply using IC LM317T. (05 Hrs.)</p>	<p>Regulated Power supply using 78XX series, 79XX series.</p> <p>Op-amp regulator, 723 regulator, (Transistorized & IC based).</p> <p>Voltage regulation, error correction and amplification etc.</p> <p>(03 Hrs.)</p>
Professional Skill 90 Hrs; Professional Knowledge 15 Hrs	Construct, test and verify the input/output characteristics of various analog circuits. ELE/N9404	<p>Transistor</p> <p>79. Identify different transistors with respect to different package type, B-E-C pins, power, switching transistor, heat sinks etc. (06 Hrs.)</p> <p>80. Test the condition of a given transistor using ohm-meter. (06 Hrs.)</p> <p>81. Construct and test a transistor based switching circuit to control a relay (use Relays of different coil voltages and Transistors of different β) (06hrs)</p>	<p>Construction, working of a PNP and NPN Transistors, purpose of E, B & C Terminals.</p> <p>Significance of α, β and relationship of a Transistor.</p> <p>Need for Biasing of Transistor.</p> <p>VBE, VCB, VCE, IC, IB, Junction Temperature, junction capacitance, frequency of operation.</p> <p>Transistor applications as switch and amplifier.</p> <p>Transistor input and output characteristics.</p> <p>Transistor power ratings & packaging styles and use of different heat sinks. (5 Hrs.)</p>
		Amplifier	Different types of biasing,

		<p>82. Construct and test fixed-bias, emitter-bias and voltage divider-bias transistor amplifier. (06 Hrs.)</p> <p>83. Construct and Test a common emitter amplifier with and without bypass capacitors. (06 Hrs.)</p> <p>84. Construct and Test common collector/emitter follower amplifier. (06 Hrs.)</p> <p>85. Construct and test a two stage RC Coupled amplifier. (06 Hrs.)</p>	<p>various configurations of transistor (C-B, C-E & C-C), their characteristics and applications.</p> <p>Transistor biasing circuits and stabilization Techniques.</p> <p>Classification of amplifiers according to frequency, mode of operation and methods of coupling.</p> <p>Voltage amplifiers - voltage gain, loading effect.</p> <p>Single stage CE amplifier and CC amplifier.</p> <p>Emitter follower circuit and its advantages.</p> <p>RC coupled amplifier, Distinguish between voltage and power amplifier, Alpha, beta, voltage gain, Concept of dB dBm. Feedback and its types. (5 Hrs.)</p>
		<p>Oscillators</p> <p>86. Demonstrate Colpitts oscillator, Hartley oscillator circuits and compare the output frequency of the oscillator by CRO. (06 Hrs.)</p> <p>87. Construct and test a RC phase shift oscillator circuits. (06 Hrs.)</p> <p>88. Construct and test a crystal oscillator circuits. (06 Hrs.)</p> <p>89. Demonstrate Astable, monostable, bistable circuits using transistors. (06 Hrs.)</p>	<p>Introduction to positive feedback and requisites of an oscillator.</p> <p>Study of Colpitts, Hartley, Crystal and RC oscillators.</p> <p>Types of multi vibrators and study of circuit diagrams. (03 Hrs.)</p>

		<p>Wave shaping circuits</p> <p>90. Construct and test shunt clipper. (06 Hrs.)</p> <p>91. Construct and test series and dual clipper circuit using diodes. (06 Hrs.)</p> <p>92. Construct and test clamper circuit using diodes. (06 Hrs.)</p> <p>93. Construct and test Zener diode as a peak clipper. (06 Hrs.)</p>	<p>Diode shunt clipper circuits, Clamping / limiting circuits and Zener diode as peak clipper, uses their applications. (02 Hrs.)</p>
<p>Professional Skill 80 Hrs;</p> <p>Professional Knowledge 20 Hrs</p>	<p>Plan and construct different power electronic circuits and analyse the circuit functioning. ELE/N1201</p>	<p>Power Electronic Components</p> <p>94. Identify different power electronic components, their specification and terminals. (05 Hrs)</p> <p>95. Construct and test a FET Amplifier. (15 Hrs)</p> <p>96. Construct a test circuit of SCR using UJT triggering. (15 Hrs)</p> <p>97. Construct a simple dimmer circuit using TRIAC. (10 Hrs)</p> <p>98. Construct UJT based free running oscillator and change its frequency. (15 Hrs)</p>	<p>Construction of FET & JFET, difference with BJT. Purpose of Gate, Drain and source terminals and voltage / current relations between them and Impedances between various terminals. Heat Sink- Uses & purpose. Suitability of FET amplifiers in measuring device applications. Working of different power electronic components such as SCR, TRIAC, DIAC and UJT. (12 Hrs.)</p>
		<p>MOSFET & IGBT</p> <p>99. Identify various Power MOSFET by its number and test by using multimeter. (05 Hrs)</p> <p>100. Construct MOSFET test circuit with a small load. (05 Hrs)</p> <p>101. Identify IGBTs by their numbers and test by using multimeter. (05 Hrs)</p>	<p>MOSFET, Power MOSFET and IGBT, their types, characteristics, switching speed, power ratings and protection.</p> <p>Differentiate FET with MOSFET.</p> <p>Differentiate Transistor with</p>

		102. Construct IGBT test circuit with a small load. (05 Hrs)	IGBT. (08 Hrs.)
Professional Skill 50 Hrs; Professional Knowledge 06 Hrs	Select the appropriate opto electronics components and verify the characteristics in different circuit. ELE/N6102	<p>Opto Electronics</p> <p>103. Test LEDs with DC supply and measure voltage drop and current using multimeter. (11 Hrs.)</p> <p>104. Construct a circuit to test photo voltaic cell. (13 Hrs.)</p> <p>105. Construct a circuit to switch a lamp load using photo diode. (13 Hrs.)</p> <p>106. Construct a circuit to switch a lamp load using photo transistor. (13 Hrs.)</p>	<p>Working and application of LED, IR LEDs, Photo diode, photo transistor, their characteristics and applications.</p> <p>Optical sensor, opto-couplers, circuits with opto isolators.</p> <p>Characteristics of LASER diodes. (06 Hrs.)</p>
Professional Skill 80 Hrs; Professional Knowledge 15 Hrs	Assemble, test and troubleshoot various digital circuits. (Mapped NOS: ELE/N1201)	<p>Basic Gates</p> <p>107. Verify the truth tables of all Logic Gate ICs by connecting switches and LEDs. (05 Hrs.)</p> <p>108. Construct and verify the truth table of all the gates using NAND and NOR gates. (05 Hrs.)</p> <p>109. Use digital IC tester to test the various digital ICs (TTL and CMOS). (05 Hrs.)</p>	<p>Introduction to Digital Electronics.</p> <p>Difference between analog and digital signals.</p> <p>Number systems (Decimal, binary, octal, Hexadecimal).</p> <p>BCD code, ASCII code and code conversions.</p> <p>Various Logic Gates and their truth tables. (05 Hrs.)</p>
		<p>Combinational Circuits</p> <p>110. Construct Half Adder circuit using ICs and verify the truth table. (07 Hrs.)</p> <p>111. Construct Full adder with two Half adder circuit using ICs and verify the truth table. (07 Hrs.)</p>	<p>Combinational logic circuits such as Half Adder, Full adder, Parallel Binary adders, 2-bit and four bit full adders.</p> <p>Magnitude comparators.</p> <p>Half adder, full adder ICs and their applications for implementing arithmetic</p>

		<p>112. Construct the adder cum subtractor circuit and verify the result. (07 Hrs.)</p> <p>113. Construct and Test a 2 to 4 Decoder. (07 Hrs.)</p> <p>114. Construct and Test a 4 to 2 Encoder. (07 Hrs.)</p> <p>115. Construct and Test a 4 to 1 Multiplexer. (05 Hrs.)</p> <p>116. Construct and Test a 1 to 4 De Multiplexer. (05 Hrs.)</p>	<p>operations.</p> <p>Concept of encoder and decoder. Basic Binary Decoder and four bit binary decoders.</p> <p>Need for multiplexing of data. 1:4 line Multiplexer / Demultiplexer. (07 Hrs.)</p>
		<p>Flip Flops</p> <p>117. Identify different Flip-Flop (ICs) by the number printed on them. (05 Hrs.)</p> <p>118. Construct and test four bit latch using 7475. (05 Hrs.)</p> <p>119. Construct and test R-S flip-flop using IC7400 with clock and without clock pulse. (05 Hrs.)</p> <p>120. Verify the truth tables of Flip-Flop ICs (RS, D, T, JK, MSJK) by connecting switches and LEDs. (05 Hrs.)</p>	<p>Introduction to Flip-Flop. S-R Latch, Gated S-R Latch, D-Latch.</p> <p>Flip-Flop: Basic RS Flip Flop, edge triggered D Flip Flop, JK Flip Flop, T Flip Flop.</p> <p>Master-Slave flip flops and Timing diagrams.</p> <p>Basic flip flop applications like data storage, data transfer and frequency division. (03 Hrs.)</p>
<p>Professional Skill 50 Hrs;</p> <p>Professional Knowledge 04 Hrs</p>	<p>Simulate and analyze the analog and digital circuits using Electronic simulator software.</p> <p>(Mapped NOS: ELE/N6102)</p>	<p>Electronic circuit simulator</p> <p>121. Prepare simple digital and electronic circuits using the software. (13 Hrs.)</p> <p>122. Simulate and test the prepared digital and analog circuits. (13 Hrs.)</p> <p>123. Convert the prepared circuit into a layout</p>	<p>Study the library components available in the circuit simulation software.</p> <p>Various resources of the software. (04 Hrs.)</p>

		<p>diagram. (12 Hrs.)</p> <p>124. Prepare simple, power electronic and domestic electronic circuit using simulation software. (12 Hrs.)</p>	
<p>Professional Skill 80 Hrs;</p> <p>Professional Knowledge 15 Hrs</p>	<p>Construct and test different circuits using ICs 741operational amplifiers & ICs 555 linear integrated circuits and execute the result. ELE/N9405</p>	<p>Op – Amp & Timer 555 Applications</p> <p>125. Use analog IC tester to test the various analog ICs. (06 Hrs.)</p> <p>126. Construct and test various Op-Amp circuits Inverting, Non-inverting and Summing Amplifiers. (06 Hrs.)</p> <p>127. Construct and test Differentiator and Integrator. (06 Hrs.)</p> <p>128. Construct and test a zero crossing detector. (06 Hrs.)</p> <p>129. Construct and test Instrumentation amplifier. (06 Hrs.)</p> <p>130. Construct and test a Binary weighted and R-2R Ladder type Digital-to-Analog Converters. (08 Hrs.)</p> <p>131. Construct and test Astable timer circuit using IC 555. (08 Hrs.)</p> <p>132. Construct and test mono stable timer circuit using IC 555. (08 Hrs.)</p> <p>133. Construct and test VCO (V to F Converter) using IC 555. (08 Hrs.)</p> <p>134. Construct and test 555</p>	<p>Block diagram and Working of Op-Amp, importance, Ideal characteristics, advantages and applications.</p> <p>Schematic diagram of 741, symbol.</p> <p>Non-inverting voltage amplifier, inverting voltage amplifier, summing amplifier, Comparator, zero cross detector, differentiator, integrator and instrumentation amplifier, other popular Op-Amps.</p> <p>Block diagram of 555, functional description w.r.t. different configurations of 555 such as monostable, astable and VCO operations for various application. (15 Hrs.)</p>

		timers as pulse width modulator. (08 Hrs.)	
ENGINEERING DRAWING: 40 Hrs.			
Professional Knowledge ED -40 Hrs.	Read and apply engineering drawing for different application in the field of work. CSC/N9401	<p><u>ENGINEERING DRAWING:</u></p> <p>Introduction to Engineering Drawing and Drawing Instrument –</p> <ul style="list-style-type: none"> • Conventions • Sizes and layout of drawings sheets • Title Block, its position and content • Drawing Instrument <p>Free hand drawing of–</p> <ul style="list-style-type: none"> • Geometrical figures and blocks with dimension • Transferring measurement from the given object to the free hand sketches. • Free hand drawing of hand tools. <p>Drawing of Geometrical figures:</p> <ul style="list-style-type: none"> • Angle, Triangle, Circle, Rectangle, Square, Parallelogram. • Lettering & Numbering – Single Stroke <p>Symbolic representation–</p> <ul style="list-style-type: none"> • Different Electronic symbols used in the related trades <p>Reading of Electronic Circuit Diagram. Reading of Electronic Layout drawing.</p> <p>Material Science</p> <p>Types metals, types of ferrous and non ferrous metals. Introduction of iron and cast iron.</p>	
WORKSHOP CALCULATION & SCIENCE: 35 Hrs			
Professional Knowledge WCS -35 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CSC/N9402	<p><u>WORKSHOP CALCULATION & SCIENCE:</u></p> <p>Unit, Fractions</p> <p>Classification of unit system Fundamental and Derived units F.P.S, C.G.S, M.K.S and SI units Measurement units and conversion. Factors, HCF, LCM and problems. Fractions - Addition, subtraction, multiplication & division. Decimal fractions - Addition, subtraction, multiplication & division. Solving problems by using calculator.</p> <p>Square root, Ratio and Proportions, Percentage</p> <p>Square and square root. Simple problems using calculator. Applications of pythagoras theorem and related problems. Ratio and proportion.</p> <p>Ratio and proportion - Direct and indirect proportions Percentage Percentage - Changing percentage to decimal and fraction.</p>	

		<p>Material Science Types metals, types of ferrous and non ferrous metals. Introduction of iron and cast iron.</p> <p>Heat & Temperature and Pressure Concept of heat and temperature, effects of heat, difference between heat and temperature, boiling point & melting point of different metals and non-metals. Scales of temperature, celsius, fahrenheit, kelvin and conversion between scales of temperature.</p> <p>Basic Electricity Introduction and uses of electricity, molecule, atom, how electricity is produced, electric current AC,DC their comparison, voltage, resistance and their units Conductor, insulator, types of connections - series and parallel. Ohm's law, relation between V.I.R & related problems. Electrical power, energy and their units, calculation with assignments. Magnetic induction, self and mutual inductance and EMF generation Electrical power, HP, energy and units of electrical energy</p> <p>Trigonometry Measurement of angles Trigonometrical ratios Trigonometrical tables</p>
<p>Project work / Industrial visit</p> <p>Broad Areas:</p> <ol style="list-style-type: none"> Delayed automatic power on circuit. Neon flasher circuit using IC 741 UJT act as a relaxation oscillator Up/down synchronous decade counter Portable continuity cum capacitor tester 		

SYLLABUS FOR ELECTRONICS MECHANIC TRADE

SECOND YEAR

Duration	Reference Learning Outcome	Professional Skills (Trade Practical) With Indicative Hours	Professional Knowledge (Trade Theory)
Professional Skill 25 Hrs; Professional Knowledge 06 Hrs	Prepare, crimp, terminate and test various cables used in different electronics industries. (Mapped NOS: ELE/N6307)	Electronic Cables & Connectors 135. Identify various types of cables viz. RF coaxial feeder, screened cable, ribbon cable, RCA connector cable, digital optical audio, video cable, RJ45, RJ11, Ethernet cable, fibre optic cable splicing, fibre optic cable mechanical splices, insulation, gauge, current capacity, flexibility etc. used in various electronics products, different input output sockets. (05 Hrs.) 136. Identify suitable connectors, solder/crimp /terminate & test the cable sets. (05 Hrs.) 137. Check the continuity as per the marking on the connector for preparing the cable set. (05 Hrs.) 138. Identify and select various connectors and cables inside the CPU cabinet of PC. (05 Hrs.) 139. Identify the suitable connector and cable to connect a computer with a network switch and prepare a cross over cable	Cable signal diagram conventions Classification of electronic cables as per the application w.r.t. insulation, gauge, current capacity, flexibility etc. Different types of connector & their terminations to the cables. Male / Female type DB connectors. Ethernet 10 Base cross over cables and pin out assignments, UTP and STP, SCTP, TPC, coaxial, types of fibre optical Cables and Cable trays. Different types of connectors Servo 0.1” connectors, FTP, RCA,BNC,HDMI Audio/video connectors like XLR, RCA (phono), 6.3 mm PHONO, 3.5 / 2.5 mm PHONO, BANTAM, SPEAKON, DIN, mini DIN, RF connectors, USB, Fire wire, SATA Connectors, VGA, DVI connectors, MIDI and RJ45,RJ11 etc. (06 Hrs.)

		to connect two network computers. (05 Hrs.)	
Professional Skill 80 Hrs; Professional Knowledge 34 Hrs	Install, configure, interconnect given computer system(s) and demonstrate & utilize application packages for different application. (Mapped NOS: ELE/N4614)	<p>Computer Hardware, OS, MS office and Networking</p> <p>140. Demonstrate various parts of the system unit and motherboard components. (06 Hrs.)</p> <p>141. Identify various computer peripherals and connect it to the system. (04Hrs.)</p> <p>142. Disable certain functionality by disconnecting the concerned cables SATA/PATA. (05 Hrs.)</p> <p>143. Replace the CMOS battery and extend a memory module. (06 Hrs.)</p> <p>144. Test and Replace the SMPS. (05 Hrs.)</p> <p>145. Replace the given DVD and HDD on the system. (06 Hrs.)</p> <p>146. Dismantle and assemble the desktop computer system. (07 Hrs.)</p> <p>147. Boot the system from Different options. (07 Hrs.)</p> <p>148. Install OS in a desktop computer. (05 Hrs.)</p> <p>149. Install a Printer driver software and test for print outs. (05 Hrs.)</p> <p>150. Install antivirus software, scan the system and explore the options in the antivirus software. (05 Hrs.)</p>	<p>Basic blocks of a computer, Components of desktop and motherboard.</p> <p>Hardware and software, I/O devices, and their working.</p> <p>Different types of printers, HDD, DVD.</p> <p>Various ports in the computer.</p> <p>Windows OS</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.</p> <p>Concept of Internet, Browsers, Websites, search engines, email, chatting and messenger service. Downloading the Data and program files etc.</p> <p>Computer Networking:-</p> <p>Network features - Network medias Network topologies, protocols- TCP/IP, UDP, FTP, models and types. Specification and standards, types of cables, UTP, STP, Coaxial cables.</p> <p>Network components like hub, Ethernet switch, router, NIC Cards, connectors, media and firewall.</p> <p>Difference between PC &Server.</p>

		<p>151. Install MS office software. (05 Hrs.)</p> <p>152. Browse search engines, create email accounts, practice sending and receiving of mails and configuration of email clients. (08 Hrs.)</p> <p>153. Prepare terminations, make UTP and STP cable connectors and test. (08 Hrs.)</p> <p>154. Configure a wireless Wi-Fi network. (10 Hrs.)</p>	(34 Hrs.)
<p>Professional Skill 70 Hrs;</p> <p>Professional Knowledge 20 Hrs</p>	<p>Identify, place, solder and desolder and test different SMD discrete components and ICs package with due care and following safety norms using proper tools/setup.</p> <p>(Mapped NOS: ELE/N5102)</p>	<p>Basic SMD (2, 3, 4 terminal components)</p> <p>155. Identification of 2, 3, 4 terminal SMD components. (05 Hrs.)</p> <p>156. De-solder the SMD components from the given PCB. (05 Hrs.)</p> <p>157. Solder the SMD components in the same PCB. (05 Hrs.)</p> <p>158. Check for cold continuity of PCB. (05 Hrs.)</p> <p>159. Identification of loose /dry solder, broken tracks on printed wired assemblies. (05 Hrs.)</p>	<p>Introduction to SMD technology</p> <p>Identification of 2, 3, 4 terminal SMD components.</p> <p>Advantages of SMD components over conventional lead components.</p> <p>Soldering of SM assemblies - Reflow soldering.</p> <p>Tips for selection of hardware, Inspection of SM. (05 Hrs.)</p>
		<p>SMD Soldering and De-soldering</p> <p>160. Identify various connections and setup required for SMD Soldering station. (05 Hrs.)</p> <p>161. Identify crimping tools for various IC packages. (05 Hrs.)</p>	<p>Introduction to Surface Mount Technology (SMT).</p> <p>Advantages, Surface Mount components and packages.</p> <p>Introduction to solder paste (flux).</p> <p>Soldering of SM assemblies, reflow soldering.</p>

		<p>162. Make the necessary settings on SMD soldering station to de-solder various ICs of different packages (at least four) by choosing proper crimping tools. (07 Hrs.)</p> <p>163. Make the necessary settings on SMD soldering station to solder various ICs of different packages (at least four) by choosing proper crimping tools. (8 Hrs.)</p> <p>164. Make the necessary setting rework of defective surface mount component used soldering / de-soldering method. (8 Hrs.)</p>	<p>Tips for selection of hardware, Inspection of SM.</p> <p>Identification of Programmable Gate array (PGA) packages.</p> <p>Specification of various tracks, calculation of track width for different current ratings.</p> <p>Cold/ Continuity check of PCBs.</p> <p>Identification of loose / dry solders, broken tracks on printed wiring assemblies.</p> <p>Introduction to Pick place Machine, Reflow Oven, Preparing stencil,& stencil printer (15 Hrs.)</p>
<p>Professional Skill 20 Hrs;</p> <p>Professional Knowledge 10 Hrs</p>	<p>Rework on PCB after identifying defects from SMD soldering and de-soldering.</p> <p>(Mapped NOS:ELE/N5102)</p>	<p>PCB Rework</p> <p>165. Checked and Repair Printed Circuit Boards single, Double layer and important tests for PCBs. (10 Hrs.)</p> <p>166. Inspect soldered joints, detect the defects and test the PCB for rework. (10Hrs.)</p>	<p>Introduction to Static charges, prevention, handling of static sensitive devices, various standards for ESD.</p> <p>Introduction to non-soldering interconnections.</p> <p>Construction of Printed Circuit Boards (single, Double, multi-layer), Important tests for PCBs.</p> <p>Introduction to rework and repair concepts.</p> <p>Repair of damaged track.</p> <p>Repair of damaged pad and plated through hole.</p> <p>Repair of solder mask. (10 Hrs.)</p>
<p>Professional Skill 30 Hrs;</p>	<p>Construct different electrical control</p>	<p>Protection devices</p> <p>167. Identify different types of</p>	<p>Necessity of fuse, fuse ratings,</p>

Professional Knowledge 10 Hrs	circuits and test for their proper functioning with due care and safety. ELE/N9406	<p>fuses along with fuse holders, overload (no volt coil), current adjust (Biometric strips to set the current). (06 Hrs.)</p> <p>168. Test the given MCBs. (03 Hrs.)</p> <p>169. Connect an ELCB and test the leakage of an electrical motor control circuit. (05 Hrs.)</p>	<p>types of fuses, fuse bases. Single/ three phase MCBs, single phase ELCBs.</p> <p>Types of contactors, relays and working voltages.</p> <p>Contact currents, protection to contactors and high current applications. (05 Hrs.)</p>
		<p>170. Test DC motor and its operating voltage. (03 Hrs.)</p> <p>171. Test DC motor control signal. (03 Hrs.)</p> <p>172. Test various Low potential motors. (03 Hrs.)</p> <p>Stepper Motor</p> <p>173. Test stepper motor. (03 Hrs.)</p> <p>174. Demonstrate working process of stepper motor in various Equipment. (04 Hrs.)</p>	<p>1.LOW VOLTAGE DC MOTOR (Low Potential motor)</p> <p>Introduction of DC motor.</p> <p>Types of DC motor .Types of DC motor controller.</p> <p>DC Motor power.</p> <p>Types of DC Motor power regulation.</p> <p>Application area of DC motor controller.</p> <p>2.What is a Stepper motor and its types.</p> <p>Stepper Motor working Principal.</p> <p>How to select a stepper motor</p> <p>Types of wiring of stepper motor. Stepper motor control By varying clock pulses.</p> <p>Advantage of stepper motor. (05 Hrs.)</p>
Professional Skill 60 Hrs; Professional Knowledge 15 Hrs	Assemble and test a commercial AM/ FM receiver and evaluate performance. ELE/N9407	Communication electronics	
		<p>175. Modulate and Demodulate various signals using AM and FM on the trainer kit and observe waveforms. (08 Hrs.)</p> <p>176. Test IC based AM Receiver (08 Hrs.)</p>	<p>Radio Wave Propagation – principle, fading.</p> <p>Need for Modulation, types of modulation and demodulation.</p> <p>Fundamentals of Antenna, various parameters, types of Antennas & application.</p> <p>Introduction to AM, FM & PM,</p>

		<p>177. Test IC based FM transmitter. (06 Hrs.)</p> <p>178. Test IC based AM transmitter and test the transmitter power. Calculate the modulation index. (08 Hrs.)</p> <p>179. Dismantle the given FM receiver set and identify different stages (AM section, audio amplifier section etc). (10 Hrs.)</p> <p>180. Modulate two signals using AM kit draw the way from and calculate percent (%) of modulation. (10 Hrs.)</p> <p>181. Modulate and Demodulate a signal using PAM, PPM, PWM Techniques. (10 Hrs.)</p>	<p>SSB-SC & DSB-SC.</p> <p>Block diagram of AM and FM transmitter.</p> <p>FM Generation & Detection.</p> <p>Digital modulation and demodulation techniques, sampling, quantization & encoding.</p> <p>Concept of multiplexing and demultiplexing of AM/ FM/ PAM/ PPM /PWM signals.</p> <p>A simple block diagram approach to be adopted for explaining the above mod/demod techniques.</p> <p>(15 Hrs.)</p>
<p>Professional Skill 60 Hrs;</p> <p>Professional Knowledge 15 Hrs</p>	<p>Test, service and troubleshoot the various components of different domestic/ industrial programmable systems.</p> <p>ELE/N9407</p>	<p>Microcontroller (8051)</p> <p>182. Identify various ICs & their functions on the given Microcontroller Kit. (07 Hrs.)</p> <p>183. Identify the address range of RAM & ROM. (07 Hrs.)</p> <p>184. Measure the crystal frequency, connect it to the controller. (07 Hrs.)</p> <p>185. Identify the port pins of the controller & configure the ports for Input & Output operation. (07 Hrs.)</p> <p>186. Use 8051 microcontroller, connect 8 LED to the port, blink the LED with a switch. (08 Hrs.)</p>	<p>Introduction Microprocessor & 8051Microcontroller, architecture, pin details & the bus system.</p> <p>Function of different ICs used in the Microcontroller Kit.</p> <p>Differentiate microcontroller with microprocessor.</p> <p>Interfacing of memory to the microcontroller.</p> <p>Internal hardware resources of microcontroller.</p> <p>I/O port pin configuration.</p> <p>Different variants of 8051 & their resources.</p> <p>Register banks & their functioning. SFRs & their configuration for different</p>

		<p>187. Perform the initialization, load & turn on a LED with delay using Timer. (08 Hrs.)</p> <p>188. Perform the use of a Timer as an Event counter to count external events. (08 Hrs.)</p> <p>189. Demonstrate entering of simple programs, execute & monitor the results. (08 Hrs.)</p>	<p>applications.</p> <p>Comparative study of 8051 with 8052.</p> <p>Introduction to PIC Architecture. (15 Hrs.)</p>
<p>Professional Skill 60 Hrs;</p> <p>Professional Knowledge 15 Hrs</p>	<p>Execute the operation of different sensors, identify, wire & test various transducers of IOT Applications ELE/N9408</p>	<p>Sensors, Transducers used in IOT Applications</p> <p>190. Identify sensors used in process industries such as RTDs, Temperature ICs, Thermocouples, proximity switches (inductive, capacitive and photo electric), load cells, strain gauge. LVDT PT 100 (platinum resistance sensor), water level sensor, thermostat float switch, float valve by their appearance. (15 Hrs.)</p> <p>191. Measure temperature of a lit fire using a Thermocouple and record the readings referring to data chart. (10 Hrs.)</p> <p>192. Measure temperature of a lit fire using RTD and record the readings referring to data. (10 Hrs.)</p> <p>193. Measure the DC voltage of a LVDT. (10 Hrs.)</p> <p>194. Detect different objectives using</p>	<p>Basics of passive and active transducers.</p> <p>Role, selection and characteristics.</p> <p>Sensor voltage and current formats.</p> <p>Thermistors/ Thermocouples - Basic principle, salient features, operating range, composition, advantages and disadvantages.</p> <p>Strain gauges/ Load cell – principle, gauge factor, types of strain gauges.</p> <p>Inductive/ capacitive transducers - Principle of operation, advantages and disadvantages.</p> <p>Principle of operation of LVDT, advantages and disadvantages.</p> <p>Proximity sensors – applications, working principles of eddy current, capacitive and inductive proximity sensors. (15 Hrs.)</p>

		capacitive, inductive and photoelectric proximity sensors. (15 Hrs.)	
Professional Skill 20 Hrs.; Professional Knowledge 06 Hrs.	Identify different IoT Applications with IoT architecture. ELE/N9409	<p>195. Connect and test microcontroller to computer and execute sample programs (04hrs.)</p> <p>196. Upload computer code to the physical board (Microcontroller) to blink a simple LED. (02hrs.)</p> <p>197. Write and upload computer code to the physical Micro controller to sound buzzer. (02hrs.)</p> <p>198. Circuit and program to Interface light sensor – LDR with Microcontroller to switch ON/OFF LED based on light intensity. (03hrs.)</p> <p>199. Set up & test circuit to interface potentiometer with Microcontroller and map to digital values for e.g. 0-1023. (03hrs.)</p>	<p>Introduction to Internet of Things applications environment, smart street light and smart water & waste management.</p> <p>What is an IOT? What makes embedded system an IOT? Role and scope of IOT in present and future marketplace.</p> <p>Smart objects, Wired – Cables, hubs etc. Wireless – RFID, WiFi, Bluetooth etc.</p> <p>Different functional building blocks of IOT architecture. (06 hrs.)</p>
Professional Skill 90 Hrs; Professional Knowledge 18 Hrs	<p>Plan and carry out the selection of a project, assemble the project and evaluate performance for a domestic/commercial applications.</p> <p>(Mapped NOS: ELE/N9802)</p>	<p>Analog IC Applications</p> <p>Make simple projects/ Applications using ICs 741, 723, 555, 7106, 7107</p> <p>Sample projects:</p> <ul style="list-style-type: none"> • Laptop protector • Mobile cell phone charger • Battery monitor • Metal detector • Mains detector • Lead acid battery charger • Smoke detector • Solar charger 	<p>Discussion on the identified projects with respect to data of the concerned ICs.</p> <p>Components used in the project. (09 Hrs.)</p>

		<ul style="list-style-type: none"> • Emergency light • Water level controller • Door watcher <p>(Instructor will pick up any five of the projects for implementation) (45 Hrs.)</p>	
		<p>Digital IC Applications</p> <p>Make simple projects/Applications using various digital ICs (digital display, event counter, stepper motor driver etc)</p> <ul style="list-style-type: none"> • Duty cycle selector • Frequency Multiplier • Digital Mains Resumption Alarm • Digital Lucky Random number generator • Dancing LEDs • Count down timer • Clap switch • Stepper motor control • Digital clock • Event counter • Remote jammer <p>(Instructor will pick up any five of the projects for implementation) (45 Hrs.)</p>	<p>Discussion on the identified projects with respect to data of the concerned ICs.</p> <p>Components used in the project.</p> <p>(09 Hrs.)</p>
<p>Professional Skill 15 Hrs;</p> <p>Professional Knowledge 05 Hrs</p>	<p>Prepare fibre optic setup and execute transmission and reception.</p> <p>ELE/N9409</p>	<p>Fiber optic communication</p> <p>200. Identify the resources and their need on the given fiber optic trainer kit. (02 Hrs.)</p> <p>201. Make optical fiber setup to transmit and receive analog and digital data. (02 Hrs.)</p> <p>202. Set up the OFC trainer kit</p>	<p>Introduction to optical fiber, optical connection and various types optical amplifier, its advantages, properties of optical fiber, testing, losses, types of fiber optic cables and specifications.</p> <p>Encoding of light.</p> <p>Fiber optic joints, splicing,</p>

		<p>to study AM, FM, PWM modulation and demodulation. (02 Hrs.)</p> <p>203. Perform FM modulation and demodulation using OFC trainer kit using audio signal and voice link. (03 Hrs.)</p> <p>204. Perform PWM modulation and demodulation using OFC trainer kit using audio signal and voice link. (03 Hrs.)</p> <p>205. Perform PPM modulation and demodulation using OFC trainer kit using audio signal and voice link. (03 Hrs.)</p>	<p>testing and the related equipment/ measuring tools. Precautions and safety aspects while handling optical cables. (05 Hrs.)</p>
<p>Professional Skill 35 Hrs;</p> <p>Professional Knowledge 05 Hrs</p>	<p>Plan and Interface the LCD, LED DPM panels to various circuits and evaluate performance. ELE/N3102</p>	<p>Digital panel Meter</p> <p>206. Identify LED Display module and its decoder/driver ICs. (05 Hrs.)</p> <p>207. Display a word on a two line LED. (06 Hrs.)</p> <p>208. Measure/current flowing through a resistor and display it on LED Module. (06 Hrs.)</p> <p>209. Measure/current flowing through a sensor and display it on a LED module (DPM). (06 Hrs.)</p> <p>210. Identify LCD Display module and its decoder/driver ICs. (06 Hrs.)</p> <p>211. Measure/current flowing through a resistor and display it. (06 Hrs.)</p>	<p>Different types of seven segment displays, decoders and driver ICs. Concept of multiplexing and its advantages. Block diagrams of 7106 and 7107 and their configuration for different measurements. Use of DPM with seven segment display. Principles of working of LCD. Different sizes of LCDs. Decoder/ driver ICs used with LCDs and their pin diagrams. Use of DPM with LCD to display different voltage & current signals. (05 Hrs.)</p>

<p>Professional Skill 120 Hrs; Professional Knowledge 40 Hrs</p>	<p>Detect the faults and troubleshoot SMPS, UPS and inverter. (Mapped NOS: ELE/N7202)</p>	<p>SMPS and Inverter</p> <p>212. Identify the components/devices and draw their corresponding symbols. (03 Hrs.)</p> <p>213. Dismantle the given stabilizer and find major sections/ ICs components. (06 Hrs.)</p> <p>214. List the defect and symptom in the faulty SMPS. (05 Hrs.)</p> <p>215. Measure / Monitor major test points of computer SMPS. (07 Hrs.)</p> <p>216. Troubleshoot the fault in the given SMPS unit. Rectify the defect and verify the output with load. Record your procedure followed for trouble shooting the defects. (08 Hrs.)</p> <p>217. Use SMPS used in TVs and PCs for Practice. (05 Hrs.)</p> <p>218. Install and test the SMPS in PC. (05 Hrs.)</p> <p>219. Install and test an inverter. (05 Hrs.)</p> <p>220. Troubleshoot the fault in the given inverter unit. Rectify the defects and verify the output with load. (08 Hrs.)</p> <p>221. Construct and test IC Based DC-DC converter for different voltages. (08 Hrs.)</p> <p>222. Construct and test a switching step down</p>	<p>Concept and block diagram of manual, automatic and servo voltage stabilizer, o/p voltage adjustment.</p> <p>Voltage cut-off systems, relays used in stabilizer.</p> <p>Block Diagram of different types of Switch mode power supplies and their working principles.</p> <p>Inverter; principle of operation, block diagram, power rating, change over period.</p> <p>Installation of inverters, protection circuits used in inverters.</p> <p>Battery level, overload, over charging etc.</p> <p>Various faults and its rectification in inverter.</p> <p>Block diagram of DC-DC converters and their working principals.</p> <p>(20 Hrs.)</p>
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		<p>regulator using LM2576. (08 Hrs.)</p> <p>223. Construct and test a switching step up regulator using MC 34063. (08 Hrs.)</p>	
		<p>UPS</p> <p>224. Connect battery stack to the UPS. (07 Hrs.)</p> <p>225. Identify front panel control & indicators of UPS. (05 Hrs.)</p> <p>226. Connect Battery & load to UPS & test on battery mode. (06 Hrs.)</p> <p>227. Open top cover of a UPS; identify its isolator transformers, the UPS transformer and various circuit boards in UPS. (08 Hrs.)</p> <p>228. Identify the various test point and verify the voltages on these. (05 Hrs.)</p> <p>229. Identify various circuit boards in UPS and monitor voltages at various test points. (05 Hrs.)</p> <p>230. Perform load test to measure backup time. (08 Hrs.)</p>	<p>Concept of Uninterrupted power supply.</p> <p>Difference between Inverters and UPS.</p> <p>Basic block diagram of UPS & operating principle.</p> <p>Types of UPS : Off line UPS, On line UPS, Line interactive UPS & their comparison</p> <p>UPS specifications. Load power factor & types of indications & protections</p> <p>Installation of single phase & UPS. (20 Hrs.)</p>
<p>Professional Skill 60 Hrs;</p> <p>Professional Knowledge 15 Hrs</p>	<p>Identify, Test and verify characteristics of Photovoltaic cells, Modules, Batteries and Charge controllers. Install a</p>	<p>1. Identify and Test an LED and a Photodiode to verify the photo emitting effect and light sensitivity. (04 hrs)</p> <p>2. Test a Photo voltaic cell for different illumination levels and verify photovoltaic</p>	<p>Semiconductor properties and types. P-type and N-type semiconductors, PN junction, etc.</p> <p>Conversion of solar radiation to electricity.</p>

solar panel, execute testing and evaluate performance by connecting the panel to the inverter. (Mapped NOS: ELE/N5902)	<p>property. (04 hrs)</p> <p>3. Plot I-V curve for photovoltaic cell based on the illumination at constant temperature. (04hrs)</p> <p>4. Plot I-V curve for photovoltaic cell based on temperature at constant illumination. (04 hrs)</p> <p>5. Test photovoltaic cell in sunlight at various angles of inclination and direction. (04 hrs)</p>	<p>Main materials used to develop solar cells (Silicon, Cadmium tellurides, etc.)</p> <p>Light sensitive properties of PN junction.</p> <p>Difference of photo electric and photo voltaic effects of a PN junction.</p> <p>PV cell characteristics, I–V curve, effects of temperature.</p> <p>Photovoltaic effect.</p> <p>Photo voltaic module: minimal functional specification, cells per module, max watts per module, maximum voltage at max power, maximum current at max power. (05)</p>
	<p>Solar Power (Renewable Energy System)</p> <p>231. Wire a solar controller to a battery storage station. (08 Hrs.)</p> <p>232. Connect storage batteries to a power inverter. (08Hrs.)</p> <p>233. Connect and test solar panel to the Inverter and run the load. (08Hrs.)</p> <p>234. Install a solar power to charge a rechargeable 12 V DC battery and find out the charging time. (08 Hrs.)</p> <p>235. Install a Solar Inverter. (08 Hrs.)</p>	<p>Need for renewable energy sources, Solar energy as a renewable resource.</p> <p>Materials used for solar cells.</p> <p>Principles of conversion of solar light into electricity.</p> <p>Basics of photovoltaic’s cell.</p> <p>Module, panel and Arrays.</p> <p>Factors that influence the output of a PV module.</p> <p>SPV systems and the key benefits. Difference between SPV and conventional power.</p> <p>Solar charge controller or regulator and its role.</p> <p>Safety precautions while working with solar systems. (10 Hrs.)</p>

<p>Professional Skill 30 Hrs; Professional Knowledge 10 Hrs</p>	<p>Dismantle, identify the various parts and interface of a cell phone to a PC. Estimate and troubleshoot.</p> <p>(Mapped NOS: ELE/N8107)</p>	<p>Cell phones</p> <p>236. Dismantle, identify the parts and assemble different types of smart phones. (04 Hrs.)</p> <p>237. Dismantle the cell phone/smart phone remove the key pad and clean it, test for the continuity of the matrix/tracks. (04 Hrs.)</p> <p>238. Interface the cell phone/smart phone to the PC and transfer the data card. (03 Hrs.)</p> <p>239. Flash the various brands of cell phone/smart phone (at least 3). (03 Hrs.)</p> <p>240. Format the cell phone/ smart phone for virus (approach the mobile repair shop/ service centre). (04 Hrs.)</p> <p>241. Perform the interfacing of cell phone/smart phone to the PC and dismantle the cell phone and identify the power section and test its healthiness. (04 Hrs.)</p> <p>242. Find out the fault of basic cell phone system. Rectify the fault in ringer section and check the performance. (04 Hrs.)</p> <p>243. Replace various faulty parts like mic, speaker, data/ charging/ audio jack etc. (04 Hrs.)</p>	<p>Introduction to mobile communication.</p> <p>Concept cell site, hand off, frequency reuse, block diagram and working of cell phones, cell phone features.</p> <p>GSM and CDMA technology.</p> <p>Use IEMI number to trace lost/misplaced mobile phone.</p> <p>(10 Hrs.)</p>
<p>Professional</p>	<p>Check the various</p>	<p>LED Lights</p>	

<p>Skill 15 Hrs; Professional Knowledge 05 Hrs</p>	<p>parts of a LED lights & stacks and troubleshoot. (Mapped NOS: ELE/N9302)</p>	<p>244. Dismantle the LED light, identify the connections of LEDs stacks, protection circuits, regulator. (03 Hrs.) 245. Identify the rectifier, controller part of LED lights. (03 Hrs.) 246. Make series string connection of six LED's and connect four Series strings in parallel. (03 Hrs.) 247. Connect to such parallel sets in Series to create a matrix of LED's. (03 Hrs.) 248. Apply suitable voltage and check Voltage across series strings. (03 Hrs.)</p>	<p>Types of LED panels used in various lighting applications. Stacking of LEDs. Driving of LED stacks. (05 Hrs.)</p>
<p>Professional Skill 50 Hrs; Professional Knowledge 15 Hrs</p>	<p>Identify, operate various controls, troubleshoot and replace modules of the LCD/LED TV & its remote. (Mapped NOS: ELE/N3102)</p>	<p>LCD and LED TV 249. Identify and operate different Controls on LCD, LED TV. (05 Hrs.) 250. Identify components and different sectors of LCD and LED TV. (05 Hrs.) 251. Dismantle; Identify the parts of the remote control. (05 Hrs.) 252. Dismantle the given LCD/LED TV to find faults with input stages through connectors. (05 Hrs.) 253. Detect the defect in a LED/LCD TV receiver given to you. Rectify the fault. (10 Hrs.) 254. Troubleshoot the faults in the given LED/LCD TV receiver. Locate and</p>	<p>Difference between a conventional CTV with LCD & LED TVs. Principle of LCD and LED TV and function of its different section. Basic principle and working of 3D TV. IPS panels and their features. Different types of interfaces like HDMI, USB, RGB etc. TV Remote Control –Types, parts and functions, IR Code transmitter and IR Code Receiver. Working principle, operation of remote control. Different adjustments, general faults in Remote Control. (15 Hrs.)</p>

		<p>rectify the faults. (10 Hrs.)</p> <p>255. Test LED/LCD TV after troubleshooting the defects. (05 Hrs.)</p> <p>256. Identify various connectors and connect the cable operators external decoder (set top box) to the TV. (05 Hrs.)</p>	
ENGINEERING DRAWING: 40 Hrs.			
Professional Knowledge ED 40 Hrs	Read and apply engineering drawing for different application in the field of work. CSC/N9401	<p><u>ENGINEERING DRAWING:</u></p> <ul style="list-style-type: none"> • Reading of Electronics Sign and Symbols. • Sketches of Electronics components. • Reading of Electronics wiring diagram and Layout diagram. • Drawing of Electronics circuit diagram. <p>Drawing of Block diagram of Instruments & equipment of trades.</p>	
WORKSHOP CALCULATION & SCIENCE: 16 Hrs			
Professional Knowledge WCS 16 Hrs	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. CSC/N9402	<p><u>WORKSHOP CALCULATION & SCIENCE:</u></p> <p>Algebra, Addition, Subtraction, Multiplication & Divisions. Algebra – Theory of indices, Algebraic formula, related problems.</p> <p>Estimation and Costing Simple estimation of the requirement of material etc., as applicable to the trade. Problems on estimation and costing.</p>	
<p>Project work / Industrial visit</p> <p>Broad areas:</p> <ol style="list-style-type: none"> a) Remote control for home appliances b) Solar power inverter c) Musical light chaser d) 7 segment LED display decoder drive circuit 			