



## COURSE OUTLINE: HET814 - ELECT/ELECTRONIC SYS

Prepared: Josh Boucher

Approved: Corey Meunier, Chair, Technology and Skilled Trades

<b>Course Code: Title</b>	HET814: ELECTRICAL/ELECTRONIC SYSTEMS
<b>Program Number: Name</b>	6086: HDE TECH LEVEL III
<b>Department:</b>	MOTIVE POWER APPRENTICESHIP
<b>Semesters/Terms:</b>	20W
<b>Course Description:</b>	Upon successful completion the apprentice is able to recommend repair of charging systems, is able to test and computerized management systems and is able to test and diagnose electrical circuit defects following manufacturers' recommendations.
<b>Total Credits:</b>	5
<b>Hours/Week:</b>	5
<b>Total Hours:</b>	40
<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>	<div>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.</div> <div>EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.</div> <div>EES 3 Execute mathematical operations accurately.</div> <div>EES 4 Apply a systematic approach to solve problems.</div> <div>EES 5 Use a variety of thinking skills to anticipate and solve problems.</div> <div>EES 6 Locate, select, organize, and document information using appropriate technology and information systems.</div> <div>EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.</div> <div>EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.</div> <div>EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.</div> <div>EES 10 Manage the use of time and other resources to complete projects.</div> <div>EES 11 Take responsibility for ones own actions, decisions, and consequences.</div>
<b>Course Evaluation:</b>	Passing Grade: 50%, D
<b>Other Course Evaluation &amp; Assessment Requirements:</b>	<div>Grade</div> <div>Definition Grade Point Equivalent</div> <div>A+ 90 - 100% 4.00</div> <div>A 80 - 89%</div> <div>B 70 - 79% 3.00</div> <div>C 60 - 69% 2.00</div> <div>D 50 - 59% 1.00</div> <div>F (Fail) 49% and below 0.00</div>



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CR (Credit) Credit for diploma requirements has been awarded.  
 S Satisfactory achievement in field /clinical placement or non-graded subject area.  
 U Unsatisfactory achievement in field/clinical placement or non-graded subject area.  
 X A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.  
 NR Grade not reported to Registrar's office.  
 W Student has withdrawn from the course without academic penalty.

**Books and Required Resources:**

Heavy Duty Truck Systems by Sean Bennett  
 Edition: 6

**Course Outcomes and Learning Objectives:**

Course Outcome 1	Learning Objectives for Course Outcome 1
Upon successful completion the apprentice is able to recommend repair of charging systems following manufacturers` recommendations.	4.1.1 Explain the purpose and fundamentals of charging system components. <ul style="list-style-type: none"> <li>- current flow</li> <li>- diodes</li> <li>- electromagnetism</li> <li>- voltage induction</li> <li>- inductive reactance of stator</li> <li>- battery conditions as affecting internal resistance</li> <li>- principles of tracing wiring schematics</li> <li>- electrical/electronic symbols</li> <li>- Ohm`s law</li> <li>- temperature effects</li> <li>- factors affecting voltage and amperage output</li> </ul> field strength rotor speed - inductor reactance 4.1.2 Identify the types and construction features of charging system components. <ul style="list-style-type: none"> <li>- brush-type alternators</li> </ul> rectifier stator <ul style="list-style-type: none"> <li>o delta</li> <li>o wye</li> </ul> rotor <ul style="list-style-type: none"> <li>o field winding</li> <li>o poles</li> <li>o slip rings</li> </ul> diode trio brush assembly case bearings and pulleys <ul style="list-style-type: none"> <li>- brushless alternators</li> </ul> stationary field magnetic poles stator rectifier transformer 12/24 volt system <ul style="list-style-type: none"> <li>- voltage regulators</li> </ul> external electronic internal electronic

		<p>electronic digital</p> <p>4.1.3 Describe the principles of operation of charging systems.</p> <ul style="list-style-type: none"> <li>- brush-type alternators <ul style="list-style-type: none"> <li>rectifier <ul style="list-style-type: none"> <li>o full-bridge</li> <li>o half-bridge</li> </ul> </li> <li>induction principles</li> <li>electromagnetism <ul style="list-style-type: none"> <li>o induction</li> <li>o inductive reactance</li> </ul> </li> <li>alternating current</li> <li>three-phase</li> </ul> <li>- brushless alternators</li> <li>- dual voltage alternator</li> </li></ul> <p>transformer principle</p> <ul style="list-style-type: none"> <li>- voltage regulator</li> </ul> <p>electronic principles</p> <p>load response</p> <p>4.1.4 Perform inspection and diagnostic procedures following manufacturers' recommendations for charging systems.</p> <ul style="list-style-type: none"> <li>- visual inspection</li> </ul> <p>belt tension and alignment</p> <p>connections and wiring</p> <p>battery and alternator specifications and application</p> <ul style="list-style-type: none"> <li>- outline recommended charging system testing sequence</li> <li>- battery condition tests</li> <li>- charging circuit resistance voltage drop tests</li> <li>- charging system current and voltage output tests</li> <li>- identify specific charging system faults from test results</li> <li>- alternator bench testing for output current and voltage</li> <li>- voltage regulator bench tests</li> <li>- identify electronic noise suppression devices</li> </ul> <p>4.1.5 Recommend reconditioning or repair procedures following manufacturers' recommendations for charging systems.</p> <ul style="list-style-type: none"> <li>- verify output capacity to satisfy the specific vehicle electrical load specifications</li> <li>- perform adjusting procedures of alternator drive belt tension and alignment</li> <li>- remove and replace an alternator and verify operation</li> </ul>
	<b>Course Outcome 2</b>	<b>Learning Objectives for Course Outcome 2</b>
	Upon successful completion the apprentice is able to test and computerized management systems following manufacturers' recommendations.	<p>4.2.1 Explain the fundamentals of Electronic Control Modules computerized management systems</p> <ul style="list-style-type: none"> <li>- analog/digital signals</li> <li>- binary systems</li> <li>- logic gates</li> <li>- multiplexing</li> </ul> <p>data bus protocols</p> <p>ISO and Non ISO protocols</p>



- fibre optics

4.2.2 Identify the types and construction features of computerized management systems

- input devices

sensors

switches

data links

- central processing unit

- data storage

Random Access Memory (RAM)

Read Only Memory (ROM)

Programmable Read Only memory (PROM)

Erasable Programmable Read Only Memory (EPROM)

Electrically Erasable Programmable Read Only Memory (EEPROM)

- output circuits

reference voltage

relays

solenoids

power modules

4.2.3 Describe the principles of operation of computerized management systems.

- analog to digital converters

- signal filtration

- central processing unit (CPU)

- processing cycle

- logic sequencing

- data storage

- output circuits

4.2.4 Perform inspection and diagnostic procedures for computerized management systems following manufacturers' recommendations.

- code identification

FMI (failure mode Identification)

DTC (diagnostic trouble code)

Audit trails

Clearing codes

- demonstrate (EST) electronic service tool diagnostic tests

- electronic service tool diagnostic tests

reprogramming ECM

- diagnostic codes extraction

- demonstrate sensor input tests

- demonstrate output device tests

4.2.5 Recommend reconditioning or repairs following manufacturers' recommendations for computerized management systems.

- identify static electricity and induction interference

prevention procedures

- outline (ECM) electronic control module replacement procedures

reprogramming ECM



	extracting data from old ECM						
<b>Course Outcome 3</b>	<b>Learning Objectives for Course Outcome 3</b>						
Upon successful completion the apprentice is able to test and diagnose electrical circuit defects following manufacturers` recommendations.	<p>4.3.1 Explain the fundamentals of electrical circuit diagnosis.</p> <ul style="list-style-type: none"><li>- visual inspection</li><li>corrosion</li><li>overheating</li><li>broken wires</li><li>odour</li><li>- verify meter integrity</li><li>accuracy</li><li>meter connections</li><li>calibration</li><li>- schematic and circuit relationships</li></ul> <p>4.3.2 Identify types of circuit failures.</p> <ul style="list-style-type: none"><li>- opens</li><li>- shorts</li><li>- unintentional grounds</li><li>- high resistance</li></ul> <p>4.3.3 Perform testing and diagnostic procedures following manufacturers` recommendations for electrical circuit failures.</p> <ul style="list-style-type: none"><li>- visual circuit test procedures</li><li>- meter circuit testing procedures</li><li>- electrical circuit diagnostic procedures</li><li>test light vs. multi-meter for diagnosing</li></ul>						
<b>Evaluation Process and Grading System:</b>	<table><tr><td><b>Evaluation Type</b></td><td><b>Evaluation Weight</b></td></tr><tr><td>Shop Assignments</td><td>40%</td></tr><tr><td>Theory Test</td><td>60%</td></tr></table>	<b>Evaluation Type</b>	<b>Evaluation Weight</b>	Shop Assignments	40%	Theory Test	60%
<b>Evaluation Type</b>	<b>Evaluation Weight</b>						
Shop Assignments	40%						
Theory Test	60%						
<b>Date:</b>	February 10, 2020						
<b>Addendum:</b>	Please refer to the course outline addendum on the Learning Management System for further information.						

