# Competency Task List – Secondary Component

# Electrical, Electronic and Communications Engineering Technology/Technician CIP 15.0303

# High School Graduation Years 2022, 2023, 2024

## 100 Safety

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 101 | Follow OSHA safety regulations. |   |   |
| 102 | Identify, select, and demonstrate proper hand tool use for electronics work. |  |  |
| 103 | Recognize the types and usages of fire extinguishers. |  |  |
| 104 | Interpret Safety Data Sheets (SDS). |  |  |
| 105 | RESERVED |  |  |
| 106 | Explain the chemical and environmental hazards for disposal of electronics equipment. |  |  |
| 107 | Describe electrical shock and list the effects of electric current on the human body. |  |  |

## 200 Electrical Quantities and Components

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 201 | Describe electronic measurements and their applications. |   |   |
| 202 | Identify the fundamental SI units. |   |   |
| 203 | Apply proper scientific and engineering notation. |   |   |
| 204 | RESERVED |   |   |
| 205 | Identify resistor values by color code and numerical markings. |   |   |
| 206 | Identify component symbols used in electronic schematic diagrams. |   |   |
| 207 | Identify schematic symbols for various types of electrical and electronic components. |  |  |
| 208 | RESERVED |  |  |

## 300 Instrumentation

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 301 | Utilize multimeters, function generators, and frequency counters. |  |   |
| 302 | RESERVED |  |   |
| 303 | RESERVED |  |  |
| 304 | Utilize a variable output power supply. |  |  |

## 400 Ohm’s Law/Power

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 401 | Apply the concept of Ohm's law to determine current, voltage, or resistance. |  |   |
| 402 | Identify the relationship between voltage, current, resistance, and power in DC using the 12 basic common formulas derived from Ohm's law and Watt's pie chart. |  |   |
| 403 | RESERVED |  |  |
| 404 | RESERVED |  |  |
| 405 | RESERVED |  |  |

## 500 Series Circuits

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 501 | Apply Kirchhoff's voltage law in a series circuit. |   |   |
| 502 | RESERVED |   |   |
| 503 | RESERVED |  |  |
| 504 | Design/build a series circuit and solve for its equivalent resistance. |  |  |
| 505 | Analyze power consumption, dissipation, and energy units in a series circuit. |  |  |
| 506 | Analyze the effects of open circuits and short circuits in series circuits. |  |  |

## 600 Parallel Circuits

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 601 | Design/build a parallel circuit and solve for its equivalent resistance.  |   |   |
| 602 | Explain voltage in a parallel circuit. |   |   |
| 603 | Apply Kirchhoff's current law in a parallel circuit. |   |   |
| 604 | RESERVED |   |   |
| 605 | Analyze power consumption, dissipation, and energy units in a parallel circuit. |  |  |
| 606 | Analyze the effects of open circuit and short circuit conditions in parallel circuits. |  |  |

## 700 Series-Parallel Circuits

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 701 | Design/build a series-parallel combination circuit and solve for its equivalent resistance. |   |   |
| 702 | Apply Kirchhoff's current and voltage law to a series-parallel circuit. |  |  |
| 703 | Analyze and troubleshoot DC combination/complex circuits. |  |  |
| 704 | Use network theorem to the solutions of series-parallel circuits. |  |  |
| 705 | Measure and calculate maximum power transfer. |  |  |

## 800 Reserved

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 801 | RESERVED |   |   |
| 802 | RESERVED |   |   |
| 803 | RESERVED |   |   |
| 804 | RESERVED |  |  |
| 805 | RESERVED |  |  |
| 806 | RESERVED |  |  |

## 900 Alternating Current

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 901 | Calculate the period and frequency of the waveform. |   |   |
| 902 | Determine the peak-to-peak, average and RMS values of a sine-wave. |   |   |
| 903 | Identify various waveforms (sine wave, square wave, triangle wave, sawtooth wave).  |   |   |

## 1000 Oscilloscope

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1001 | Describe the basic sections of an oscilloscope. |   |   |
| 1002 | Measure voltage using an oscilloscope. |   |   |
| 1003 | Measure frequency using an oscilloscope. |   |   |
| 1004 | Measure phase relationships using an oscilloscope. |  |  |

## 1100 Inductance

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1101 | Calculate the value of the inductor based on physical properties. |   |   |
| 1102 | RESERVED |   |   |
| 1103 | Calculate and measure the total inductance of inductors connected in series or parallel circuits. |   |   |
| 1104 | Calculate and measure RL time constant. |  |  |

## 1200 Inductive Reactance

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1201 | Measure and calculate the effect of inductive reactance on current. |   |   |
| 1202 | Measure and calculate the effect of change in frequency on current. |   |   |
| 1203 | Identify the phase (lead-lag) relationship between current and applied voltage in a series RL circuit. |   |   |
| 1204 | Calculate the total inductive reactance in series and parallel circuits. |  |  |

## 1300 Resistor Inductor (Rl) Circuits in Alternating Current (AC)

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1301 | Use vectors to describe magnitude and direction of voltages. |   |   |
| 1302 | Use vectors in determining total current or voltage in series and parallel RL circuits. |   |   |
| 1303 | Measure and calculate the effect of a series resistive-inductive (RI) circuit on AC voltage and current. |   |   |

## 1400 Transformers

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1401 | Identify transformer windings, types, and usages. |   |   |
| 1402 | Calculate and measure voltage-turns ratio. |   |   |
| 1403 | Measure the effect of secondary load on primary current. |   |   |
| 1404 | Troubleshoot transformers for open and short circuit conditions. |  |  |

## 1500 Capacitance

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1501 | Identify the effect of capacitance in AC and DC circuits. |   |   |
| 1502 | Calculate and measure for equivalent capacitance in series and parallel circuits. |   |   |
| 1503 | Calculate and measure RC time constants. |   |   |

## 1600 Capacitive Reactance

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1601 | Measure and calculate the effect of capacitive reactance on current. |   |   |
| 1602 | Measure and calculate the effect of change in frequency on circuit current. |   |   |
| 1603 | Identify phase (lead-lag) relationship between current and applied voltage in a series RC circuit. |   |   |
| 1604 | Calculate the total capacitive reactance in series and parallel circuits. |  |  |

## 1700 Resistance Capacitance (RC) Circuits

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1701 | Describe magnitude and direction of voltages using vectors. |   |   |
| 1702 | Determining total current or voltage in series and parallel RC circuits using vectors. |   |   |
| 1703 | RESERVED |   |   |
| 1704 | Measure and calculate the effect of a series capacitive-resistive circuit on AC voltage and current. |  |  |

## 1800 Resistance Inductance Capacitance (RLC) Circuits

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1801 | Analyze and construct series RLC circuits. |   |   |
| 1802 | Analyze and construct parallel RLC circuits. |   |   |
| 1803 | RESERVED |   |   |
| 1804 | RESERVED |  |  |

## 1900 Resonance

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 1901 | Calculate and measure the resonant frequency of a series RLC circuit. |   |   |
| 1902 | RESERVED |   |   |
| 1903 | Calculate the Q of a series resonant circuit. |   |   |
| 1904 | Calculate and measure the resonant frequency of a parallel RLC circuit. |  |  |
| 1905 | RESERVED |  |  |
| 1906 | Graph a response curve on a series RLC circuit. |  |  |
| 1907 | Graph a response curve on a parallel RLC circuit. |  |  |

## 2000 Soldering/Desoldering

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2001 | Demonstrate types and usage of soldering/desoldering equipment. |   |   |
| 2002 | Desolder components from a circuit board. |   |   |
| 2003 | Solder components to a circuit board. |   |   |
| 2004 | Demonstrate soldering and de-soldering surface mount device (SMD) methods. |  |  |

## 2100 Diodes

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2101 | Test diodes and identify the cathode and anode. |   |   |
| 2102 | Analyze the voltage-current relationship of diodes by plotting the characteristic curve. |   |   |
| 2103 | Distinguish the correct bias for the operation of a LED. |   |   |
| 2104 | Compare the forward and reverse characteristics of a Zener diode. |  |  |

## 2200 Power Supplies

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2201 | Identify common rectifier circuits (half-wave and full-wave). |   |   |
| 2202 | Construct and analyze the operation of a rectifier circuit. |   |   |
| 2203 | Investigate the cause and effect of power supply filtering, hum, and common filter types. |   |   |
| 2204 | RESERVED |  |  |
| 2205 | Measure and calculate power supply ripple percentage and voltage regulation. |  |  |
| 2206 | RESERVED |  |  |
| 2207 | RESERVED |  |  |
| 2208 | Measure and identify the regulation properties of a shunt-type Zener regulator. |  |  |
| 2209 | Select switch mode power supply for different applications. |  |  |

## 2300 Transistor Characteristics

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2301 | Identify base, emitter, and collector terminals of PNP and NPN transistors. |   |   |
| 2302 | Locate the ratings, characteristics and operating parameters listed on a typical transistor specification/data sheet. |   |   |
| 2303 | Determine the type of transistor, PNP or NPN, and operating condition. |   |   |
| 2304 | Identify schematic symbols and uses for various types of transistors. |  |  |
| 2305 | Compare FET and BJT devices. |  |  |

## 2400 Small Signal Amplifiers

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2401 | Use biasing polarity of NPN or PNP transistors. |   |   |
| 2402 | Calculate and measure gain. |   |   |
| 2403 | Distinguish between basic amplifier configurations. |   |   |
| 2404 | RESERVED |  |  |
| 2405 | RESERVED |  |  |

## 2500 Operational Amplifiers

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2501 | Construct and analyze the phase shift between input and output of an inverting IC Op-Amp. |   |   |
| 2502 | Construct and analyze the phase shift between input and output of a non-inverting IC Op-Amp. |   |   |

## 2600 Basic Digital Electronics

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2601 | Convert between numbering systems (decimal, binary, octal and hexadecimal). |   |   |
| 2602 | RESERVED |   |   |
| 2603 | Identify the operation and develop the truth tables for the seven basic logic gates. |   |   |
| 2604 | Connect combinational logic (multiplexer, demultiplexer, half-adder, full-adder). |  |  |
| 2605 | Apply Boolean reduction and construct Karnaugh mapping for complex logic circuits. |  |  |

## 2700 Reserved

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2701 | RESERVED |   |   |
| 2702 | RESERVED |   |   |

## 2800 Troubleshooting

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2801 | Utilize the order of the troubleshooting process to detect failures in electrical and electronic circuits. |   |   |
| 2802 | Analyze and troubleshoot failures in electrical and electronic circuits. |   |   |

## 2900 Electronic Communications

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 2901 | Identify and explain the major components of a basic communication system. |   |   |
| 2902 | RESERVED |   |   |
| 2903 | Measure and calculate maximum power transfer. |   |   |

## 3000 Motors

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 3001 | Describe the characteristics of AC and DC motors. |   |   |
| 3002 | Describe characteristics of induction and Stepper motors. |   |   |
| 3003 | Explain the difference between brushed and brushless motors. |   |   |
| 3004 | Explain the use and function of a servomechanism. |  |  |
| 3005 | Explain and use motor controllers and speed controllers. |  |  |

## 3100 History of Electronics – Past, Present, and Future

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 3101 | Examine the cause and effect of past, present, and future technologies. |   |   |
| 3102 | RESERVED |   |   |
| 3103 | RESERVED |   |   |

## 3200 Microcontrollers

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Task  | (X) Indicates Proficiency 1 | Secondary Course Crosswalk |
| 3201 | Program and use a microcontroller to read an input and control an output (digital, analog, PWM, and display). |   |   |

1 Student Demonstrated Entry-Level Industry Proficiency as Indicated by (X)

Secondary CTE Instructor Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Student Signature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_