







Multiple Category Scope and Sequence: Scope and Sequence Report For Course Standards and Objectives, Content, Skills, Vocabulary

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Unit	Course Standards and Objectives	Content	Skills	Vocabulary
<p>Hunter High Advanced <u>Advanced Electronics (47.0107) (District)</u> 2014-2015 <u>Watson, Scott</u></p>	<p><u>Electrical Safety</u>  (Week 1, 1 Week) </p> <p>UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Basic Electronics Standard 01 Students will be able to understand and demonstrate safe practices.</p> <ul style="list-style-type: none"> ▪ Objective 0101 Use safe work practices. (A1) <ol style="list-style-type: none"> a. Describe the purposes of legislation concerning safety in the workplace. b. Describe safety precautions and procedures pertaining to and working with electricity. c. Describe correct safety procedures for hand and power tools. d. Locate and describe shop safety equipment. e. Use safe work practices. 	<ul style="list-style-type: none"> ▪ The reason and purpose of safety regulations ▪ Safe practice around electrical circuitry ▪ Basic hand and power tool safety 	<ul style="list-style-type: none"> ▪ State reasons why we have safety regulations ▪ Discuss general safety practices to observe around electrical circuits ▪ Demonstrate proper hand and power tool use. 	<ul style="list-style-type: none"> ▪ Circuit Breaker ▪ Lock-out tag-out ▪ Material Safety Data Sheets (MSDS) ▪ Fatal Current ▪ Lethal Voltage
<p><u>Induction and transformers</u>  (Week 2, 1 Week) </p>	<p>UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 01 Students will be able to understand and demonstrate how to test and select passive electronic components.</p> <ul style="list-style-type: none"> ▪ Objective 0101 Use, test, and select inductors. <ol style="list-style-type: none"> a. Describe inductors, their schematic symbols and principles of operation. b. Describe the operation of inductors in DC circuits. c. Describe the operation of inductors in AC circuits. d. Describe the procedures 	<ul style="list-style-type: none"> ▪ How magnetic energy is converted into electrical energy and electrical energy into magnetic energy. ▪ Construction of a transformer ▪ transformer types ▪ transformer winding ratio 	<ul style="list-style-type: none"> ▪ Students will be able to explain the process of how magnetic energy is converted into electrical energy or electrical energy into magnetic energy. ▪ Students will be able to describe the construction of a transformer ▪ Students will be able to list the 3 main transformer types ▪ Students will be able to explain how a transformer winding ratio changes the electrical signal inputted into a transformer. 	<ul style="list-style-type: none"> ▪ Induction ▪ Permeability ▪ Magnetic-polarization ▪ Air core ▪ Iron core ▪ Primary ▪ Secondary ▪ winding-ratio ▪ step-up ▪ step-down ▪ isolation

- e. Use, test, and select inductors.
- Objective 0102
Use, test, and select transformers.
 - a. Describe the common types of transformers, their schematic symbols, major parts, uses and principles of operation.
 - b. Use formulas to predict the operation of transformers.
 - c. Describe the procedures for selecting, connecting and testing transformers.
 - d. Use, test, and select transformers.

DC Circuits  (Week
3, 4 Weeks) 

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 02
Students will be able to trouble shoot passive DC circuits.

- Objective 0201
Construct, measure and analyze series parallel resistive circuits.
 - a. Describe series-parallel circuit principles.
 - b. Calculate the theoretical values of voltage, current, resistance and power in all parts of a circuit.
 - c. Identify chassis-ground connections and explain their effect when located at various points in a circuit.
 - d. Describe the applications of series parallel circuits.
 - e. Analyze a loaded voltage divider, describe bleeder current and explain how specified values of voltage and current are supplied to the loads
 - f. Construct, measure and analyze series-parallel circuits.

- State series circuit characteristics
- Calculate theoretical voltage, resistance, current, and electrical power values in a series resistor circuit.
- State parallel circuit characteristics
- Calculate theoretical voltage, resistance, current, and electrical power values in a parallel resistor circuit.

- Students will be able to state series circuit characteristics
- Students will be able to calculate theoretical voltage, resistance, current, and electrical power values in a series resistor circuit.
- Students will be able to state parallel circuit characteristics
- Students will be able to calculate theoretical voltage, resistance, current, and electrical power values in a parallel resistor circuit.

- Voltage
- Current
- Resistance
- Ohm's Law
- Kirchhoff's law
- Power
- Series
- Parallel

- g. Describe internal resistance of source, constant voltage source, matching and loading.
- Objective 0202
Troubleshoot passive DC circuits.
 - a. Describe a logical method for isolating faults and repairing circuits
 - b. Identify faults in series circuits.
 - c. Identify faults in parallel circuits.
 - d. Identify faults in series-parallel circuits.
 - e. Troubleshoot passive DC circuits
- Objective 0203
Construct and measure time constant circuits.
 - a. Explain the application of capacitive timing circuits.
 - b. Explain the application of RL timing circuits.
 - c. Calculate time constants, voltages and current in RC and RL circuits.
 - d. Construct and measure time constant circuits.
- Objective 0204
Analyze resistance networks.
 - a. Simplify circuits using Thevinin's Theorem.
 - b. Simplify circuits using Norton's Theorem.
 - c. Simplify circuits using Millman's Theorem.

AC Circuits  (Week 7, 5 Weeks) 

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 03
Students will be able to troubleshoot passive AC circuits.

- Objective 0301
Interpret waveforms.
 - a. Describe AC current and voltage.
 - b. List the characteristics of

- AC circuitry waveform and phase shift
- AC circuit impedance
- AC circuit reactance
- AC circuit resonance

- The students will be able to explain AC circuitry waveform and phase shifting.
- The students will be able to calculate AC circuit impedance
- The students will be able to calculate AC circuit reactance
- The students will be able to calculate AC circuit resonance

- Waveform
- Impedance
- Reactance
- Resonance

waveforms.

c. Determine voltage value in various measuring systems.

- Objective 0302
Troubleshoot resistive inductive (RL) circuits.
 - a. Describe the process of testing and troubleshooting inductive circuits.
 - b. Troubleshoot resistive inductive (RL) circuits.
- Objective 0303
Troubleshoot resistive capacitive (RC) circuits.
 - a. Explain phase relationship.
 - b. Calculate values of reactance, impedance, voltage, current and power in series and parallel capacitive circuits.
 - c. Describe the procedures for constructing, testing and troubleshooting capacitive circuits.
 - d. Troubleshoot resistive capacitive (RC) circuits.
- Objective 0304
Troubleshoot reactive (RLC) circuits
 - a. Describe the response of RLC circuits to sine wave signals:
 - b. Calculate values of reactance, impedance, voltage, current and power for simple reactive circuits.
 - c. Describe the procedures for testing and troubleshooting RLC circuits. Troubleshoot reactive circuits.
- Objective 0305
Construct and measure resonant circuits.
 - a. Describe the properties of resonant circuits.
 - b. Calculate the resonant frequency, bandwidth, impedance, voltage and currents in currents operating at resonance.
 - c. Draw graphs that show

the response curves of series and parallel resonant circuits.

d. Describe the procedures for constructing, and measuring resonant circuits.

e. Construct and measure resonant circuits.

- Objective 0306
Construct and measure passive filter circuits.
 - a. Describe the operation of and draw the frequency response curves of filters.
 - b. Explain the operation and applications of filter configurations.
 - c. From schematic diagrams, predict and plot the frequency response of filter circuits.
 - d. Construct and measure passive filter circuits.

Active Discrete

Circuits  (Week 12,
4 Weeks) 

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 04

Students will be able to troubleshoot active circuits.

- Objective 0401
Troubleshoot simple power supply circuits.
 - a. Draw schematic diagrams of power supplies and explain their operating principles and characteristics
 - b. Explain the operating principles of voltage regulators.
 - c. Predict power supply DC output voltage, ripple frequency and percent ripple.
 - d. Describe the procedures for constructing, testing, and troubleshooting power supply circuits.
 - e. Construct and make measurements on power supply circuits.


- troubleshooting basic power supply circuits
- troubleshooting amplifier circuits

- Students will be able to troubleshoot basic power supply circuits to component level
- Students will be able to troubleshoot amplifier circuits to component level.

- Active
- Discrete
- Integrated
- Amplifier
- Oscillator

- f. Troubleshoot power supply circuits.
- Objective 0402
Troubleshoot bipolar junction transistor amplifier circuits.
 - a. Explain the concepts of linear amplification
 - b. Draw schematic diagrams of simple bipolar junction transistor (BJT) amplifier circuits and explain their operating principles and characteristics.
 - c. Describe the operating principles and characteristics of BJT biasing circuits.
 - d. Describe typical BJT amplifier coupling arrangements and their characteristics.
 - e. Describe the characteristics of common BJT power amplifier circuits.
 - f. Describe the procedures for constructing, testing and troubleshooting BJT amplifier circuits.
 - g. Troubleshoot bipolar junction transistor amplifier circuits.
- Objective 0403
Troubleshoot sinusoidal and non-sinusoidal oscillators.
 - a. Describe the principles of oscillator operation.
 - b. Explain the operation of sinusoidal oscillators
 - c. Explain the operation of non-sinusoidal oscillators.
 - d. Describe the procedures for constructing, testing and troubleshooting BJT oscillator circuits.
 - e. Construct and make measurements on oscillator circuits
 - f. Troubleshoot oscillator circuits.
- Objective 0404
Troubleshoot field effect transistor amplifier circuits.
 - a. Explain the concepts of

linear amplifications.
 b. Draw schematic diagrams of simple field effect transistor (FET) amplifier circuits and explain their operating principles and characteristics.
 c. Describe the operating principles and characteristics of FET biasing circuits.
 d. Describe typical FET amplifier coupling arrangements and their characteristics.
 e. Describe the characteristics of common FET power amplifier circuits.
 f. Describe the procedures for constructing, testing and troubleshooting FET amplifier circuits.

Linear Circuits 
 (Week 16, 3 Weeks) 

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 05
 Students will be able to troubleshoot linear integrated circuits.



- Objective 0501
 Replace integrated circuits (IC).
 - a. Describe linear and digital integrated circuits and their applications.
 - b. Identify common integrated circuit packages.
 - c. Describe safe handling of integrated circuits.
 - d. Replace non-soldered types of ICs.
- Objective 0502
 Troubleshoot operational amplifiers.
 - a. Describe basic operational amplifier concepts
 - b. Describe the characteristics of operational amplifier circuit configurations.

- Identify integrated circuitry
- replace DIP integrated circuitry
- Amplifier operation
- 555 Timer operation
- Voltage regulator operation

- Students will be able to identify integrated circuitry
- Students will be able to replace simple DIP integrated circuitry
- Students will be able describe amplifier operation
- Students will be able describe 555 Timer operation
- Students will be able describe voltage regulator operation

- c. Explain operational amplifier terms and specifications
- d. Describe the procedures for constructing, testing and troubleshooting operational amplifier circuits.
- e. Construct operational amplifier circuits.
- f. Measure the voltage levels, waves shape, gain, frequency response, and phase relationships in operational amplifier circuits.
- g. Troubleshoot integrated circuit operational amplifier circuits.
- Objective 0503
Troubleshoot integrated circuit timers.
 - a. Describe the principles of operation of a typical integrated circuit timer.
 - b. Describe the operation of monostable and astable multivibrator timers.
 - c. Use equations to design monostable and astable timer circuits.
 - d. Construct, test and measure signals in an IC timer circuits
 - e. Troubleshoot faulty IC timer circuits.
- Objective 0504
Troubleshoot integrated circuit regulators.
 - a. Describe the roles of the major functional blocks in linear and switching voltage regulators.
 - b. Describe the similarities and differences between linear and switching regulators.
 - c. Explain the operation of step down and step up switching voltage regulators.
 - d. Explain the operation of the fixed and adjustable voltage regulators.
 - e. Describe the procedures

for constructing, testing and troubleshooting integrated circuit regulators.
 f. Construct and measure signals in an IC regulator circuit.
 g. Troubleshoot faulty IC regulators circuits.

Digital Circuits 
 (Week 19, 7 Weeks) 

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 06

Students will be able to troubleshoot digital integrated circuits.

- Objective 0601
 Perform arithmetic operations in various numbering systems.
 - a. Use the decimal number system.
 - b. Use the octal number system.
 - c. Use the hexadecimal number system.
 - d. Use the binary number system.
 - e. Convert from decimal to binary.
 - f. Convert between octal and binary
 - g. Convert between hexadecimal and binary
 - h. Convert between octal and hexadecimal.
 - i. Convert decimal to octal or hexadecimal.
 - j. Perform binary addition.
 - k. Perform binary subtraction.
- Objective 0602
 Construct and test simple logic circuits.
 - a. Describe standard digital gates.
 - b. Simplify logic equations using Boolean algebra.
 - c. From the truth table or Boolean equation, draw the logic diagram and predict the voltage and logic levels in all parts of the digital

- How to convert numbers between the common digital storage systems
- Why each of the different number systems exist and the common uses of each.
- Basic common digital logic gate operation
- How to use Boolean Algebra to simplify digital logic
- How to troubleshoot digital logic circuits
- Transistor to Transistor Logic (TTL) operation and device identifiers.
- Complementary metal–oxide–semiconductor (CMOS) operation and device identifiers
- Common digital design problems of fan-out and propagation delay.
- What Combinational Logic is
- Karnaugh mapping use.
- Boolean algebra
- de Morgan theorem
- Flip-flop operation
- shift register operation
- frequency divider and counter operation
- sequential logic operation
- Students will be able to convert decimal numbers into binary, octal, and hexadecimal representations of the decimal number.
- Students will be able to convert numbers stored in hexadecimal, octal, binary, or decimal systems into one of the other systems.
- Students will be able to describe the basic logic operation of the common digital logic gate types.
- Students will be able to use Boolean algebra to simplify a digital logic expression.
- Students will be able to isolate faults in digital logic circuits.
- Students will be able to identify TTL devices by their common identifiers
- Students will be able to identify CMOS devices by their common identifiers
- Students will be able to explain what fan-out and propagation delay are.
- Students will be able to describe what Combinational Logic is
- Students will be able to describe Karnaugh mapping use.
- Students will be able to describe Boolean algebra
- Students will be able to describe Flip-flop operation
- S
- Students will be able to describe sequential logic
- Binary
- Decimal
- Octal
- Hexidecimal
- GATE
- INVERTOR
- AND
- OR
- NAND
- NOR
- Exclusive OR
- Exclusive NOR
- Universal Gate
- Boolean Algebra
- flip-flops
- shift registers
- counters
- dividers
- sequential logic

- circuit.
- d. Describe the procedures for testing and troubleshooting logic circuits.
- e. Construct and test simple logic circuits.
- Objective 0603
Use, test and select digital devices.
 - a. Identify common digital families
 - b. Identify the levels of integration and chip component density
 - c. Describe the procedures for testing and selecting digital devices.
 - d. Use, test and select digital devices.
- Objective 0604
Construct, test and troubleshoot combinational logic circuits.
 - a. Analyze combinational logic circuits and write the Boolean equation and truth table for each circuit.
 - b. Simplify combinational logic circuits using Boolean identities, de Morgan's Theorem and logical equivalencies.
 - c. Use Karnaugh maps to simplify combinational logic circuits.
 - d. Determine the logical expression for any combinational logic circuit.
 - e. From schematic diagrams and specifications, write a truth table and the Boolean equation for combinational logic circuits.
 - f. From the truth table, predict the logic levels in all parts of combinational logic circuits.
 - g. Write the truth table of arithmetic circuits and describe how each works.
 - h. Describe the procedures for testing and

troubleshooting
combinational logic circuits.
i. Construct, test and
troubleshoot combinational
logic circuits

- Objective 0606
Troubleshoot digital/analog
converter circuits.
a. Describe the operation of
analog to digital (A/D) and
digital to analog (D/A)
converter circuits.
b. Describe the procedures
for testing and
troubleshooting converter
circuits.
c. Troubleshoot
digital/analog converter
circuits.
- Objective 0607
Troubleshoot semi-
conductor memory circuits.
a. Describe principles of
operation of semi-conductor
memory devices
b. Describe the applications
of semi-conductor memory
devices and the procedures
for constructing, testing and
troubleshooting circuits
containing them.
c. Troubleshoot circuits
containing semi-conductor
memory devices.

Professional

Development:

(Week 20, 5 Weeks)



UT: CTE: Skilled and Technical
Sciences, UT: Grades 9-12,
Advanced Electronics
Standard 10

Students will understand the need for
professional development.

- Objective 1001
Complete a personal
inventory.
- Objective 1002
Set and meet goals.
- Objective 1003
Be self-motivated.
- Objective 1004
Know how to make
decisions.

- What Professional
Development is
- How it can benefit them
- What the basic components
of professional
development are

- Students will self evaluate
their professional
development skills and set
achievable goals for
improvement in one or more
areas.

- Personal Inventory
- Goal Setting
- Motivation
- Decision Making
- Time management
- Organization Skills
- Verbal
Communication
- Written
Communication
- Personal Reading
Program
- Work Skills Attitude

- Objective 1005
Know how to manage time.
- Objective 1006
Organize personal belongings and lab equipment.
- Objective 1007
Learn to communicate verbally.
- Objective 1008
Write effective communications.
- Objective 1009
Establish a personal reading program.
- Objective 1010
Develop effective work skills and attitudes.
- Objective 1011
Master a working knowledge of SkillsUSA.
 - a. Learn the acronym SkillsUSA.
 - b. State the SkillsUSA motto.
 - c. State the SkillsUSA creed
 - d. Learn the SkillsUSA colors.
 - e. Describe the official SkillsUSA dress
 - f. Describe the procedure for becoming a SkillsUSA officer

Programming



(Week 25, 7 Weeks)



UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 07

Students will be able to understand and demonstrate how the program and interface simple microprocessor based systems.

- Objective 0701
Describe basic principles of microprocessors.
 - a. Describe the functional elements of a model microprocessor
 - b. Describe the process of executing instructions in a microprocessor.

- program specification tables
- program flow charts
- decision logic
- branching
- loops

- Students will be able to create program specification tables
- Students will be able to create program flow charts
- Students will be able to create decision logic
- Students will be able to create branching logic
- Students will be able to create loop structures

- flow chart
- specification table
- low level
- high level
- sequential
- object oriented
- loop
- branching
-

c. Name and describe the conventions used in naming signal/control leads in microprocessor integrated chips (ICs)

- Objective 0702
Identify components of a microcomputer
 - a. Identify the five main blocks that constitute a microcomputer system
- Objective 0703
Write simple machine language programs.
 - a. Describe the elements of programming
 - b. Describe the procedures for flowcharting a program or process
 - c. Describe microprocessor codes and addressing modes
 - d. Describe the procedure for instruction coding and program debugging. Draw a flowchart for a typical program.

Leadership Skills



(Week 25, 5 Weeks)



UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 11

Students will understand the need for leadership skills.

- Objective 1101
Serve on a committee.
- Objective 1102
Prepare an agenda.
- Objective 1103
Assist in planning a meeting.
- Objective 1104
Review basic parliamentary procedures.
 - a. Make a main motion
- Objective 1105
Participate in a school project.
- Objective 1106
Attend a community meeting.

- What basic leadership skills are

- Students will be able to describe what basic leadership skills are.
- Students will be able to explain how leadership skills are developed.

- committee
- agenda
- communications

- Objective 1107
Practice effective speaking.
- Objective 1108
Present a three-to-five minute talk.
- Objective 1109
Implement a leadership project.
- Objective 1110
Master a working knowledge of SkillsUSA
 - a. Describe the meaning of the SkillsUSA emblem
 - b. State the SkillsUSA pledge
 - c. Describe the duties of a SkillsUSA officer

Career Planning

(Week 30, 5 Weeks)



UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 12
Students will understand the need for career planning.

- Objective 1201
Define your future occupation.
- Objective 1202
Survey employment opportunities.
- Objective 1203
Report on a trade journal article.
- Objective 1204
Explore opportunities for advanced training.
- Objective 1205
Conduct a worker interview.
- Objective 1206
Contact a professional association.
- Objective 1207
Explore entrepreneurship opportunities.
- Objective 1208
Give a talk about your career.
- Objective 1209
Review career goals.

- How to plan for a successful career

- Students will be able to describe the actions necessary to plan a career.

- Occupation
- Professional Association
- Trade Journal
- Advanced Training
- Employment Opportunity

Personal Computers



(Week 32, 4 Weeks)

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 08
Students will be able to understand and demonstrate the use of personal computers.

- Objective 0801
Connect and operate a personal computer system.
 - a. Describe applications of personal computer systems in an electronic technician's work.
 - b. Describe the principles of operation of a personal computer system, using a block diagram
 - c. Describe the interface and interconnections between the computer and its peripherals.
 - d. Describe the layout and use of a typical keyboard
 - e. Connect and operate a personal computer system.
- Objective 0802
Use operating systems.
 - a. Describe common operating systems and their functions.
 - b. Describe disk and file handling in Windows
 - c. Describe disk and file handling in DOS.
 - d. Use operating systems.
- Objective 0803
Use common applications software packages.
 - a. Describe common types of applications software.
 - b. Use common applications software packages

- Personal computer parts and general operation
- Operating systems common tasks
- Application program common tasks

- The students will be able to identify general personal computer parts and their general operation
- The students will be able to perform operating systems common tasks
- The students will be able to perform application program common tasks

- Operating system
- Application program
- file handling

Employability and Work Habits

(Week 35, 4 Weeks)

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 13
Students will understand the importance of employability and work habits.

- The importance of having good employability skills

- Students willThe importance of having good employability skills

- ethics
- network

- Objective 1301
Develop a list of work standards to follow at school and on the job.
- Objective 1302
Evaluate your personal ethics.
 - a. Evaluate your personal ethics against acceptable workplace ethics.
- Objective 1303
Build a job search network.
- Objective 1304
Find job leads.
- Objective 1305
Write a resume.
- Objective 1306
Create a job portfolio.
- Objective 1307
Complete a job application.
- Objective 1308
Write a business letter and memo.
- Objective 1309
Participate in an actual or simulated job interview.

Documentation and Advanced Subjects



(Week 36, 3 Weeks)

UT: CTE: Skilled and Technical Sciences, UT: Grades 9-12, Advanced Electronics Standard 09
Students will be able to understand and maintain and produce technical documents.

- Objective 0901
Use, maintain and/or produce electronics documentation.
 - a. Describe the types of information that may be found in catalogues, data sheets, bulletins and manuals
 - b. Describe the use of diagrams in electronics.
 - c. Describe methods of record keeping
 - d. Use, maintain and/or

- Technical data research
- Technical data record keeping
- Technical writing

- The students will be able to locate and research Technical data
- The student will be able to perform entry level technical data record keeping
- The student will be able to perform simple technical writing tasks

- Data sheet
- Bulletin
- Diagram

produce electronics
documentation.

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