COURSE OUTLINE: HET814 - ELECT/ELECTRONIC SYS

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Approved: Corey Meunier, Chair, Technology and Skilled Trades

Course Code: Title	HET814: ELECTRICAL/ELECTRONIC SYSTEMS
Program Number: Name	6086: HDE TECH LEVEL III
Department:	MOTIVE POWER APPRENTICESHIP
Semesters/Terms:	20W
Course Description:	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.
Total Credits:	5
Hours/Week:	5
Total Hours:	40
Prerequisites:	There are no pre-requisites for this course.
Corequisites:	There are no co-requisites for this course.
Essential Employability Skills (EES) addressed in this course:	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.
	EES 2 Respond to written, spoken, or visual messages in a manner that ensures effective communication.
	EES 3 Execute mathematical operations accurately.
	EES 4 Apply a systematic approach to solve problems.
	EES 5 Use a variety of thinking skills to anticipate and solve problems.
	EES 6 Locate, select, organize, and document information using appropriate technology and information systems.
	EES 7 Analyze, evaluate, and apply relevant information from a variety of sources.
	EES 8 Show respect for the diverse opinions, values, belief systems, and contributions of others.
	EES 9 Interact with others in groups or teams that contribute to effective working relationships and the achievement of goals.
	EES 10 Manage the use of time and other resources to complete projects.
	EES 11 Take responsibility for ones own actions, decisions, and consequences.
Course Evaluation:	Passing Grade: 50%, D
Other Course Evaluation & Assessment Requirements:	Grade Definition Grade Point Equivalent A+ 90 - 100% 4.00 A 80 - 89% B 70 - 79% 3.00 C 60 - 69% 2.00 D 50 - 59% 1.00 F (Fail) 49% and below 0.00

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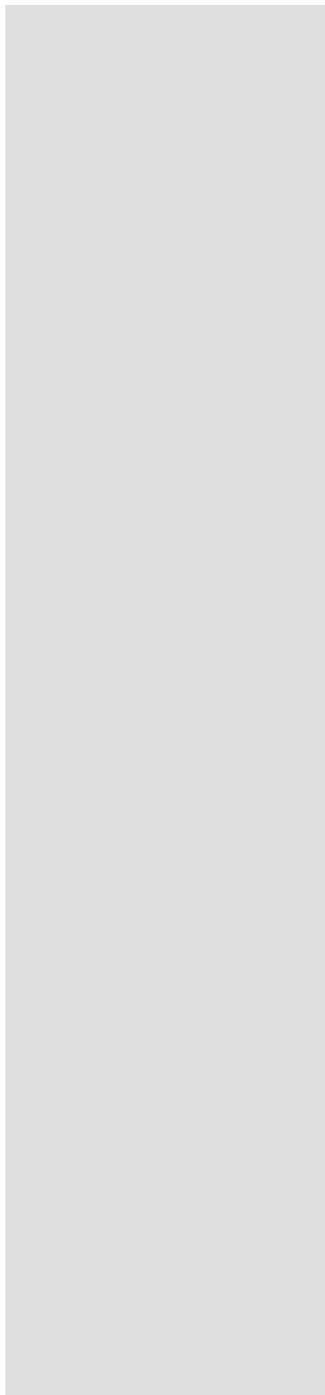
CR (Credit) Credit for diploma requirements has been awarded.
S Satisfactory achievement in field /clinical placement or non-graded subject area.
U Unsatisfactory achievement in field/clinical placement or non-graded subject area.
X A temporary grade limited to situations with extenuating circumstances 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. - current flow - diodes - electromagnetism - voltage induction - inductive reactance of stator - battery conditions as affecting internal resistance - principles of tracing wiring schematics - electrical/electronic symbols - Ohm`s law - temperature effects - factors affecting voltage and amperage output field strength rotor speed - inductor reactance 4.1.2 Identify the types and construction features of charging system components. - brush-type alternators rectifier stator o delta o wye rotor o field winding o poles o slip rings diode trio brush assembly case bearings and pulleys - brushless alternators stationary field magnetic poles stator rectifier transformer 12/24 volt system - voltage regulators external electronic internal electronic

electronic digital

4.1.3 Describe the principles of operation of charging systems.
- brush-type alternators
rectifier
o full-bridge
o half-bridge
induction principles
electromagnetism
o induction
o inductive reactance
alternating current
three-phase
- brushless alternators
- dual voltage alternator
transformer principle
- voltage regulator
electronic principles
load response

4.1.4 Perform inspection and diagnostic procedures following manufacturers`
recommendations for charging systems.
- visual inspection
belt tension and alignment
connections and wiring
battery and alternator specifications and application
- outline recommended charging system testing sequence
- battery condition tests
- charging circuit resistance voltage drop tests
- charging system current and voltage output tests
- identify specific charging system faults from test results
- alternator bench testing for output current and voltage
- voltage regulator bench tests
- identify electronic noise suppression devices

4.1.5 Recommend reconditioning or repair procedures following manufacturers`
recommendations for charging systems.
- verify output capacity to satisfy the specific vehicle
electrical load specifications
- perform adjusting procedures of alternator drive belt
tension and alignment
- remove and replace an alternator and verify operation

Course Outcome 2	Learning Objectives for Course Outcome 2
Upon successful completion the apprentice is able to test and computerized management systems following manufacturers` recommendations.	4.2.1 Explain the fundamentals of Electronic Control Modules computerized management systems - analog/digital signals - binary systems - logic gates - multiplexing data bus protocols ISO and Non ISO protocols

- 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)
Electronically 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
	Course Outcome 3	**Learning Objectives for Course Outcome 3**
	Upon successful completion the apprentice is able to test and diagnose electrical circuit defects following manufacturers` recommendations.	4.3.1 Explain the fundamentals of electrical circuit diagnosis. - visual inspection corrosion overheating broken wires odour - verify meter integrity accuracy meter connections calibration - schematic and circuit relationships 4.3.2 Identify types of circuit failures. - opens - shorts - unintentional grounds - high resistance 4.3.3 Perform testing and diagnostic procedures following manufacturers` recommendations for electrical circuit failures. - visual circuit test procedures - meter circuit testing procedures - electrical circuit diagnostic procedures test light vs. multi-meter for diagnosing

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Shop Assignments	40%
Theory Test	60%

Date:

February 10, 2020

Addendum:

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