TRN 120 Basic Transportation Electricity

COURSE DESCRIPTION:

Prerequisites: None
Corequisites: None

This course covers basic electrical theory, wiring diagrams, test equipment, and diagnosis, repair and replacement of batteries, starters, and alternators. Topics include Ohm's Law, circuit construction, wiring diagrams, circuit testing, and basic troubleshooting. Upon completion, students should be able to properly use wiring diagrams, diagnose, test, and repair basic wiring, battery, starting, charging, and electrical concerns. Course Hours per Week: Class, 4. Lab, 3. Semester Hours Credit, 5

STUDENT LEARNING OUTCOMES:

After completing the course requirements, the student will be able to
(Statewide outcomes)

a. Demonstrate work place safety related to transportation electrical systems.
b. Interpret and apply wiring diagram information on a transportation vehicle electrical system.
c. Demonstrate the proper use of electrical diagnostic test equipment.
d. Use Ohm's law to calculate the value of any of the following given the values of the remaining variables: Voltage (V), Resistance (R), Amperage (A)
e. Given a transportation vehicle with a fault in the battery, starting, and charging system, students will be able to perform successful diagnosis and repairs.
f. Demonstrate the ability to obtain appropriate service information on electrical circuit construction.

(Local outcomes)

g. Explain the basic principles of direct current electricity, magnetism, inductance, and capacitance.
h. Identify circuit types and circuit symbols.
i. Identify and use circuit test equipment.
j. Use schematics and perform circuit testing.
k. Diagnose and repair variouss102uyaMD(/MCID 58 >>BD10 (o)-2 (uso)- 7.81 2O-2 -ph)-4 (e)err
    A. Procedures and policies
    B. Required materials and supplies
    C. Automotive lab safety

A. Headlight Circuit
   1) High beam lamps
   2) Low beam lamps
   3) Dimmer switch
   4) Switch rheostat
   5) Wiring
   6) Test, aim, and replace headlights
B. Stop Lamp Circuit
   1) Adjust Stop light switch
   2) Test stop light Portion of turn signal switch
C. Directional Signal Circuit
   1) Flasher types
   2) Switch replacement
   3) Flashing speed
D. Hazard Warning Lights
E. Tail Lamp Circuit
F. BackUp Lamp Circuit
G. Instrument Panel Displays and Interior Lights
   1) Printed circuit boards/connectors/wires
H. Problem/Diagnosis
   1) Intermittent, dim, or no headlight operation
   2) No dash light brightness control
   3) No flash on one or both sides
   4) No hazard flasher lights
   5) Brighterthan normal lights
   6) No backup lights
   7) No tall lamps
   8) No stop lamps

VII. Accessory Systems
A. Basic Theory of Operation for Each Component/Circuit
B. Basic Troubleshooting Procedures (including Printed Circuits)
   1) Oil sending unit
   2) Fuel gauge and tank sending unit
   3) Temperature warning)
   4) Horns
   5) Constant voltage regulator for dash instruments charge test)
   6) Buzzer/relays/timers
   7) Air bags
   8) Wiper/washer circuit
   9) Power side window
   10) Power tailgate
   11) Power seat circuit
   12) Electric door locks

13) Defogger switches, grid, and blower motors
14) Radio Power
15) Radio speaker and antenna (trim procedure)
16) Cruise control cables, regulator, servo, and hoses
17)

8) Replace cables and clamps
9) Constant battery drain (including computer draw)

G. Interpretation of Test Results

H. Problem/Diagnosis
1) Corroded connections
2) Leakage (dirt on battery top)
3) No start complaints
4) Slow cranking complaints
5) Excessive water use
6) Discharges overnight (heavy current drain)
7) Damaged plates

I. Storage
1) Dry charge
2) Wet charge
3) Putting into service procedure

IX. Charging System

A. Basic System Components/Purpose/Operation
1) Diodes
2) Rotor
3) Stator
4) Slip rings
5) Load input to ECM (computer) circuitry

B. Circuit Operation
1) Various system schematics
2) Voltage regulation
3) Current control.
4) Light relay
5) Field relay
6) Ammeter circuit (instead of charge indicator light)

C. Test Equipment
1) Voltmeter
2) Ammeter
3) Ohmmeter
4) Quarter Q resistor/rheostat
5) Knife switch
6) Diode testers
7) Lab scope

D. Test Hook-Up/Interpretation of Results
1) Field circuit (current draw)
2) Rotor tests (shorts, grounds, continuity)
3) Stator tests (shorts, grounds, (continuity)
4) Diode tests
5) Output test

6) Voltageregulator setting
7)

2) Overrunning clutch
3) Inspect and replace

F. Testing/Service
1) Current draw using BST
2) Field coil tests (shorts, grounds, continuity)
3) Armature tests (shorts, grounds, continuity)
(a) Growler and test light
(b) Free-running bench test
4) Insulated circuit voltmeter readings (drop)
5) Ground circuit voltmeter readings (drop)
6) Remote cranking
7) Rebuilding procedures
(a) Turning commutator
(b) Don't wash starter drive in solvent
(c) Torque test
(d) Replace components (include bushings and end frames)
8) Inspecting control circuit wiring

G. Problem/Diagnosis
1) Dragging armature
2) Defective starter drive
3) Worn bushings
4) Worn flywheel ring gear
5) Starter alignment (shims)
6) Noise when cranking
7) High current draw
8) Low current draw
9) Thrown armature windings
10) Will not crank
11) Cranks slowly
12) Burned commutator
13) Worn brushes/holders
14) Spins but will not engage
15) Solenoid plunger vibrates back and forth

XI. Starter Circuit Controls (Understand Basic Operation)
A. Relays
B. Solenoids
C. Neutral Safety Switches
D. Resistor Bypass
E. Ignition Switches (Including Removal and Replacement)
F. Circuit Testing
1) Voltage drop acceptable readings
2) Solenoid/relay tests
3) Supply circuit and control circuit