Diesel Electrical and Electronic Systems-570043

Diesel Electrical and Electronic Systems is designed to provide students with the foundational knowledge and skills to perform maintenance on diesel electrical and electronic systems. Safety and proper tool use are emphasized throughout this course. Specific topics include diagnostic and maintenance procedures for general electrical systems, batteries, start systems, charging systems, lighting systems, gauges and warning devices, horn, wipers and washer systems. As part of this course, students apply knowledge and skills by participating in diagnostic and repair activities associated with diesel electrical and electronics systems components. This course must follow the guidelines and standards set forth by Automotive Service Excellence (ASE) and National Automotive Technicians Education Foundation (NATEF) minimum standards. Workplace Employability Skills Task lists should be incorporated into the diesel Program.

Career and technical student organizations are integral, co-curricular components of each career and technical education course. These organizations serve as a means to enhance classroom instruction while helping students develop leadership abilities, expand workplace-readiness skills, and broaden opportunities for personal and professional growth.

Safety

Students will:

1. Identify and practice general shop safety rules and procedures.
   - Utilizing safe procedures for handling of tools and equipment.
   - Identifying and using proper placement of floor jacks and jack stands.
   - Identifying and using proper procedures for safe lift operation.
   - Utilizing proper ventilation procedures for working within the lab/shop area.
   - Identifying marked safety areas.
   - Identifying the location and the types of fire extinguishers and other fire safety equipment.
   - Demonstrating knowledge of the procedures for using fire extinguishers and other fire safety equipment.
   - Identifying the location and use of eye wash stations.
   - Identifying the location of the posted evacuation routes.
   - Complying with the required use of safety glasses, ear protection, gloves, and shoes during lab/shop activities.
   - Identifying and wearing appropriate clothing for lab/shop activities.
   - Securing hair and removing jewelry for lab/shop activities.
   - Demonstrating awareness of the safety aspects of supplemental restraint systems (SRS), electronic brake control systems, and hybrid vehicle high voltage circuits.
   - Demonstrating awareness of the safety aspects of high voltage circuits (such as high intensity discharge (HID) lamps, ignition systems, injection systems, etc.).
   - Locating and demonstrating knowledge of material safety data sheets (MSDS).
Tools and Equipment

2. Identify tools and their usage in automotive applications.
   - Identifying standard and metric designation.
   - Demonstrating safe handling and use of appropriate tools.
   - Demonstrating proper cleaning, storage, and maintenance of tools and equipment.
   - Demonstrating proper use of precision measuring tools
     Examples: micrometer, dial-indicator, dial-caliper

Electrical Systems

3. Read and interpret electrical/electronic circuits using wiring diagrams.

4. Check continuity in electrical/electronic circuits using appropriate test equipment.

5. Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.

6. Check current flow in electrical/electronic circuits and components using appropriate test equipment.

7. Check resistance in electrical/electronic circuits and components using appropriate test equipment.

8. Locate shorts, grounds, and opens in electrical/electronic circuits.

9. Identify parasitic (key-off) battery drain problems; perform tests; determine needed action.

10. Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed.

11. Inspect and test spike suppression devices; replace as needed.

12. Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.

Battery

13. Identify battery type; perform appropriate battery load test; determine needed action.


15. Inspect, clean, and service battery; replace as needed.

16. Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed.

17. Charge battery using appropriate method for battery type.

18. Inspect, test, and clean battery cables and connectors; repair or replace as needed.

19. Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.
20. Perform battery capacitance test; determine needed action.

21. Identify and test low voltage disconnect (LVD) systems; determine needed repair.

**Starting System**

22. Perform starter circuit cranking voltage and voltage drop tests; determine needed action.

23. Inspect and test components (key switch, push button and/or magnetic switch) and wires and harnesses in the starter control circuit; replace as needed.

24. Inspect and test, starter relays and solenoids/switches; replace as needed.

25. Remove and replace starter; inspect flywheel ring gear or flex plate.

**Charging System Diagnosis and Repair**

26. Test instrument panel mounted volt meters and/or indicator lamps; determine needed action.

27. Identify causes of a no charge, low charge, or overcharge problems; determine needed action.

28. Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment.

29. Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action.

30. Perform charging circuit voltage drop tests; determine needed action.

31. Remove and replace alternator.

32. Inspect, repair, or replace cables, wires, and connectors in the charging circuit.

**Lighting Systems**

33. Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.

34. Identify causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.

35. Test, aim, and replace headlights.

36. Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed.

37. Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, relays, wires, and control components/modules of parking, clearance, and taillight circuits; repair or replace as needed.
38. Inspect and test instrument panel light circuit switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and printed circuits/control modules; repair or replace as needed.

39. Inspect and test interior cab light circuit switches, bulbs/LEDs, sockets, low voltage disconnect (LVD), connectors, terminals, wires, and control components/modules; repair or replace as needed.

40. Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed.

41. Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.

42. Inspect and test turn signal and hazard circuit flasher(s), switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires and control components/modules; repair or replace as needed.

43. Inspect and test reverse lights and warning device circuit switches, bulbs/LEDs, sockets, horns, buzzers, connectors, terminals, wires and control components/modules; repair or replace as needed.

**Gauges and Warning Devices**

44. Interface with vehicle’s on-board computer; perform diagnostic procedure, verify instrument cluster operations using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.

45. Identify causes of intermittent, high, low, or no gauge readings; determine needed action.

46. Identify causes of data bus-driven gauge malfunctions; determine needed action.

47. Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed.

48. Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets, connectors, wires, and control components/modules; repair or replace as needed.

49. Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer systems.

**Related Electrical Systems**

50. Interface with vehicle’s on-board computer; perform diagnostic procedures using recommended electronic service tool(s) (including PC based software and/or data scan tools); determine needed action.

51. Identify causes of constant, intermittent, or no horn operation; determine needed action.

52. Inspect and test horn circuit relays, horns, switches, connectors, wires, clock springs, and control components/modules; repair or replace as needed.
53. Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action.

54. Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires and control components/modules; repair or replace as needed.

55. Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed.

56. Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.

57. Inspect and test side view mirror motors, heater circuit grids, relays, switches, connectors, terminals, wires and control components/modules; repair or replace as needed.

58. Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, terminals, wires, and control components/modules; repair or replace as needed.

59. Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed.

60. Identify causes of slow, intermittent, or no power window operation; determine needed action.

61. Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power window circuits; repair or replace as needed.

62. Inspect and test block heaters; determine needed repairs.

63. Inspect and test cruise control electrical components; repair or replace as needed.

64. Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.

65. Check operation of keyless and remote lock/unlock devices; determine needed action.

66. Inspect and test engine cooling fan electrical control components/modules, wiring; repair or replace as needed.

67. Identify causes of data bus communication problems; determine needed action.