Electronics and Computer Technology I introduces students to the fundamental electronic concepts necessary for entry into an electronic and computer systems career pathway, which will culminate with industry certifications or additional post-secondary education. Classroom and laboratory experiences will allow students to begin their career preparation in the fundamental electronics concepts of Jobsite Skills, DC Basics, AC Basics, and Personal Computer Design, and will incorporate safety, technical writing, mathematical concepts, and customer service.

- **DOE Code:** 5684
- **Recommended Grade Level:** Grade 11-12
- **Recommended Prerequisites:** Introduction to Advanced Manufacturing
- **Credits:** 2-3 credits per semester, 6 credits maximum.
- **Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- **This course is aligned with postsecondary courses for Dual Credit:**
  - **Ivy Tech**
    - EECT 101- Intro to Electronics & Projects
    - EECT 111- Intro to Circuits Analysis
  - **Vincennes University**
    - ELEC 100- Basic Electricity & Electronics
    - ELEC 110- Basic Component & Circuit Analysis

**Dual Credit**

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

**Application of Content and Multiple Hour Offerings**

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

**Career and Technical Student Organizations (CTSOs)**

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in SkillsUSA, the CTSO for this area.

**Content Standards**

**Domain – Careers**
Core Standard 1 Students analyze career and employment trends in Electronics and Computer Technology to prepare for future employment opportunity

Standards
ECTI-1.1 Understand the importance of electronics and computers in the 21st century
ECTI-1.2 Recognize and explain the convergence of technologies
ECTI-1.3 Investigate various careers associated with electronics and computer technology
ECTI-1.4 Differentiate between the training and certification needed for different careers
ECTI-1.5 Compare the advancement opportunities in various careers
ECTI-1.6 Demonstrate project management skills

Domain – Safety
Core Standard 2 Students apply concepts of safety as outlined in professional and governmental regulation to ensure personal and workplace security.

Standards
ECTI-2.1 Assess tools and hazards that are associated with technician activities in the workplace
ECTI-2.2 Examine ladder handling, usage, and height safety concepts as outlined by OSHA
ECTI-2.3 Recognize service vehicle safety concerns such as transporting ladders, securing equipment and materials, and providing driver screens inside the vehicle
ECTI-2.4 Utilize lockout and tagging rules for potentially unsafe electrical or mechanical hazards
ECTI-2.5 Recognize personal safety precautions for working with electrical and electronic devices
ECTI-2.6 Examine the human physiological reactions electrical shock causes
ECTI-2.7 Break down various degrees of current the human body can tolerate
ECTI-2.8 Explain the concept of First Aid and its particular importance to workers in electric and electronic fields
ECTI-2.9 Compare the different classes of fires (A, B, C & D) and the type of fire extinguishers used to fight them
ECTI-2.10 Research fire safety regulations as specified by National Electrical Code (NEC) and National Fire Protection Association (NFPA) 70
ECTI-2.11 Determine fiber optics hazards to skin and eyes
ECTI-2.12 Outline the safety precautions to be taken when working with diodes, transistors, thyristors, integrated circuits, optoelectronic devices, power supplies, amplifiers, operational amplifiers, oscillators, and wave-shaping circuits
ECTI-2.13 Examine static causes and CMS damage prevention straps, mats, and grounding technology

Domain – Soldering, De-soldering And Tools
Core Standard 3 Students select the appropriate process and tools to perform soldering-desoldering operations.

Standards
ECTI-3.1 Recognize solder safety as it pertains to burns and potential fires or damage to facilities or customer products
ECTI-3.2 Diagnose the cause of solder fumes and the effects of lead poisoning
ECTI-3.3 Examine causes and precautions to prevent or reduce solder splatter
ECTI-3.4 Outline the reasons for flux usage and describe types
ECTI-3.5  Compare types of solder and explain reasons for choosing each type
ECTI-3.6  Classify heat shunts and explain why and how they are used
ECTI-3.7  Recognize cold solder joints and explain the causes
ECTI-3.8  Contrast the differences between good and bad mechanical and electrical solder connections
ECTI-3.9  Demonstrate proper care of solder and de-solder equipment and aids
ECTI-3.10 Assess de-soldering principles
ECTI-3.11 Compare various types of de-soldering equipment and how they are used
ECTI-3.12 Utilize braid-wick solder removers

Domain – DC Basics: Electrical Theory
Core Standard 4 Students analyze basic electrical theory to apply concepts in equipment repair and maintenance.

Standards
ECTI-4.1 Interpret the scientific symbols and metric prefixes used in DC electronics
ECTI-4.2 Recognize the following electronic measurements and their application to DC electronics: current, voltage, resistance, and power
ECTI-4.3 Determine electronic components and their usage: resistors, insulators, conductors, switches, fuses, circuit breakers, and batteries
ECTI-4.4 Select appropriate tools for electronics troubleshooting
ECTI-4.5 Interpret electronic schematic diagrams
ECTI-4.6 Examine basic electrical and magnetic properties and their relation to various materials
ECTI-4.7 Examine multimeter components and usage
ECTI-4.8 Distinguish wire types and construction
ECTI-4.9 Examine wire gauges and identify specific purposes for each wire gauge
ECTI-4.10 List common identifications for copper cables such as #18, #24, and UTP telephone cable
ECTI-4.11 Differentiate between various cable types
ECTI-4.12 Convert fixed numbers to scientific notation
ECTI-4.13 Demonstrate standard metric conversion
ECTI-4.14 Examine Ohms Law and it’s applications in calculating current, voltage, or resistance
ECTI-4.15 Outline the characteristics of DC resistance
ECTI-4.16 Differentiate between various circuits including series, parallel, combination, loaded voltage divider and Wheatstone bridge circuits

Domain – AC Basics: Principles Of Alternating Current
Core Standard 5 Students examine AC wave form characteristics and applications to apply concepts in equipment repair and maintenance.

Standards
ECTI-5.1 Examine AC wave form characteristics: effective voltage (RMS), average voltage, negative alternation, positive alternation, wavelength, amplitude, and period
ECTI-5.2 Calculate peak, RMS, and average voltage values for an AC wave form
ECTI-5.3 Identify the frequency terms: cycle, hertz, and phase
ECTI-5.4 Quote Ohms Law power, voltage, current, and resistance formulas. Solve for circuit
values
ECTI-5.5 Compare capacitor types; list common usages and methods of varying capacitance
ECTI-5.6 Compare inductor types and reasons for various core materials
ECTI-5.7 Recognize common types of transformers and list uses for each; explain why laminations are used
ECTI-5.8 Describe the requirement for inductance in AC electrical circuits identifying the difference between self and mutual inductance
ECTI-5.9 Examine Lenz’s law in complement with Faraday’s law of induction
ECTI-5.10 Deduce the factors used in calculating inductance for a single and multi-layer air core coil
ECTI-5.11 Contrast the differences between reactance and resistance and describe current/voltage relationships
ECTI-5.12 Compare impedance with reactance and resistance; explain the causes and effects of impedance
ECTI-5.13 Calculate power consumption and requirements in inductors in AC circuits
ECTI-5.14 Solve series, parallel and series-parallel problems utilizing each appropriate formula for reactance, voltage, current, and power
ECTI-5.15 Show the different purposes for capacitors and list common types and construction of the different types
ECTI-5.16 Contrast the differences between capacitive reactance and resistance; describe current/voltage relationships
ECTI-5.17 Explain phase relationships of voltage and current for series and parallel RL, RC, and RCL circuits
ECTI-5.18 Examine bandwidth and selectivity for series and parallel resonant circuits
ECTI-5.19 Diagram the component configurations used in PI, L, and T type high and low pass filter circuits

Domain – Circuit Analysis: Analog Devices and Circuits - Optional
Core Standard 6 Students verify circuits and their components ensuring proper operation within various electronic products.
ECTI-6.1 Describe the purpose and use of diodes
ECTI-6.2 Recognize the common types of diodes and their schematic symbols
ECTI-6.3 Describe the purpose and types of a transistor
ECTI-6.4 Identify schematic symbols and leads of a transistor
ECTI-6.5 Describe NPN and PNP transistor bias
ECTI-6.6 Describe the purpose of an amplifier
ECTI-6.7 Describe classes of amplifier operation including CE, CC, and CB amplifiers
ECTI-6.8 Examine multistage, RC coupled, Push-Pull and FET transistor amplifiers
ECTI-6.9 Describe the purpose of transformers
ECTI-6.10 Identify transformer schematic symbols
ECTI-6.11 Describe transformer operating characteristics
ECTI-6.12 Calculate turns ratio, secondary voltage, primary and secondary current and power
ECTI-6.13 Examine power supplies and rectifiers
ECTI-6.14 Investigate Half Wave, Full Wave and Bridge rectifier operation
ECTI-6.15 Examine Zener diode and IC voltage regulator operation
ECTI-6.16 Examine various types of Oscillators and Multivibrator circuits
ECTI-6.17 Investigate various types if trigger circuits including Unijunction transistors, SCRs, Diacs, Triacs and 4 layer diodes
ECTI-6.18 Describe the types operational amplifiers

Domain – Personal Computer Design – Optional
Core Standard 7 Students apply and adapt computer disassembly/assembly procedures to perform various computer troubleshooting, repair and maintenance services.

Standards
ECTI-7.1 Using common practice hand tools, assemble and dissemble a personal computer
ECTI-7.2 Using common practice software and test equipment, troubleshoot and identify malfunctions on computer motherboards, secondary storage devices, and power supplies
ECTI-7.3 Examine the theory of operation, characteristics, and use of system memory
ECTI-7.4 Examine the theory of operation, characteristics, and use of the various buses used in computers
ECTI-7.5 Outline the categories of System Resources theory of operation and their use
ECTI-7.6 Explain the theory of operation, types, characteristics, and use of microprocessors
ECTI-7.7 Examine the operation, characteristics, and use of peripheral devices commonly used with computer systems
ECTI-7.8 Troubleshoot and identify malfunctions on peripheral devices commonly used with computer systems using common practice software and test equipment
ECTI-7.9 Examine the operation, characteristics, and use of current operating systems
ECTI-7.10 Examine the operation and design of laptops and notebooks
ECTI-7.11 Describe the theory of operation and characteristics of File Management systems that are currently in use with computers
ECTI-7.12 Explain the term “Integrated high voltage transformer” supply; explain how it differs from direct and other power supply types
ECTI-7.13 Describe basic computer networking topologies and protocols
ECTI-7.14 Compare and Contrast various common word processing systems with emphasis on specific hot keys
ECTI-7.15 Outline SCSI, termination, and SCSI IDs
ECTI-7.16 Flow Chart General Purpose I/O
ECTI-7.17 Outline Internet Applications

Domain – Electronics Systems Technician (EST) – Optional

Core Standard 8 Students apply and adapt low voltage wiring procedures to ensure proper installation of residential and commercial electronic systems.

Standards
ECTI-8.1 Recognize differences between AC and DC to promote safety, efficiency, and quality on a job/project
ECTI-8.2 Recognize differences between low-voltage and line voltage to promote safety,
efficiency, and quality on the job
ECTI-8.3 Identify the four basic units of measurement used with electricity, and explain how they relate in Ohm’s Law
ECTI-8.4 Interpret construction drawings and symbols on drawings, to promote safety, productivity, and quality on a job/project
ECTI-8.5 Outline the various types of documentation tools and methods used on a job/project. to promote safety, productivity, and quality
ECTI-8.6 Identify hand and power tools and their uses, storage, and maintenance to promote safety, productivity, and quality on a job/project.
ECTI-8.7 Distinguish between various tools and test equipment and identify their uses, storage, and maintenance to promote safety, productivity, and quality on a job/project
ECTI-8.8 Recognize and explain various construction methods and materials used to promote safety, productivity, and quality on a job/project
ECTI-8.9 Select appropriate wire and cable materials to complete specific jobs/projects
ECTI-8.10 Identify termination types, pin-out configuration, wire preparation and termination techniques and connection points on cables and equipment to promote safety, efficiency, accuracy and quality on a job/project
ECTI-8.11 Identify color code standards for telephony, speakers, data, and video to promote safety, efficiency, and quality on a job/project
ECTI-8.12 Compare various fasteners, anchors and back boxes used to mount cable and other equipment to structures to promote safety, efficiency, and quality on the job
ECTI-8.13 Break down installation techniques and procedures to promote quality, efficiency, and safety on the job/project
ECTI-8.14 Examine accepted standards and best practices
ECTI-8.15 Recognize accepted standards and best practices

Domain – Robotics – Optional
Core Standard 9 Students analyze robotic concepts to explore design processes and procedures.

Standards
ECTI-9.3 Determine how signals are sent when controlling a robot
ECTI-9.2 Measure how much current a robot draws
ECTI-9.3 Determine how much a motor will lift
ECTI-9.4 Assess how gear ratios affect speed and torque
ECTI-9.5 Design, build, and test a gear train
ECTI-9.6 Determine if wheel size matters
ECTI-9.7 Examine the use and design of sensors in a robot
ECTI-9.8 Examine the role and use of encoders
ECTI-9.9 Program a robot to perform various tasks
ECTI-9.10 Distinguish between tele-operated (remote control) and autonomous devices
ECTI-9.11 Distinguish between tele-operated (remote control) and autonomous devices

Domain – Mobile Electronics – Optional
Core Standard 10 Students evaluate various mobile electronics systems to ensure proper installation and
service.

**Standards**

ECTI-10.1  Distinguish between various mobile electronic equipment
ECTI-10.2  Demonstrate audio component installation techniques
ECTI-10.3  Examine audio installation components and techniques
ECTI-10.4  Outline security System Architecture
ECTI-10.5  Describe mobile navigation systems
ECTI-10.6  Introduction to Mobile video systems and remote control start