

Colorado CTE Course – Scope and Sequence

Course Name	Avionic Wiring		Course Details	Credit= 0.5 CTE Credential= CTE Transportation, CTE Transportation Operations	
			Course = 0.50 Carnegie Unit Credit		
Course Description	Avionic Wiring is designed to teach students about wiring systems and troubleshooting electronic systems within an aircraft. It covers different types of electrical wires and cables, various preparation and fabrication techniques (cutting, stripping, crimping, soldering, and tying) and installation issues (segregation, tie-wrapping, and chafing).				
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.				
SCED Identification #	20053	Schedule calculation based on 60 calendar days of a 90-day semester. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.			
All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at https://www.cde.state.co.us/standardsandinstruction/essentialskills					
Instructional Unit Topic	Suggested Length of Instruction	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Safety		Apply safety concepts and rules when working with electrical components and wiring.	Demonstrate general lab safety rules and procedures. Student is expected to: (A) describe general shop safety rules and procedures; (B) demonstrate knowledge of OSHA and its role in workplace safety; (C) comply with require use of personal protective equipment; (D) use safe procedures for handling tools and equipment; and		

			(E) operate lab equipment according to safety guidelines.		
Basic Electricity		Understand the concepts of basic electricity and its application to the aviation industry.	<p>Apply knowledge of electricity and circuits to aviation repair and maintenance tasks.</p> <p>Student is expected to:</p> <ul style="list-style-type: none"> A) apply basic rules when working with static discharge. B) apply and understanding of the use of electrical diagrams. C) identify electrical measuring instruments and their application; and D) inspect, check, and perform basic repairs of aircraft electrical systems. 	<p>Describe how voltage and current are controlled in DC generator or alternator systems.</p> <p>Explain how equalization of electrical load is accomplished in an aircraft electrical system that uses two DC generators or alternators.</p> <p>Read and record voltage and output for each generator or alternator in an operating system.</p> <p>Adjust voltage regulators and load equalization in an operating system.</p> <p>Demonstrate flashing of a generator field.</p> <p>Check operation of the reverse current cutout relays.</p> <p>Locate and correct an open or short circuit malfunction.</p>	
Aircraft Wiring and Cables		Understand the technical aspects of aircraft wiring and cabling.	Apply knowledge of aircraft wiring and cables for installation and repair. Student is expected to:	<p>Define unshielded twisted pair (UTP)-show understanding and where it is used</p> <p>Demonstrate ability to install and troubleshoot RJ45/48</p>	

			<ul style="list-style-type: none"> A) identify various coaxial cabling used in aviation; B) understand and apply the concept of impedance C) explain how bandwidth is used in aviation D) define stray capacitance and magnetic induction E) list possible effects of cable chaffing F) understand how to prepare, install, and properly ground and bond aircraft cabling. 	<p>telephone connectors and fittings.</p> <p>Calculate wavelength for several different aircraft communications frequencies.</p> <p>Discuss Impedance and explain its importance in aircraft cabling.</p> <p>Explain bandwidth as used in aircraft cabling systems.</p> <p>Explain the differences between coax types RG 58, RG 59, RG 11 and RG 6 Describe Heliac cable and indicate where it is used in avionics applications.</p> <p>List the impedance factors which affect signals in coaxial, twisted pair and fiber cables.</p> <p>Define stray capacitance and magnetic induction List possible effects of cable chaffing.</p> <p>Describe how to locate a short or an open in an aircraft cable Properly prepare and fabricate cable connectors for twisted pair, coaxial cables</p>	
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				and fiber. Properly ground and bond aircraft cabling. Discuss wave-guide signal (transmission / reception) and show where wave-guides are used in aircraft	
Technical Data Systems		Understand how technical data systems work in an aircraft to record and monitor flight data and safety information.	Describe the major wireless communications systems used in avionics. Student is expected to: <ul style="list-style-type: none"> A) describe the basics of wired voice communications B) explain how basic telephone systems work C) explain how electronic engine controls are used in today's aircraft D) understand the mechanisms an aircraft uses to monitor and sense flight information. E) identify Aircraft warning systems. F) list where servo motors and syncros are used in aircraft. G) describe how autopilots 	Explain the principles used in Distance Measuring Equipment. Draw a block diagram showing how basic instrument landing systems operate. Explain the operation of Ground Proximity Warning systems. Explain the operation of Aircraft Proximity Warning systems. Explain the difference between Stall Warning systems and Angle of Attack sensors. Explain the principles used in Distance Measuring Equipment. Describe an Inertial Reference system. Define IFF (explain how and where it is used).	

			<p>control aircraft functions.</p> <p>H) understand how Air Data Computers are connected within the aircraft</p> <p>I) understand how RADAR and Emergency Locator Transistors are used in aviation.</p> <p>J) list the major components of the Marker Beacon system</p> <p>K) list the components of a Fuel Indicating system</p> <p>L) define "GLONASS"</p>	<p>Describe how autopilots control aircraft functions.</p> <p>Draw a block diagram showing how Air Data Computers are connected within the aircraft.</p> <p>List the frequency ranges of common RADAR systems used on commercial aircraft</p> <p>Discuss how Emergency Locator Transmitters (EPIRBs) are used in aviation.</p> <p>Draw a diagram that visually describes how GPS-Global Positioning Systems operate.</p>	
Soldering on Terminals, PC Boards and Connectors		Demonstrate knowledge in the use of soldering in an electrical environment.	<p>Apply terminals, splicing, and crimping Techniques. Student is expected to:</p> <p>A) demonstrate technical skills for installing soldered and crimped terminals and splices on aircraft wire;</p> <p>B) demonstrate lacing and tying;</p>	<p>Demonstrate ability to install, inspect, and service aircraft electrical wiring:</p> <ul style="list-style-type: none"> • Wire selection • Clamps and tying • Power supplies • Switches • Electrical terminals • Breakaway wire • High tension electrical wire • Low tension wire • Thermocouple leads 	

			<p>C) select wiring by grade and application; and</p> <p>D) connect electrical components to power supply.</p>	<ul style="list-style-type: none"> • Solder crimped terminal and splices • Pins and sockets in connectors 	
Harness Fabrication and Installation		<p>Demonstrate knowledge of electrical wiring to fabricate and install a wiring harness.</p> <p>Perform component installation and removal.</p>	<p>Fabricate and install aviation harness. Student is expected to:</p> <p>A) identify various electronic and electrical component schematic symbols;</p> <p>B) understand the use of signal filters;</p> <p>C) identify the components used communications equipment;</p> <p>D) describe the differences between display components; and</p> <p>E) understand active and passive filters.</p>	<p>Describe the use of signal filters and list several types.</p> <p>Explain the use of crystals and show various circuits they may be used in.</p> <p>Identify the components used in the power supply section of communications equipment.</p> <p>Explain the practicality of circuit board substitution versus component level parts replacement.</p> <p>Describe the differences between display components such as CRTs, LEDs and LCDs Contrast active filters used in avionics equipment and passive filters.</p>	
Fiber Optics		<p>Understand a basic knowledge of the use of fiber optics and its use.</p>	<p>Student is expected to:</p> <p>A) identify fiber optic cabling and where it is used</p>	<p>Compare fiber optic cabling with coaxial or copper utilized in aircraft systems.</p>	

			<p>in aircraft technology; and</p> <p>B) investigate fiber optic assemblies.</p>	<p>Research issues related to fiber optic systems on various commercial and military aircraft. Discuss the problems and issues (i.e. issues with fly-by-light) and identify some approaches to alleviate these problems.</p> <p>Clean and test fiber optic assemblies.</p>	
Inspection and Troubleshooting		<p>Inspect aircraft electrical systems.</p> <p>Troubleshoot aircraft electrical systems malfunctions.</p>	<p>Demonstrate ability to install and troubleshoot interconnecting wiring of aircraft. Student is expected to:</p> <p>A) understand the risk analysis tool (RAT) developed by the FAA to identify common wiring issues;</p> <p>B) understand the importance of the electrical wiring interconnection systems; and</p> <p>C) practice troubleshooting electrical wiring issues.</p>	<p>Demonstrate understand in RAT and how it works. Identify three types of EWIS failures: wire bundle, bundle level, and zonal level. Explain what these failures are and how a technician would troubleshoot their issues.</p> <p>Given various wiring failure scenarios, identify the steps a technician would take to troubleshoot the issue.</p>	

