

**Syllabus**  
**Engineering and Technology**

General Electronic Technician Career Major Scope

<b>Course #</b>	<b>Courses</b>	<b>Theory</b>	<b>Lab</b>	<b>Total</b>
TI-00539	Electronics Hand and Power Tools for Electronics Technicians	6	9	15
TI-00531	Electrical Safety for Electronics Technicians	12	3	15
TI-00533	DC Circuits for Electronics Technicians	75	45	120
TI-00540	Soldering for Electronics Technicians	3	12	15
TI-00630	Mechanical Fasteners and Terminals for Electronics Technicians	6	9	15
TI-00629	Instruments and Measurements for Electronics Technicians	6	9	15
TI-00532	Electromechanical Devices for Electronics Technicians	18	27	45
TI-00631	AC Circuits for Electronics Technicians	90	90	180
TI-00534	Semiconductor Devices for Electronics Technicians	15	75	90
TI-00535	Semiconductor Circuits for Electronics Technicians	90	60	150
TI-00693	Linear Circuits for Electronics Technicians	15	75	90
TI-00679	Data Communications for Electronics Technicians	75	45	120
TI-00678	Microprocessor Systems for Electronics Technicians	15	45	60
TI-00515	Digital Systems for Electronics Technicians	15	75	90
TI-00802	Workforce Staging	24	6	30
	<b>Total Hours</b>	<b>465</b>	<b>585</b>	<b>1050</b>

## **Instructor**

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## **Location**

Southwest Technology Center  
North Building  
711 W. Tamarack  
Altus, Ok 73521

## **Methodology**

Course is self paced within the set time frame of the course. Delivery of instruction consists of computer aided courseware, lectures, individual projects, and team activities.

## **Attendance**

All students will be required to be in attendance ninety (90) percent of the time. This means you cannot miss more than 4 days during a nine week period. Three tardy slips equal 1 absence. Students are counted tardy if they arrive to class within 59 minutes from the start of class. After this time, students are considered absent. If you are in high school and miss more than 5 days, you will not be given credit for this course for the semester and be terminated the following semester. If you are an adult and miss 5 days, you will be terminated as a student and not allowed to enroll the next semester unless you file and are granted an appeal. Students must submit an appeal to the Chief Operating Officer and/or Student Services Director with documented extenuating circumstances for admittance back into the course. If you violate the attendance policy, you will **lose your eligibility with financial aid and it cannot be appealed.**

## **Evaluation**

Skills	20%
Quiz	20%
Exams	30%
<u>Daily Grade (daily assignments)</u>	<u>30%</u>
Total	100%

## Grading

Grades will be issued according to the following scale:

Above	90%	A
	80-89%	B
	70-79%	C
	60-69%	D
Below	60%	F

I – Incomplete (Given when student does not complete course or owes make-up time.)

W – Withdraw (Given when student withdraws from SWTC or exceeds attendance policy.)

## Competencies

Required Certifications:

State ODCTE assessments:

Electronics Assembler

General Electronics Technician (G.E.T.)

Optional Certifications:

International Society of Certified Electronics Technicians assessments:

DC Electronics Systems Associates Certification Exam

AC Electronics Systems Associate Certification Exam

Solid State Electronics Systems Associate Certification Exam

Digital Electronics Systems Associate Certification Exam

(Successful completion of the above four certification exams will satisfy the requirements for the International Society of Certified Electronics Technicians (I.S.C.E.T.) Associate Level Certification)

## Curriculum Resources

NIDA Corporation Basic Electronics Series Courseware.

Tel-a-Train, Safety Training Series

NFPA 70 and 70E.

Chaney Inc, Solder Kits

Multistate Academic and Vocational Curriculum Consortium; Electronics Technician Series.

Employment / Workplace Skills- CIMC

Professional Development Program – SkillsUSA

Parallax Stamps in Class

Grob, Bernard. Basic Electronics. 7<sup>th</sup> Edition. Glencoe/McGraw-Hill. 1992.

Meade, Russell L. Foundations of Electronics. Delmar Publishers. 1994

Schuler, Charles A. Electronics. 4<sup>th</sup> Edition. Macmillan/ McGraw-Hill. 1994.

## **Compliance Statement**

Southwest Technology Center does not discriminate on the basis of race, color, national origin, sex/gender, age, disability, or veteran status in admission to its programs, services, or activities, in access to them, in treatment of individuals, or in any aspect of their operations. Southwest Technology Center does not discriminate in its hiring or employment practices.

This notice is provided as required by Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title IX of the Education Amendment of 1972, the Age Discrimination Act of 1975, and the Americans with Disabilities Act of 1990.

Questions, complaints, or requests for additional information regarding these laws may be forwarded to compliance coordinator Brenda Krieger 711 West Tamarack Road Altus, OK 73521 (580)477-2250 each weekday from 8:00 a.m. to noon and 1:00 p.m. to 4:00 p.m.

## Course Title

Course #	Course	Theory	Lab	Total
TI-00515	Digital Systems for Electronics Technicians	15	75	90

## Course Description

This course teaches students the theory and practical principles of digital electronic devices and circuits, including all families of digital construction. Emphasis will be placed on measurement, troubleshooting and repair techniques, safety, and reliability.

## Knowledge and Skills

- Define and apply number systems to codes and arithmetic operations
- Analyze, construct, and troubleshoot logic gates, logic arithmetic circuits, flip-flops, and encoders and decoders
- Analyze, construct, and troubleshoot registers and counters, clock and timing circuits, multiplexers and demultiplexers, digital to analog and analog to digital devices, and discrete input/output circuits
- Analyze, construct, and troubleshoot displays and representative digital systems
- Apply logical and systematic approach to troubleshooting digital logic devices
- Set-up and operate test equipment for digital devices
- Identify integrated circuit families
- Test integrated circuits

## Course Title

Course #	Course	Theory	Lab	Total
TI-00531	Electrical Safety for Electronics Technicians	12	3	15

## Course Description

Safety rules and regulations for electricians, precautions for electrical and mechanical hazards on the job, tool and equipment safety, first aid, CPR, blood borne pathogens, OSHA and NFPA mandated lockout/tag out, personal protective equipment, right to know, and confined space entry procedures.

## Knowledge and Skills

- Identify and practice mechanical safety
  - Tool safety
  - Hand safety
  - Eye safety
- Immediately report injuries/accidents following company procedures
- Identify and practice electrical safety
- Participate in “Right to Know” training and practice environmental safety
  - Chemical awareness
  - Environmental regulations
  - Gases and pressure safety
- Identify and practice safety related to infectious disease, universal precautions, blood-borne pathogens, and chemical hygiene
- Identify and practice thermal safety
- Identify and practice radiation safety
- Demonstrate and practice traffic and vehicle safety
- Identify and practice laser safety
- Demonstrate knowledge of lock-out/tag-out requirements and danger associated with potential energy sources
- Identify and practice fiber optic handling safety
- Perform a leakage check on electronic equipment
- Test electrical equipment to ensure proper grounding
- Identify sources of hazardous noise
- Research and apply appropriate codes and regulations
- Identify and test circuit protection devices
- Demonstrate proper handling of static-sensitive devices

## Course Title

Course #	Course	Theory	Lab	Total
TI-00532	Electromechanical Devices for Electronics Technicians	18	27	45

## Course Description

This course covers the many devices that convert electricity or electronic signals into other forms of power and those which convert other forms of power into electricity or electronic signals. Emphasis will be placed on troubleshooting, repair, safety, and reliability.

## Knowledge and Skills

- Demonstrate knowledge of and ability to work on mechanical systems
- Disassemble and reassemble complex electro-mechanical systems
- Demonstrate knowledge of preventative and ongoing maintenance procedures and the effects on electro-mechanical equipment
- Identify parts and functions of motors and generators
- Identify functions of solenoids, relays, and switches
- Identify synchro, servo, and stepper motors, associated components, characteristics, and operations
- Test motors and generators
- Test solenoids, relays, and switches
- Test, synchro, servo, and stepper motors



## Course Title

Course #	Course	Theory	Lab	Total
TI-00533	DC Circuits for Electronics Technicians	45	75	120

## Course Description

This course covers electrical theory in DC circuits and develops a student's understanding of the electrical units of volts, ohms, amps, and watts, measurement equipment and methods, interrelationships, and troubleshooting skills.

## Knowledge and Skills

- Apply electronics-related mathematical concepts
  - Addition, subtraction, multiplication, and division of:
  - Whole numbers
  - Fractions
  - Decimals
  - Percentages
  - Exponents
  - Scientific notations
  - Significant digits
  - Measurements
  - Metric
  - Use of calculator
  - Estimation
  - Application of formulas
  - Word problems
  - Thought problems
- Relate electricity to nature of matter
- Identify sources of electricity
  - Chemical
  - Mechanical
  - Thermal
  - Tibro (static)
  - Piezo
  - Photo voltaic
- Define voltage, current, resistance, power, and energy
- Apply and relate Ohms Law
- Measure properties of a circuit using VOM and DVM meters
- Compute and measure conductance and resistance of conductors and insulators
- Analyze, construct, and troubleshoot series circuits, parallel circuits, series-parallel circuits, and voltage dividers
- Define magnetic properties of circuits and devices
- Apply logical and systematic approach to troubleshooting DC circuits

- Solve network theorem problems using Kirchhoff, Thevenin, Norton, and Superposition
- Distinguish between conductors and insulators
- Identify types of cells and batteries and demonstrate proper storage and handling procedures
- Determine resistor values by color code and size
- Identify the types and applications of lamps
- Identify types and applications of various photo-sensitive devices
- Identify and test types and applications of various temperature sensitive devices
- Identify types/sizes of wire and cable and appropriate applications
- Test conductors and insulators
- Test cells and batteries
- Test connectors
- Test lamps
- Test resistors
- Test various photo-sensitive devices

## Course Title

Course #	Course	Theory	Lab	Total
TI-00534	Semiconductor Devices for Electronics Technicians	15	75	90

## Course Description

This course covers 2-, 3-, and 4-layer semiconductor devices commonly used in electronic circuits, including diodes, bi-polar transistors, and specialized devices used in measurement and power control circuits. Classes of amplifiers will also be covered. Much of the course will focus on hands-on construction, testing, and troubleshooting circuits for the purpose of examining the operation of semiconductor devices.

## Knowledge and Skills

- Identify and use common notations and symbols
- Use schematics, diagrams, and blueprints to locate and identify specific equipment within areas
- Use schematics, diagrams, and blueprints to interface subassemblies/peripherals
- Trace signal/power flow
- Recognize proper waveforms
- Use schematics, diagrams, and blueprints to construct/assemble equipment
- Maintain service documentation library/Internet file
- Identify and test basic electron tubes
- Identify diode types and parameters by color codes and/or markings
- Identify types of transistors and their parameters
- Identify types of thyristors and their parameters
- Test diodes
- Test transistors
- Test thyristors
- Identify properties of semi-conductor materials
- Analyze and measure characteristic of P-N junction diodes
- Analyze and measure characteristics of special diodes
- Analyze, construct, and troubleshoot diode circuits
- Identify, define, and measure characteristics of unipolar and bipolar devices, thyristors, and integrated circuits

## Course Title

Course #	Course	Theory	Lab	Total
TI-00535	Semiconductor Circuits for Electronics Technicians	90	60	150

## **Course Description**

This course covers the many active circuits that use semiconductors to measure, amplify, control, receive, and transmit electronic signals. Specialized circuits such as FET amplifiers, bridges, oscillators, active filters, and power control circuitry will be covered. Much of the course will focus on hands-on construction, testing, and troubleshooting circuits.

## **Knowledge and Skills**

- Apply logical and systematic approach to troubleshooting semi-conductor devices
- Set up and operate test equipment for solid state devices
- Analyze, construct, and troubleshoot single stage amplifiers
- Analyze, construct, and troubleshoot multi-stage amplifiers
- Analyze, construct, and troubleshoot operational amplifiers
- Analyze, construct, and troubleshoot basic power supplies and filters
- Analyze, construct, and troubleshoot oscillators

## Course Title

Course #	Course	Theory	Lab	Total
TI-00539	Electronics Hand and Power Tools for Electronics Technicians	6	9	15

## Course Description

This course covers the proper, safe use of, and maintenance of power and hand tools.

## Knowledge and Skills

- Identify and demonstrate proper use of occupationally-specific tools
- Identify automated testing equipment and methods of using test circuits and systems
- Use appropriate instrumentation to test ESD protective systems
- Use an analog multimeter to measure:
  - Voltage
  - Current
  - Resistance
- Use a digital multimeter to measure:
  - Voltage
  - Current
  - Resistance
- Use an oscilloscope to measure AC, DC, and time-based waveforms
- Use a function/signal generator to simulate necessary signals
- Use frequency counters to measure frequencies and period
- Use a digital storage oscilloscope to capture and display specialized waveform
- Use a logic probe to analyze logic circuits
- Use capacitor/inductor analyzer to test passive circuit elements
- Use a pulse injector to insert pulses into digital circuitry
- Use variac
- Use isolation transformer
- Use DC power supply
- Use an AC circuit polarity tester
- Use an electrical resistance insulation tester (megger)
- Demonstrate proper care and use of precision measuring tools and instrument
- Use clamp on meters (volt or amp)
- Perform metric and standard mechanical measurements
- Demonstrate proper use of hand tools
- Demonstrate proper use of power tools

### **Course Title**

<b>Course #</b>	<b>Course</b>	<b>Theory</b>	<b>Lab</b>	<b>Total</b>
TI-00540	Soldering for Electronics Technicians	3	12	15

### **Course Description**

This course covers the theory and essentials of preparing surfaces and leads for soldering, preparation and adjustment of soldering equipment, and procedures for through-hole, surface mount, and lead free soldering for reliability. Mil-Spec procedures will be covered briefly.

### **Knowledge and Skills**

- Perform standard soldering and desoldering techniques
- Perform hot air soldering and desoldering techniques
- Identify multi-layer boards and demonstrate knowledge of procedural differences
- Perform surface-mount soldering and desoldering techniques
- Perform high and low temp soldering

## Course Title

Course #	Course	Theory	Lab	Total
TI-00629	Instruments and Measurements for Electronics Technicians	6	9	15

## Course Description

This course covers the theory and practical considerations of electronic measurements, including concepts of accuracy and precision. The construction, calibration, and maintenance of test equipment and special circuits to facilitate measurement will be covered in detail. The concepts of measurement error, parallax error, and circuit loading will be covered.

## Knowledge and Skills

- Use an analog multimeter to measure:
  - Voltage
  - Current
  - Resistance
- Use a digital multimeter to measure:
  - Voltage
  - Current
  - Resistance
- Use an oscilloscope to measure AC, DC, and time-based waveforms
- Use a function/signal generator to simulate necessary signals
- Use frequency counters to measure frequencies and period
- Use a digital storage oscilloscope to capture and display specialized waveforms
- Use capacitor/inductor analyzer to test passive circuit elements
- Use a pulse injector to insert pulses into digital circuitry
- Use variac
- Use isolation transformer
- Use DC power supply
- Use an AC circuit polarity tester
- Use an electrical resistance insulation tester
- Demonstrate proper care and use of precision measuring tools and instruments
- Use clamp on meters (volt or amp)
- Perform metric and standard mechanical measurements
- Demonstrate proper use of hand tools
- Demonstrate proper use of power tools

## Course Title

Course #	Course	Theory	Lab	Total
TI-00630	Mechanical Fasteners and Terminals for Electronics Technicians	6	9	15

## **Course Description**

This course will cover in depth the many standards and uses of mechanical fasteners and electrical/electronic terminals used in constructing electronic circuits and devices. Special emphasis will be placed on nomenclature and specifications, print and schematic reading, and mechanical construction techniques.

## **Knowledge and Skills**

- Identify types of fasteners and terminals
- Demonstrate use of fasteners and terminals
- Differentiate between types and sizes of screws
- Identify the types and applications of connectors



## Course Title

Course #	Course	Theory	Lab	Total
TI-00631	AC Circuits for Electronics Technicians	75	105	180

## Course Description

This course covers alternating current in detail, including concepts of frequency, amplitude, and phase, and the effect alternating current has on passive devices such as resistors, capacitors, inductors, and conductors. Calculations will include capacitive and inductive reactance and resonance. Special emphasis will be placed on multi-element filters and troubleshooting AC circuits.

## Knowledge and Skills

Apply electronics-related mathematical concepts

- Addition, subtraction, multiplication, and division of:
- Decimals
- Percentages
- Exponents
- Scientific notations
- Significant digits
- Basic trigonometry functions
- Measurements
- Metric
- Use of calculator
- Estimation
- Reading charts, graphs, and tables
- Basic geometry
- Application of formulas
- Word problems
- Thought problems
- Identify properties of an AC signal
- Identify AC sources
- Set up and operate test equipment for AC circuits
- Analyze and measure AC signals using proper test equipment
- Analyze and apply principles in transformers to AC circuits
- Apply logical and systematic approach to troubleshooting AC circuits
- Analyze basic motor theory and operation
- Identify and configure Delta and Wye configurations
- Analyze basic generator theory and operation
- Solve basic trigonometric problems as applicable to electronics

- Construct, analyze, and troubleshoot AC capacitive circuits, AC inductive circuits, RLC circuits (series, parallel, complex) series and parallel resonant circuits, filter circuits, and polyphase circuits
- Analyze and measure RL and RC time constants
- Analyze, construct, and troubleshoot maximum power transfer theory
- Determine capacitor values
- Determine inductor values
- Test capacitors
- Test inductors
- Identify transformer ratings and lead configurations by color codes and/or markings
- Test transformers

## Course Title

Course #	Course	Theory	Lab	Total
TI-00678	Microprocessor Systems for Electronics Technicians	15	45	60

## **Course Description**

This course builds on the digital systems course, introducing microprocessors, memory systems, assembly language programming, and interfacing microprocessors with external circuits to control signal and power flow and sense input conditions. Digital to analog and analog to digital concepts will be taught and special emphasis will be placed on troubleshooting and repair techniques, safety, and reliability.

## **Knowledge and Skills**

- Analyze and troubleshoot processors
- Analyze and troubleshoot memory systems
- Analyze and troubleshoot input/output systems
- Apply logical and systematic approach to troubleshooting microprocessor systems
- Analyze and troubleshoot bus systems and protocols
- Execute computer instruction sets
- Demonstrate proper use of system diagnostics

### Course Title

Course #	Course	Theory	Lab	Total
TI-00679	Data Communications for Electronics Technicians	45	75	120

### **Course Description**

This course teaches principles and protocols of data communications techniques, including wired and wireless, cabling installation and troubleshooting, traditional AM and FM analog broadcasting, digital data communication techniques, and microwave circuits. Emphasis will be placed on troubleshooting, repair techniques, safety, and reliability.

### **Knowledge and Skills**

- Test and troubleshoot AM circuits
- Test and troubleshoot FM circuits
- Test and troubleshoot specialized analog and digital communications techniques (various pulse modulations, modem, faxes)
- Identify types of antenna systems and their use
- Test antenna systems

## Course Title

Course #	Course	Theory	Lab	Total
TI-00693	Linear Circuits for Electronics Technicians	15	75	90

## Course Description

This course teaches students the theory and practical principles of analog electronic devices and circuits including passive and active linear electronic devices. Emphasis will be placed on troubleshooting and repair techniques, safety, and reliability.

## Knowledge and Skills

- Analyze motor or phase control circuits
- Apply logical and systematic approach to troubleshooting analog circuit devices
- Analyze, construct, and troubleshoot power supply regulators
- Analyze, construct, and troubleshoot active filters
- Set-up and operate test equipment for analog circuits
- Troubleshoot switching power supplies
- Analyze and troubleshoot phase-locked-loop systems

## Course Title

Course #	Course	Theory	Lab	Total
TI-00802	Workforce Staging	24	6	30

## Course Description

This course is designed to be delivered as an integrated component within the courses taken by the individual student. The course is designed for the development of leadership, personal development and employability skills.

## Knowledge and Skills

Work Force Awareness:

- Identify personal interests
- Engage in team negotiation activity
- Identify effective communication skills
- Describe workplace components
- Recognize stress factors
- Identify personal qualities that are desirable for the workplace
- Evaluate professional development traits
- Develop awareness of cultural diversity and equity issues
- Demonstrate effective communications with others
- Identify components of an employment portfolio
- Select characteristics of an employment portfolio
- Demonstrate social etiquette
- Complete survey of employment opportunities
- Develop a resume and write cover letter
- Demonstrate interview skills
- Understand your right to know
- Prepare customer documents used for removal, repair, and reinstallation of an electronic system or component
- Prepare typical work orders, logbooks, and historical records
- Perform proper and complete documentation of maintenance and repair actions
- Research and order parts
- Demonstrate the ability to properly document engineering changes or field modifications
- Calculate and prepare a customer billing document
- Complete work order using electronic documentation