



## COURSE OUTLINE: CVC614 - ELECTRICAL SYSTEMS

Prepared: Josh Boucher

Approved: Corey Meunier, Dean, Technology, Trades, and Apprenticeship

<b>Course Code: Title</b>	CVC614: ELECTRICAL SYSTEMS
<b>Program Number: Name</b>	6080: COMM VEHICLE-COMMON
<b>Department:</b>	MOTIVE POWER APPRENTICESHIP
<b>Academic Year:</b>	2024-2025
<b>Course Description:</b>	Upon successful completion the apprentice is able to describe the principles of electricity following accepted scientific theories and the laws governing electricity, is able to use basic electrical test equipment, is able to trace, test and repair electrical circuits, is able to locate and test circuits and components, is able to diagnose and repair electrical circuits, is able to describe the operation of electromagnetic devices, and is able to service, test and evaluate batteries - all according to manufacturers` recommendations, schematics and specifications.
<b>Total Credits:</b>	6
<b>Hours/Week:</b>	0
<b>Total Hours:</b>	48
<b>Prerequisites:</b>	There are no pre-requisites for this course.
<b>Corequisites:</b>	There are no co-requisites for this course.
<b>Essential Employability Skills (EES) addressed in this course:</b>	<p>EES 1 Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.</p> <p>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>EES 3 Execute mathematical operations accurately.</p> <p>EES 4 Apply a systematic approach to solve problems.</p> <p>EES 5 Use a variety of thinking skills to anticipate and solve problems.</p> <p>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</p> <p>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.</p> <p>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</p> <p>EES 10 Manage the use of time and other resources to complete projects.</p> <p>EES 11 Take responsibility for ones own actions, decisions, and consequences.</p>
<b>Course Evaluation:</b>	<p>Passing Grade: 50%, D</p> <p>A minimum program GPA of 2.0 or higher where program specific standards exist is required for graduation.</p>



**Other Course Evaluation & Assessment Requirements:**

Theory tests 50%  
 Shop Practical 30%  
 Assignments 20%

**Books and Required Resources:**

Heavy Duty Truck Systems by Bennett  
 Publisher: cengage Edition: 6th

Medium /Heavy Duty Truck Engines, Fuels and Computers by Bennett  
 Publisher: Cengage

**Course Outcomes and Learning Objectives:**

Course Outcome 1	Learning Objectives for Course Outcome 1
<p>Upon successful completion the apprentice is able to describe the principles of electricity following accepted scientific theories, be able to describe the laws governing electricity, use basic electrical test equipment, trace, test, and repair electrical circuits, Batteries and components safely following manufacturers` recommendations.</p>	<p><b>LEARNING OUTCOME AND CONTENT</b>          Upon successful completion, the apprentice is able to:          4.2.1 Explain the fundamentals of electrical laws.          [2/0] - Ohms Law          - state law          - mathematical relationship between current, voltage, and resistance          - Watts Law          - state law          - mathematical relationship between current, voltage, and wattage          - Kirchoffs Laws          - state laws          -current law          -voltage law          - mathematical relationship of individual voltage drops to circuit voltage</p> <p><b>LEARNING OUTCOMES AND CONTENT</b>          Upon successful completion, the apprentice is able to:          4.3.1 Explain the purpose and fundamentals of electrical test equipment.          [1/0] - analog and digital instruments          - voltmeter          - ammeter          - ohmmeter          - electronic service tools (EST)          - test lamp          4.3.2 Identify the function, types, and application of electrical test equipment.          [4/0] - analog and digital instruments          - voltmeter          - ammeter          - ohmmeter          - electronic service tools (EST)          - message identifiers (MIDs)          - parameters identifiers (PIDs)          - subsystem identifiers (SIDs)          - fault mode indicators (FIMs)</p>



- communication protocol J1939 and J1587/1708
- test lamp
- select scale appropriate to test being performed

#### LEARNING OUTCOMES AND CONTENT

Upon successful completion, the apprentice is able to:

4.4.1 Explain the fundamentals of electrical circuits.

[1/0] - define the following terms:

- voltage
- amperage
- resistance
- wattage
- grounds
- power source
- circuit related electrical fundamentals

4.4.2 Identify the construction features, composition, types, and application of electrical circuits.

[3/0] - electrical schematics and symbols

- electrical circuit formulae
- series, parallel, and series-parallel circuits
- circuit characteristics

4.4.3 Perform circuit calculations to verify Ohms and Kirchoffs Laws.

[0/2] - apply Ohms Law to the following:

- series, parallel, and series-parallel circuits
- circuit calculations

4.4 Perform tests of electrical circuits following manufacturers recommendations using selected meters to measure voltage, amperage, and resistance.

[0/2] - circuit board test exercises

- simulated electrical circuit tests
- identify vehicle electrical circuits
- demonstrate the comparison between measured and calculated circuit performance

#### LEARNING OUTCOMES AND CONTENT

Upon successful completion, the apprentice is able to:

4.5.1 Explain the purpose and function of vehicle electrical circuit schematics and protection devices.

[1/0] - schematics

- symbol
- fuses/breakers/fusible links
- virtual fuses/breakers (current protected drivers)
- circuit identification

4.5.2 Identify the construction features, type, style, and application of wiring diagrams.

[3/0] - wiring schematics

- line type
- Valley Forge type



- Illustrated
- Deutsche International (DIN)
- electrical symbols
- protection devices
- circuit breakers
- fuses
- virtual fuses/breakers (current protected drivers)
- fusible links
- wiring and connectors
- wire size configuration American Wire Gauge (AWG)/system international unit (s.i.)
- identification
- composition
- terminal configuration (multi-pin, layout)

#### LEARNING OUTCOMES AND CONTENT

Upon successful completion, the apprentice is able to:

4.6.1 Explain electrical circuit failures.

[1/0] - opens

- shorts
- unintentional grounds
- high resistance conditions

4.6.2 Identify the characteristics of electrical circuit failures.

[1/0]

- opens
- shorts
- unintentional grounds
- high resistance conditions

4.6.3 Describe the construction, types, styles, and application of electrical circuit connectors.

[2/0] - proprietary connectors (Weatherpack-Deutsch)

- soldered and solderless joints
- heat shrink tubing
- connectors
- corrosive protection materials

4.6.4 Perform reconditioning or repair procedures following manufacturers' recommendations for electrical circuits.

[0/4] - repair of electrical circuit connectors for:

- proprietary connectors/tools (e.g. Weatherpack-Deutsch)
- soldered and solderless joints
- heat shrink tubing
- identification corrosive protection materials

4.5.3 Perform component location and condition assessment exercise following manufacturers' recommendations.

[0/3] - pin-out test

- component function test (switches, ect.)



- identify component location using equipment schematics

**Evaluation Process and Grading System:**

<b>Evaluation Type</b>	<b>Evaluation Weight</b>
assignments	20%
Shop Practical	30%
Theory	50%

**Date:**

November 12, 2024

**Addendum:**

Please refer to the course outline addendum on the Learning Management System for further information.

