ITE EDUCATION SERVICES PTE LTD
(Subsidiary of Institute of Technical Education)
(RCB No: 200300585W)

Electronic Project Construction & Troubleshooting Course

Course Outline

1. **Common Electrical and Electronic Components and their uses**
   - Resistors, Capacitors, Inductors, Switches, Fuses, Mains plug, Loudspeakers, Cables
   - Resistor Colour Code, Reading Resistor and Capacitor values
   - Types of switches and their connections
   - Ohm's Law – series and parallel connections

2. **Semiconductors**
   - Semiconductors and PN junction
   - Forward and reverse bias
   - Junction diode, zener diode, LED and their uses

3. **AC and DC values**
   - AC waveform
   - Peak, peak-peak, average and RMS values
   - Calculation of above values

4. **Rectification and Power supply**
   - Half Wave, Full Wave and Bridge connection
   - Capacitor filter
   - IC regulators eg LM7805 and LM317

5. **Transistors**
   - PNP and NPN transistors
   - Biasing of transistor circuits
   - Common emitter, common collector and common base connections
   - Simple gain calculations
   - Simple analysis of a common emitter amplifier

6. **SCRs , Triacs and Diacs, Photoelectric devices**
   - Brief introduction of above components and their uses

7. **Operational Amplifiers**
   - Brief Introduction

- Inverting, Non-inverting and Voltage follower
- Typical IC Op-Amp – LM741

8. 555 Timer IC
- Typical IC layout and circuit
- Uses of the IC timer

9. Digital Circuits
- Simple Boolean Algebra – And, Or, Not, Nand and Nor
- Logic Diagrams and Truth Tables
- Typical IC and their diagrams
- Other logic circuits like Flip-flops and simple counter/decoder circuits.

Practical Assignment and Exercise

1) Familiarisation and use of tools and equipment
- Tools- Soldering Iron, Iron stand, Desoldering Tool, diagonal cutter, long nose plier , test pen, strip board (veroboard) cutter, bench drill, bench vice, files , etc
- Equipment – DC Power Supply, Analogue Multimeter, Digital Multimeter, Function generator, Analogue Oscilloscope, etc

2) Reading of Resistor and Capacitor values
- Connection of series and parallel circuits and their measurements
- Ohm's Law – Resistance, Current and Voltage – Reading resistance, current and voltage
- Use of DC power supply, analogue and digital multimeters

3. Reading of Capacitor values

4. Soldering practice exercises using wires and on strip board.
- Reading of circuit drawings (including data sheets) and soldering connections to strip board
- Identify components and Plan layout of components and wires (20 to 25 components)
- Check for accurate and correct connection and quality of solder joints

5. Using function generator and oscilloscope
- Familiarise with the various controls
- Adjustment and calibration for measurement
- Observation of sine, triangle and square waveform
- Measurement of peak and peak-peak voltage
- Measurement of period and frequency
- Measuring a circuit under test (eg half-wave and bridge rectifier circuits)

6. Reading and testing of diodes and transistors, including LEDs (normal and 7-segment)

- Measurement of transistor voltages wrt ground using multimeter
- Applying input signal and observe input and output waveforms
- Measure the peak and peak-peak values

7. Simple logic experiments

- AND, OR, NOT, NAND and NOR gates
- Logic levels
- Reading digital IC pin layout

8. Project Construction eg

- Common emitter amplifier (1 or 2 stages)
- Simple dc power supply
- Logic Probe
- 7-segment display
- 555 timer circuit
- combination of above circuits

9. Troubleshooting of electronic circuits (25 to 50 components)

- use the theory knowledge and practical skills to understand the function of the circuit and circuit components
- reading the circuit from the PCB side
- carrying out measurements – voltage, resistance, and waveform observation (able to use power supply, function generator, analogue and digital multimeters, oscilloscope and connection cables)
- using the theory understanding to deduce the possible fault (one fault).