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