CareerClusters™ PATHWAYS TO COLLEGE & CAREER READINESS
Transportation, Distribution & Logistics

Learning that works for Colorado CTE®

Colorado CTE Course – Scope and Sequence

Course Name	**Electrical Systems Diagnostics & Repair**	**Course Details** **Course = 0.50 Carnegie Unit Credit**	**Credit= 0.5**
Course Description	Provides a comprehensive study of the theory, operation, diagnosis, and repair of vehicle accessories and electrical systems.		
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 #	20105	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		Understand industry expectations for safety in the workplace.	Describe safety practices to be followed when performing engine service. Student is expected to: (A) demonstrate use of personal protective equipment; and (B) demonstrate safe use and operation of all tools, and equipment.		
Fundamentals of Electrical Systems		Understand and apply knowledge of electricity to automotive repair and service.	Understand and apply knowledge of electricity to automotive repair and service. Student is expected to: (A) explain the fundamental application of electricity in automotive electrical systems;		

			(B) explain Ohm's Law and its calculations (C) identify conductors and insulators in automotive electrical systems; (D) identify current flow in automotive electrical systems; (E) identify sources of electricity in automobiles and trucks; and (F) read automotive electrical circuit diagrams.		
Batteries		Understand how batteries operate and are used in automotive systems.	Understand how batteries are used in automotive systems. Student is expected to: (A) explain battery operating principals; (B) explain battery capacity; (C) explain electronic memory functions; (D) explain the safety precautions for high-voltage circuits; (E) explain how a hybrid vehicle battery is serviced; (F) perform battery state of charge testing; and (G) explain battery maintenance and replacement procedures.		

Diagnosis and Repair of Electrical Circuits		Apply knowledge of electrical theory, electrical components and testing equipment to service and repair automotive electrical circuits and systems.	Diagnosis and repair electrical circuits and automotive electrical systems. Student is expected to: (A) use digital multimeters to test electrical systems and their components; (B) explain voltage drop and perform voltage drop tests (C) explain and perform current tests (D) explain and perform resistance tests; (E) explain and perform output tests; (F) explain how generators/alternators function; (G) identify issues related to charging of a system; (H) differentiate between slow-crank and no-crank conditions; and identify issues related to starter relays and solenoids.	1. Use wiring diagrams during the diagnosis and troubleshooting of electrical/electronic circuit problems. 2. Diagnose the cause(s) of excessive key-off battery drain including parasitic draw; determine needed action. 3. Perform starter current draw test; determine necessary action. 4. Perform starter circuit voltage drop tests; determine necessary action. 5. Inspect and test starter relays and solenoids; determine necessary action. 6. Remove and install starter in a vehicle. 7. Inspect and test switches, connectors, and wires of starter control circuits; determine necessary action. 8. Explain the operation of an automatic idle-stop/start-stop system. 9. Differentiate between electrical and engine mechanical problems that cause a slow-crank or a no-crank condition. 10. Perform charging system output test;	

				determine necessary action. 11. Inspect, adjust, and/or replace generator/alternator drive belts; check pulleys and tensioners for wear; check pulley and belt alignment. 12. Remove, inspect, and/or replace generator/alternator. 13. Perform charging circuit voltage drop tests; determine necessary action. 14. Diagnose and troubleshoot charging system for causes of undercharge, no-charge, or overcharge conditions.	
Troubleshoot vehicle electrical systems			Apply knowledge of electrical systems and circuits to troubleshoot and repair vehicle electrical issues: (A) identify and repair issues related to vehicle lighting systems; (B) identify and repair issues related to supplemental restraint systems (SRS); (C) identify and repair issues related to windshield wipers; (D) identify and repair issues related to	Troubleshooting Lighting Systems Repair: 1. Inspect interior and exterior lamps and sockets including headlights and auxiliary lights including fog lights/driving lights; replace as needed. 2. Aim headlights. 3. Diagnose and troubleshoot the causes of brighter-than-normal, intermittent, dim, or no light operation; determine needed action.	

			driver warning systems; (E) identify and repair issues related to vehicle accessories.	4. Identify system voltage and safety precautions associated with high-intensity discharge headlights. Verify operation of instrument panel gauges and warning/indicator lights; reset maintenance indicators. Disable and enable Supplemental Restraint System (SRS); verify indicator lamp operation. Other: Describe the operation of keyless entry/remote-start systems. Remove and reinstall door panel.	
