Syllabus on Vocational Education and Training Course (VTC)

Paper Title	**: Electrical -I**
CODE	**: VTC: 242.2**
Number of Credits	**: 4**
Semester	**: III**
No. of Theory Hours Per Week	**: One (1 hour)**
No. of Practical Hours per Week	**: Three (3 Hours)**

Outline of the Paper:

Type of Course	Units in the VTC	Hours	Credits	Total Marks	Distribution of Marks (as per OC-8)			
					In-Semester		End-Semester	
					Theory	Practical	Theory	Practical
Electrical - I	Unit-I Theory (25 Marks)	15	4	100	25			
	Unit-II to IV Theory (75 Marks)	90				15		60

Marks Distribution	**: Internal Assessment: 40** **: External Assessment: 60**
Course Objectives	**1.** To enable students to describe the electrical safety tools and electrical symbols. **2.** To enable students to explain the concepts of electrical network elements and associated laws of electrical circuits **3.** To enable students to detect the fundamental skills for fault detection, repairing of electrical equipment and PCB circuit design.
Course Learning Outcome	At the end of the course students will be able to: 1. explain the concepts of electrical circuits. 2. demonstrate of working & operating principles of electronic circuits & equipment. 3. make use of skills related to fault analysis and diagnosis of electronic equipment, repair & replacement of faulty parts. 4. examine schematic layouts wiring diagrams and product details. 5. apply safety precautions and knowledge of entrepreneurship activities.
Unit I: (Theory) **15 Hours**	• **Basics of Electrical:** Electrical Symbols, Electrical safety, Tool Kit, Basic Electrical Terms, Basic Networks; • **Electrical Laws:** Ohm's law, effect of temperature on resistance, resistance temperature coefficient, insulation resistance, Kirchhoff's law, ideal and practical voltage and current sources; • **Electrical Components:** Passive Components, Active Components, PCB and Soldering; • **Electrostatics:** Electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance, composite dielectric

	capacitors, capacitors in series and parallel, energy stored in capacitors, charging and discharging of capacitors and concept of time constant.
UNIT-II: (Practical) 30 Hours	• Prepare drawing sheet of electrical symbols • Prepare drawing sheet of tools used in the electronics lab. • Enlist the Safety precautions to be taken in the Electronics Laboratory.
UNIT-III: (Practical) 30 Hours	• Verification of Ohm's Law. • Verification of Kirchhoff's Current Law and Voltage Law. • Enlist different voltage sources in the laboratory and note their specifications.
UNIT-IV: (Practical) 30 Hours	• Prepare drawing sheet of Active and passive components. • Identification and testing of Active and Passive components • Familiarization and use of Ammeter, Voltmeter and Multimeter • Prepare layout and PCB of simple circuit like bridge rectifier.
Suggested Readings	1. Fitzgerald, E. Arvin Grabel, David E. Higginbotham, Textbook of Basic Electrical Engineering, TMH Publishing Co. 2. Kothari, D P I J Nagrath, Basic Electrical Engineering, TMH Publishing Co. Ltd. References: 3. Mehta K Rohit Mehta, Basic electronics, S. Chand & Co. 4. Patel, A Textbook of Elements of Electrical Engineering, Mahajan Publishing House, Ahmedabad. 5. Theraja,B. L. A.K. Theraja, Textbook of Electrical Technology, Volume I, S. Chand Co.
Requirements	• Multimeter- Analog and Digital • Cathode Ray Oscilloscope (CRO) • Function Generator • Soldering Iron- 25 to 50 Watts • Solder Wire, Flux Bread Board • DC Power Supply Variable Type-1-30 V • Hook Up Wires • Soldering Station • Long Nose Pliers, Tweezers • Screw Driver set (various size) • Wires Stripper • Crocodile Clip • Capacitance Bridge Meter • Desoldering Pump, • Wick for removing solder

	• Wheat Stone Bridge Meter • **Any other item as and when required**
Qualified Instructors	• Instructors with experience in Electrical Repairing and teaching. • Certifications or relevant qualifications in Electrical Repairing

Paper Title	**: Electrical -II**

CODE	**: VTC: 262.2**
Number of Credits	**: 4**
Semester	**: IV**
No. of Theory Hours Per Week	**: One (1 hour)**
No. of Practical Hours per Week	**: Three (3 Hours)**

Outline of the Paper:

Type of Course	Units in the VTC	Hours	Credits	Total Marks	Distribution of Marks (as per OC-8)			
					In-Semester		End-Semester	
					Theory	Practical	Theory	Practical
Electrical II	Unit-I Theory (25 Marks)	15	4	100	25			
	Unit-II to IV Theory (75 Marks)	90				15		60

Marks Distribution	**: Internal Assessment: 40** **: External Assessment: 60**
Course Objectives	**1.** To explain to students the knowledge and skills necessary to understand the magnetic circuits with basic laws. **2.** To analyze the fundamentals of DC and AC electrical circuits. **3.** To describe the knowledge of single phase and poly phase AC circuits with various possible connections of electrical components. **4.** To demonstrate the uses of switches, relays, connectors, IC's and measuring instruments.
Course Learning Outcome	At the end of the course students are able to: 1. explain the foundation regarding electrical and magnetic circuits and the associated laws of it 2. apply nodal analysis, mesh analysis and source transformation in electrical circuit 3. describe the fundamentals of single phase and poly phase AC circuits with the concept of resonance, impedance and admittance 4. analyze various switches, relays, connectors and pin configuration of IC's 5. demonstrate how to handle PMMC Galvanometer, Ammeter and Voltmeter
Unit I: (Theory) **15 Hours**	• **Magnetism and Electromagnetism:** Magnetic effect of electrical current cross and dot convention, right hand thumb rule and cork screw rule, nature of magnetic field of long straight conductor, concepts of solenoid and torrid, Concepts of MMF, flux, flux density, reluctance, permeability and field strength, their units and relationship, Simple series and parallel magnetic circuits, Fleming's left hand rule, Faraday's law; • **D. C. Circuits:** Mesh and Nodal analysis (Super node and

	super mesh excluded, Source transformation, Star delta transformation; • **Single phase AC Circuits:** Sinusoidal voltage and currents, Rectangular and polar representation of phasors., Study of A.C circuits of pure resistance, inductance and capacitance and corresponding voltage-current phasor diagrams, voltage- current and power waveforms, Study of series and parallel R-L, R-C, R-L-C circuits, concept of impedance and admittance for different combinations, wave form and relevant voltage current phasor diagrams, Concept of active, reactive, apparent, complex power and power factor, resonance in series and parallel RLC circuit, Q-factor and bandwidth; • **Polyphase AC circuits:** Concept of three phase supply and phase sequence, Balanced and unbalanced loads voltage current and power relations in three phase balance star and delta loads and their phasor diagrams.
UNIT-II: (Practical) 30 Hours	• Study of different types of Switches, Relays and Connectors. • Identify and draw Pin Configuration of IC's 555,741, 74XX, etc. • Study charging and discharging of capacitor through resistor.
UNIT-III: (Practical) 30 Hours	• Study of series and parallel resistive circuits. • Demonstrate solenoid as Electro-magnet. • Prepare chart for typical sinusoidal waves for Amplitude, frequency, time period, Peak value, Average value, RMS value.
UNIT-IV: (Practical) 30 Hours	• Study of PMMC galvanometer • Conversion of PMMC into Ammeter • Conversion of PMMC into Voltmeter. • Project, Industrial Visit
Suggested Readings	1. Robert T. Paynter, Introducing Electronic Devices & Circuit, Pearson Education. 2. Salivahanan,S. N. Suresh Kr., A. Vallavara, Electronic Devices & Circuit, Tata McGraw Hill. Reference Books: 3. Singh, S.N. Basic Electrical Engineering, PHI. 4. Uppal,S.L. and G.C. Garg, Electrical Wiring Estimating & Costing, Khanna Publishers. 5. William Hayt, Engineering Circuit Analysis, TMH. 2. Electronic Devices and Circuits- McGraw Hill Millman, Halkias and Jit
Requirements	• Multimeter- Analog and Digital • Cathode Ray Oscilloscope (CRO)

	• Function Generator • Soldering Iron- 25 to 50 Watts • Solder Wire, Flux Bread Board • DC Power Supply Variable Type-1-30 V • Hook Up Wires • Soldering Station • Long Nose Pliers, Tweezers • Screw Driver set (various size) • Wires Stripper • Crocodile Clip • Capacitance Bridge Meter • Desoldering Pump, • Wick for removing solder • Wheat Stone Bridge Meter • IC Testers • PMMC Galvanometer • Heat sink • Magnifying Glass or Microscope • **Any other item as and when required**
Qualified Instructors	• Instructors with experience in Electrical Repairing and teaching. • Certifications or relevant qualifications in Electrical Repairing

Paper Title	**: Electrical -III**
CODE	**: VTC: 362.2**
Number of Credits	**: 4**
Semester	**:VI**
No. of Theory Hours Per Week	**: One (1 hour)**
No. of Practical Hours per Week	**: Three (3 Hours)**

Outline of the Paper:

Type of Course	Units in the VTC	Hours	Credits	Total Marks	Distribution of Marks (as per OC-8)			
					In-Semester		End-Semester	
Electrical III					Theory	Practical	Theory	Practical
	Unit-I Theory (25 Marks)	15			25			
	Unit-II to IV Theory (75 Marks)	90	4	100		15		60

Marks Distribution	**: Internal Assessment: 40** **: External Assessment: 60**
Course Objectives	**1.** To describe the fundamentals of semiconductors, diodes, rectifiers and filters. **2.** To explore the details of various types of amplifiers and oscillators. **3.** To analyze the application of diodes in electronics circuits. **4.** To explain the knowledge regarding different configurations of transistors. **5.** To develop skills for performing the project works and industrial visit.
Course Learning Outcome	At the end of the course students are able to: 1. identify semiconductors, diodes and its application on electronic circuits 2. explain the concepts of amplifiers and oscillators 3. apply the knowledge of voltage regulators in ICs 4. design and analyze various configurations of transistors.
Unit I: (Theory) 15 Hours	• **Semiconductors:** Atomic structure, Semiconducting material; Special semiconductor diodes: P-N Junction, Special Diodes; • **Power Supplies:** Rectifiers, Filters, Characteristics, Regulators; • **Amplifiers:** Transistor, Amplifiers, Multistage amplifiers, Feed backs in Amplifier, Differential Amplifier; • **Oscillators:** Basic of oscillator, LC oscillator, RC oscillator, Crystal
UNIT-II: (Practical) 30 Hours	• Identification of different types of diodes (LED, PHOTO, PN-junction, ZENER, etc) • Testing of diode using analog and digital multimeter. • Study of V-I characteristics of PN junction diode. • Construct and test Halfwave or Fullwave rectifier.

	• Construct and test Bridge rectifier
UNIT-III: (Practical) 30 Hours	• Study of LC filter and its ripple factor. • Find Line and Load regulation of unregulated power supply. • Construct and test Zener diode as voltage regulator. • Study of Fixed voltage regulator (using IC-7805/7809/7912 etc) • Identification of different types of transistors (UJT, BJT, FET, Power)
UNIT-IV: (Practical) 30 Hours	• Study input characteristics of CE transistor configuration. • Study output characteristics of CE transistor configuration. • Construct Hartley or Colpitt's oscillator using transistor. • Construct phase shift oscillator using transistor. • Project, Industrial Visit
Suggested Readings	1. Halkias, Millman, Electronic Devices and Circuits, McGraw Hill 2. Hayt, William Engineering Circuit Analysis, TMH. 3. Paynter,Robert T. Introducing Electronic Devices & Circuit, Pearson Education. 4. M. L Anwani, Electrical Motor Winding & Repair, R. B. Publications 4. Salivahanan, S. N. Suresh Kr., A. Vallavara, Electronic Devices & Circuit, Tata McGraw Hill. 5. Singh, S.N. Basic Electrical Engineering, PHI 6. Uppal S.L. and G.C. Garg, Electrical Wiring Estimating & Costing, Khanna Publishers.
Requirements	• Multimeter- Analog and Digital • Cathode Ray Oscilloscope (CRO) • Function Generator • Soldering Iron- 25 to 50 Watts • Solder Wire, Flux Bread Board • DC Power Supply Variable Type-1-30 V • Hook Up Wires • Soldering Station • Long Nose Pliers, Tweezers • Screw Driver set (various size) • Wires Stripper • Assorted Electronic Components: Diodes: PN-junction, Zener, LED, Photo diode; Transistors: UJT, BJT, FET, power transistors.; Resistors, Capacitors, Inductors: Various values for constructing filters and regulators; IC Voltage Regulators: 7805, 7809, 7912, etc. Oscillator Components: Inductors, capacitors, transistors for Hartley and Colpitt's oscillators. • Crocodile Clip • Capacitance Bridge Meter • Desoldering Pump, Wick for removing solder • Wheat Stone Bridge Meter

	• IC Testers • PMMC Galvanometer • Heat sink • Magnifying Glass or Microscope • **Any other item as and when required**
Qualified Instructors	• Instructors with experience in Electrical Repairing and teaching. • Certifications or relevant qualifications in Electrical Repairing