Electronics Circuit Refresher and Troubleshooting
CGTCECRT101B

Course Description
The Electronics Circuit Refresher and Troubleshooting Course provides 80 hours of theory and hands-on troubleshooting for students who have experience working in the field of electronics as a technician. The course provides a brief overview of theories followed by hand-on practical application. Troubleshooting and schematic reading are incorporated into the course work in all lab activities.

Prerequisite: None
Instructor to student ratio: 1:15
Course Length: 80 hours

Training Syllabus - Week One

Day 1 (Monday) - Direct Current Circuits

Electricity Fundamentals and Safety

Electrostatic Sensitive Devices

Metric Notation

Voltage and Current

Resistors

Switches, Fuses, and Circuit Breakers

Tools for Electronic Troubleshooting

Schematic Diagrams

Multimeter Measurements

Magnetism, Relays, and Meters

Introduction to Multimeters

Multimeter Use

Voltage Measurements

Current Measurements

Resistance Measurements

Ohm's Law and Power

Series Circuits*

Series Circuit Troubleshooting Theory

Series Circuit Troubleshooting Experiment

Parallel Circuits

Parallel Circuit Troubleshooting Theory

Parallel Circuit Troubleshooting Experiment

Series-Parallel Circuits

Series-Parallel Circuit Troubleshooting Theory

Series-Parallel Circuit Troubleshooting Experiment

Complex DC Circuits

Voltage Divider Circuits

Bridge Circuits

Introduction to Kirchhoff's Voltage and Current Laws

Kirchhoff's Voltage and Current Laws

Norton's Theorem

Thevenin's Theorem

Multimeter Loading

Day 2 (Tuesday) - Alternating Current - Part 1

AC Fundamentals

Generating AC Electricity

Non-Sinusoidal Waves

Resistance in AC Circuits

AC Test Equipment

Introduction to Oscilloscopes

Oscilloscope Use

Introduction to the Function Generator

Function Generator Use

Introduction to the Frequency Counter

Frequency Counter Use

Inductance & RL Circuits

Introduction to Inductors

Inductor Identification

RL Series Circuits

RL Series Circuit Operation

RL Series Circuit Troubleshooting Experiment

RL Parallel Circuits

RL Parallel Circuit Operation

RL Parallel Circuit Troubleshooting Experiment

Day 3 (Wednesday) - Alternating Current - Part 2

RL Filters

Capacitance & RC Circuits

Introduction to Capacitors

Capacitor Identification

RC Series Circuits

RC Series Circuit Operation

RC Series Circuit Troubleshooting Experiment

RC Parallel Circuits

RC Parallel Circuit Operation

RC Parallel Circuit Troubleshooting Experiment

RC Filters

RC Time Constants & Transients

RC and RL Time Constants

RC Time Constants Operation

RC Circuit Transient Analysis

RC Circuit Transient Experiment

RC Circuit Transient Troubleshooting Experiment

Resonance

Day 4 (Thursday) - Alternating Current - Part 3

Capacitive/Inductive Reactance and LCR Circuits

Series and Parallel LCR Circuit Experiment

LCR Circuit Troubleshooting

Series Resonance

Series Resonant Circuits

Parallel Resonance

Parallel Resonant Circuits

Resonant Circuit Troubleshooting Experiment

Transformers

Introduction to Transformers

Transformer Operation

Troubleshooting Transformers

Relays & Switches

Relays

Relay Operation Experiment

Troubleshooting Relays and Switches

Electrical Circuits

Electrical Circuits Experiment

Electrical Circuits Troubleshooting

Day 5 (Friday) - Solid State Devices - Part 1

Diode and Diode Circuits

Introduction to Diodes

Junction Diodes

Junction Diode Operation

Junction Diode Troubleshooting Experiment

Diode Limiter Operation

Diode Clamper Operation

Limiter and Clamper Troubleshooting Experiment

Introduction to Transistors

Transistor Operation

Introduction to Transistor Amplifiers

Common Emitter Amplifier

Common Emitter Amplifier Experiment

Common Collector Amplifier

Common Collector Amplifier Experiment

Common Base Amplifier

Common Base Amplifier Experiment

Training Syllabus - Week Two

Day 6 (Monday) - Solid State Devices – Part 2

Power Supplies

Introduction to Power Supplies and Diode Rectifiers

Full- and Half-Wave Rectifier Operation

Bridge Rectifier Operation

Introduction to Voltage Regulators

Zener Diode Operation

Zener Diode Regulator Operation

Voltage Regulator Operation

Voltage Regulator Troubleshooting Experiment

IC Regulator Operation

Voltage Doubler Operation

Transistor Amplifiers

Multistage Transistor Amplifiers

RC Coupled Transistor Amplifier Operation

Push-Pull Amplifier Operation

Multistage Amplifier Troubleshooting Experiment

Field Effect Transistor Amplifiers

FET Amplifier Troubleshooting Experiment

Metal-Oxide Semiconductor Field Effect Transistor (MOSFET)

Day 7 (Tuesday) - Linear Circuits – Part 1

Transistor Oscillators

Introduction to Sine Wave Oscillators

Hartley Oscillator Operation

Colpitts Oscillator Operation

RC Phase Shift Oscillator Operation

Crystal Controlled Oscillator Operation

Sine Wave Oscillator Troubleshooting Experiment I

Sine Wave Oscillator Troubleshooting Experiment II

Sawtooth Generator Operation

Blocking Oscillator Operation

Non-Sine Wave Oscillator Troubleshooting Experiment

Transistor Pulse Circuits

Introduction to Multivibrator Circuits

Astable Multivibrator Operation

Monostable Multivibrator Operation

Bistable Multivibrator Operation

Multivibrator Troubleshooting Experiment

Day 8 (Wednesday) – Linear Circuits – Part 2

Schmitt Trigger Operation

Schmitt Trigger Troubleshooting Experiment

Trigger Device Circuits

Introduction to Trigger Devices

Unijunction Transistor Oscillator Operation

SCR Trigger Circuit Operation

SCR Power Control Operation

SCR Trigger Circuit Troubleshooting Experiment

Triacs, Diacs, and Four-Layer Diodes

Programmable Unijunction Transistors

Operational Amplifiers

Introduction to Operational Amplifiers

Operational Amplifier Operation

Operational Amplifier Troubleshooting Experiment

Day 9 (Thursday) - Digital Circuits – Part 1

Introduction to Digital Circuits

Introduction to Digital Electronics

Digital Electronics Hardware

Buffers and Inverters

Digital Test Equipment

555 Timer

Digital Logic Circuits

Introduction to Logic Functions

AND Gates

OR Gates

NOT Gates

NAND Gates

NOR Gates

XOR and XNOR Gates

Combinational Logic Circuits

Introduction to Combinational Circuits

Logic Families

Number Systems

Base 10 to Binary Conversion

Binary to 7 Segment Conversion

4-Bit Comparator

Day 10 (Friday) - Digital Circuits – Part 2

Flip-Flop Circuits

Introduction to Latches and Flip-Flops

RS Flip-Flops

Clocked RS Flip-Flops

D-Type Flip-Flops

JK Flip-Flops

Master-Slave Flip-Flops

Register and Memory Circuits

Introduction to Registers and Memory

Arithmetic and Counting Circuits

Introduction to Arithmetic Counting Circuits

4-Bit Adder

Up Counter

Down Counter

Conversion and Data Circuits

Introduction to Conversion and Data Circuits

D/A Conversion

Basic Microprocessor Systems

Troubleshooting Digital Systems

Introduction to Microprocessors

Basic Microprocessor Operations

Microprocessor Number Systems

8086 Microprocessor Circuit