



COURSE OUTLINE

AST713

Prepared: Jamie Schmidt Approved:

Course Code: Title	AST713: ELECTRICAL/ELECTRONIC & EMISSIONS SYSTEM
Program Number: Name	6068: AUTO SERV TN LEVEL 2
Department:	MOTIVE POWER APPRENTICESHIP
Semester/Term:	18S
Course Description:	Upon successful completion the apprentice will have the ability to explain the characteristics of various circuit types and perform circuit calculations using a selection of meters, the ability to explain the purpose, principles of operation and usage of diagnostic test equipment, the ability to explain the purpose, construction and operating principles of cranking systems, the ability to explain cranking system operations and perform diagnosis, the ability to explain the construction, principles of operation, inspection and testing of electronic devices, ignition systems, charging systems, electronic-controlled gasoline fuel injection systems, and emission control systems - all according to manufacturers' standards and recommendations, and accepted trade practices.
Total Credits:	12
Hours/Week:	12
Total Hours:	96
Essential Employability Skills (EES):	<p>#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>#2. Respond to written, spoken, or visual messages in a manner that ensures effective communication.</p> <p>#3. Execute mathematical operations accurately.</p> <p>#4. Apply a systematic approach to solve problems.</p> <p>#5. Use a variety of thinking skills to anticipate and solve problems.</p> <p>#6. Locate, select, organize, and document information using appropriate technology and information systems.</p> <p>#7. Analyze, evaluate, and apply relevant information from a variety of sources.</p>
Course Evaluation:	Passing Grade: 50%, D
Other Course Evaluation & Assessment Requirements:	In this course you will study electrical/electronic fundamentals and perform testing using a variety of diagnostic test equipment. Charging and starting system operation and testing will be covered. Emission control systems, Fuel injection and ignition system construction operation and testing will also be studied.

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

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.

Evaluation Process and Grading System:

Evaluation Type	Evaluation Weight
Assignments	10%
Shop	30%
Tests	60%

Books and Required Resources:

Automotive Technology: A Systems Approach by Erjavec Restole
ISBN: 9780176501679

Course Outcomes and Learning Objectives:

Course Outcome 1.

Electrical Circuit Calculations

Learning Objectives 1.

Explain the characteristics of electrical circuits.

- series circuits
- parallel circuits
- series
- parallel circuits

Perform circuit calculations using Ohms™ & Watts Law.

- series circuits
- parallel circuits
- series
- parallel circuits

Measure voltage, amperage and resistance.

- circuit board exercises
- simulated electrical circuits
- vehicle electrical circuits
- compare calculated and measured circuit performance

Course Outcome 2.

Diagnostic Test Equipment

Learning Objectives 2.

Explain the purpose and principles of operation of diagnostic test equipment.

- pressure gauges
- vacuum gauges
- compression tester
- hand-held scan tools
- oscilloscopes
- smoke generators
- leak down tester
- pressure transducers

Perform diagnostic tests using the following equipment.

- pressure gauges
- vacuum gauges
- compression tester
- hand-held scan tools
- oscilloscopes
- smoke generators
- leak down tester
- pressure transducers

Course Outcome 3.

Cranking Systems and Control Circuits

Learning Objectives 3.

Explain the purpose and fundamentals of cranking systems.

- cranking motors
- control circuits
- torque, load and cranking speed relationship

Explain the construction, types, styles and principles of operation of cranking motor circuits.

- starter control circuits
- relay controlled cranking circuits
- neutral switch
- starter solenoid
- cranking motors
- gear reduction
- permanent magnet field type
- wire wound field type
- cranking motor drives

Disassemble and re-assemble cranking motors.

- inspect and test major components of cranking motors
- armature for shorts, opens, ground, alignment
- field coils for shorts, opens, ground
- identify type of winding
- pole shoes
- bushings and bearings
- brushes and springs

Course Outcome 4.

Cranking System Diagnostics and Testing

Learning Objectives 4.

Explain the factors affecting engine cranking system performance.

- ambient temperature
- battery conditions and ratings
- engine mechanical loads
- charging system operation
- oxidation and corrosion of connections
- cable sizes and condition
- engine fuel and ignition system condition
- excessive cranking time and overheating

Perform inspection, testing, and diagnostic procedures on cranking motor circuits.

- Analyze the results.
- cranking system visual inspection
- battery load test and verify capacity and performance to application
- cranking circuit voltage drop tests
- cranking system current draw test
- perform ring gear tooth inspection
- slow cranking
- no cranking

Course Outcome 5.

Electronic Fundamentals

Learning Objectives 5.

Explain the construction, composition, types, principles of operation and applications of electronic devices.

- diodes
- forward and reverse bias
- current control
- transistors
- switching
- gain
- capacitors
- sensors
- permanent magnet pulse generators
- piezoelectric
- galvanic
- hall effect
- optical
- variable resistors
- rheostat
- thermistors
- potentiometers
- piezoresistive

Perform inspection and testing procedures for electronic devices.

- diodes
- forward and reverse bias
- LED
- rectifying / zener
- light emitting
- photo
- capacitors
- sensors
- permanent magnet pulse generators
- piezoelectric
- galvanic
- hall effect
- optical
- variable resistors
- rheostat
- thermistors
- potentiometers
- piezoresistive

Course Outcome 6.

Electronic Ignition Fundamentals

Learning Objectives 6.

Explain the purpose and fundamentals of electronic ignition systems and controls.

- electronic ignition systems
- computer-controlled timing
- distributorless ignition
- coil over plug
- factors that affect ignition timing
- engine speed
- engine load
- engine temperature
- input sensors

Explain the construction, types, styles, operation and application of electronic ignition systems devices.

- ignition coils
- primary windings
- secondary windings
- distributors
- magnetic pulse generator
- Hall Effect device
- optical device
- secondary voltage circuit
- high tension spark plug wires
- spark plugs
- distributor cap and rotor
- modules
- sensors

Inspect, test and diagnose electronic ignition systems devices.

- identify and locate electronic ignition system components on various vehicles

- distributor components
- coils, modules
- sensors
- check and test ignition timing operation using a scan tool
- diagnose electronic ignition system components
- high tension wires
- spark plugs
- distributor cap and rotor

Course Outcome 7.

Charging Systems and Control Circuits

Learning Objectives 7.

Explain the purpose and fundamentals of charging systems and control circuits.

- alternators
- voltage regulation
- electromagnetic induction principles
- factors affecting alternator output
- battery condition and temperature
- circuit condition
- engine speed
- electrical loads

Explain the construction, types, principles of operation and application of charging systems and voltage regulations

- alternators
- rectifier & diodes
- stator
- rotor
- field winding, poles, slip rings
- brush assemblies
- bearings
- pulleys
- cooling fans
- idlers and tensioners
- clutch pulleys / damper
- voltage regulator

Inspect, test and diagnose alternator and voltage regulation systems.

- perform charging system visual inspection
- belt tension and alignment
- connections and wiring
- perform charging system current and voltage output tests
- disassemble, test and re-assemble alternator
- rotor field tests
- rectifier diodes
- stator

Course Outcome 8.

Gasoline Fuel Injection Fundamentals

Learning Objectives 8.

Explain the purpose and fundamentals of gasoline fuel injection systems.

- port injection
- throttle body injection
- direct injection

Explain the construction, types, styles, operation and application of gasoline fuel injection and delivery systems.

- fuel tanks, lines and fittings
- filters and pumps
- injectors
- pressure regulators
- electronic control units
- returnless fuel systems

Inspect and test fuel injection systems.

- perform fuel pump tests
- pressure
- visual inspection
- leaks

Course Outcome 9.

Emission Control Systems

Learning Objectives 9.

Explain the principles of operation of emission control systems.

- exhaust gas re-circulation systems
- vacuum controlled
- electronic controlled
- positive crankcase ventilation
- evaporative emissions systems
- carbon canister
- computer controlled fuel evaporative emission solenoids
- air injection systems
- air pumps
- air switching valves
- catalytic converters
- three-way
- sensors / actuators

Inspect and test emission control systems.

- exhaust gas re-circulation systems
- positive crankcase ventilation
- evaporative emission systems
- air injection systems
- catalytic converters

Date:

Tuesday, April 24, 2018

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