



Republic of the Philippines

Department of Education

DepEd Complex, Meralco Avenue, Pasig City

STRENGTHENED SENIOR HIGH SCHOOL CURRICULUM

AUTOMOTIVE SERVICING

(ELECTRICAL REPAIR)

Grade 12

Course Description:

This course equips learners with essential skills for Automotive Servicing following industry standard, focusing on electrical repair such as ignition systems, starting systems, Charging Systems, Body Electrical Systems and Automotive manual Air-Conditioning Systems. Upon completion, learners are eligible to take assessments to earn National Certificate level II in Automotive Servicing (Electrical Repair), higher education, and careers relative automotive industry sector.

Elective: Technical Professional

Prerequisite: Driving and Automotive Servicing

Time Allotment: 320 hours for one semester, 16 hours per week

Schedule: First/Second Semester

QUARTER 1

CONTENT STANDARD	The learners demonstrate an understanding of the concepts and principles in diagnosing, repairing ignition system starting system, charging system and body electrical systems”	
PERFORMANCE STANDARD	The learners perform procedures in diagnosing, troubleshooting, and repairing the ignition system, starting system, charging system, body electrical system and costing of services employing appropriate safety precautions.	
LEARNING COMPETENCIES		CONTENT
1. Discuss the overview of automotive electrical servicing		Overview of Automotive Electrical Servicing <ul style="list-style-type: none"> • Automotive electrical principles and electrical system • Emerging Trends and Advancement Technology • Career and Business Opportunities
2. Discuss the principles of automotive electrical operating system		Automotive Electrical Operating System <ul style="list-style-type: none"> • Operating Principles, Construction, Component Parts, and Functions <ul style="list-style-type: none"> ○ automotive electronic/electrical circuits ○ car air-conditioner system ○ ignition system ○ starting system ○ charging system

	<ul style="list-style-type: none"> ○ body electrical system
3. Distinguish the required items for servicing the ignition and starting system	<p>Starting System Required Items</p> <ul style="list-style-type: none"> ○ tools, materials, equipment, and instruments ○ car protective equipment (CPE) ○ manufacturer specifications ○ repair/service manual
4. Perform procedures in diagnosing and troubleshooting the ignition and starting system	<p>Diagnosing and Troubleshooting Procedures for Starting System</p> <ul style="list-style-type: none"> ● Components and Principles of ignition system and starting system ● Types of ignition and starting system ● Diagnosing Procedures ● Inspection/Checking ● Mensuration Procedures ● Testing Procedures
5. Perform procedures in repairing the ignition and starting systems	<p>Procedures for Repairing Ignition System</p> <ul style="list-style-type: none"> ● Required Items Preparations ● Disassembly and Assembly Procedures ● Repair and/or Replacement Procedures ● Releasing Procedures ● Final Inspection, and Post-Repair Testing ● Documentation Review and Service Record Keeping
6. Distinguish the required items for servicing the charging system	<p>Charging System Required Items</p> <ul style="list-style-type: none"> ● tools, materials, equipment, and instruments ● car protective equipment (CPE) ● manufacturer specifications ● repair/service manual ● schematic diagrams

<p>7. Perform procedures in diagnosing and troubleshooting the charging system</p>	<p>Diagnosing and Troubleshooting Procedures for Charging System</p> <ul style="list-style-type: none"> • Diagnosing Procedures <ul style="list-style-type: none"> ○ Inspection/Checking ○ Mensuration ○ Testing • Troubleshooting Procedures <ul style="list-style-type: none"> ○ Faults and their causes
<p>8. Perform procedures for repairing the charging system</p>	<p>Procedures for Repairing Charging System</p> <ul style="list-style-type: none"> • Required Items Preparations • Disassembly and Assembly Procedures • Repair and/or Replacement Procedures • Releasing Procedures <ul style="list-style-type: none"> ○ Final Inspection, and Post-Repair Testing ○ Documentation Review and Service Record Keeping ○ Hand-over Process • Post Work Processes
<p>9. Distinguish the required items for servicing the automotive body electrical systems</p>	<p>Automotive Body Electrical Systems Required Items</p> <ul style="list-style-type: none"> • Tools, materials, equipment, and instruments • Car protective equipment (CPE) • manufacturer specifications • repair/service manual • schematic diagrams
<p>10. Perform procedures in diagnosing and troubleshooting the automotive body electrical systems</p>	<p>Diagnosing and Troubleshooting Procedures for Automotive Body Electrical Systems</p> <ul style="list-style-type: none"> • Diagnosing Procedures <ul style="list-style-type: none"> ○ Inspection/Checking ○ Mensuration ○ Testing • Troubleshooting Procedures <ul style="list-style-type: none"> ○ Faults and their causes

	<p>Basic principles of operation</p> <ul style="list-style-type: none"> • Refrigeration cycle
<p>2. Distinguish the required items for servicing the automotive manual air-conditioning system</p>	<p>Required Items in servicing automotive manual air-conditioning system</p> <ul style="list-style-type: none"> ○ Tools, materials, equipment, and instruments ○ Car protective equipment (CPE) ○ Manufacturer specifications ○ Repair/service manual ○ Schematic diagrams ○ Cleaning agents
<p>3. Perform procedures in diagnosing and troubleshooting automotive air-conditioner system</p>	<p>Diagnosing and Troubleshooting Procedures for Automotive Air-Conditioner System</p> <ul style="list-style-type: none"> • Diagnosing Procedures <ul style="list-style-type: none"> ○ Inspection/Checking ○ Mensuration ○ Testing • Troubleshooting Procedures <ul style="list-style-type: none"> ○ Faults and their causes
<p>4. Perform procedures in servicing of automotive manual air-conditioning system and components</p>	<p>Inspection and Diagnosis of A/C System</p> <ul style="list-style-type: none"> • Visual inspection • System Performance Testing • Leak detection <p>Refrigerant Handling and Recovery</p> <ul style="list-style-type: none"> • Component Cleaning and Maintenance • Component Replacement and Repairs <p>A/C System Servicing Procedures</p> <ul style="list-style-type: none"> • Refrigerant Evacuation and Recharging • Component Cleaning and Maintenance • Component Replacement and Repairs <p>Electrical System Inspection and Repairs</p> <ul style="list-style-type: none"> • fuses and relays • pressure switches and sensors

	<ul style="list-style-type: none"> • A/C clutch operation and electrical connections • Final Testing and Quality Check
5. Perform procedures in repairing the automotive air-conditioner system	<p>Procedures for Repairing automotive air-conditioner system</p> <ul style="list-style-type: none"> • Required Items Preparations • Recovery and recycling refrigerant machine • Disassembly and Assembly Procedures • Cleaning Procedures for: <ul style="list-style-type: none"> ○ A/C Filter ○ Cooling Fan ○ Evaporator ○ Condenser • Repair and/or Replacement Procedures <ul style="list-style-type: none"> ○ manual air-conditioner compressor magnetic clutch • Releasing Procedures <ul style="list-style-type: none"> ○ Final Inspection, Post-Repair Testing ○ Documentation Review and Service Record Keeping ○ Hand-over Process ○ Post Work Processes
6. calculate the service cost for automotive car air-conditioner system	<p>Service Costing for Automotive air-conditioner system</p> <ul style="list-style-type: none"> • Standard rate • Material costs • Manpower (labor cost) • Overhead costs

GLOSSARY

Air Conditioning (A/C) System – a vehicle's system for cooling and dehumidifying air inside the cabin.

Battery – an energy source providing electrical power for starting and operating the vehicle.

BLOWBAGETS – an acronym for pre-driving inspection – Battery, Lights, Oil, Water, Brake, Air, Gas, Engine, Tire, Self/Safety.

Car Protective Equipment (CPE) - equipment like seat covers and fender covers used to protect the vehicle during servicing.

Charging System – a system responsible for replenishing the battery and powering the vehicle's electrical systems.

Class 1, 2, 3 Vehicles – categories for tollway classification based on vehicle size, height, and axle count.

Compressor – a component in the A/C system that pressurizes refrigerant to enable cooling.

Condenser – a heat-exchanging component of the A/C system that cools and liquefies refrigerant.

Consumables – items like oils, filters, and coolants used in vehicle maintenance or repair.

Documentation – records of vehicle servicing or repair, including diagnostics and maintenance logs.

Electrical System – the network of components like the ignition, lighting, and air-conditioning systems powered by the battery.

Engine – the vehicle's primary component that converts fuel into mechanical energy.

Evaporator – a part of the A/C system that absorbs heat from the cabin air and cools it.

Hybrid Vehicle – a vehicle powered by a combination of an internal combustion engine and an electric motor.

Ignition System – the system that ignites the fuel-air mixture in the engine to start the vehicle.

Inspection Checklist – a list of tasks or items to verify during vehicle inspections.

Jack and Lifters – tools used for lifting vehicles for inspection, maintenance, or repair.

Job/Repair Order – a document detailing the work to be performed on a vehicle, including services requested and parts needed.

Labor Cost – the expense for manpower involved in vehicle maintenance or repair.

License Acquisition Requirements – the criteria and processes for obtaining a driver's license or vehicle registration.

Magnetic Clutch – a component of the A/C system that engages or disengages the compressor.

Periodic Maintenance Services (PMS) – regularly scheduled inspections and services to ensure vehicle reliability and performance.

Power Source – the energy system that drives a vehicle, such as gasoline, diesel, or electricity.

Pre-Delivery Inspection (PDI) – a comprehensive check performed before delivering a new vehicle to ensure its condition and performance.

Pre-Start Check – a routine inspection to verify the vehicle's readiness for operation.

Road Emergencies – unexpected situations like breakdowns or accidents requiring immediate action.

Service Costing – calculating expenses related to vehicle maintenance, including labor, parts, and overheads.

Service Records – logs maintained for tracking vehicle maintenance and repair history.

Traffic Rules and Regulations – laws and guidelines for safe and efficient road use.

Vehicle Specifications – the detailed characteristics and capabilities of a vehicle, including type and power source.

Work Bay – a designated area in a workshop for vehicle maintenance or repair tasks.

REFERENCES

3G E-Learning FC LLC. (2016). *Automotive Electrical Assembly: Intermediate*. 3G E-Learning FC LLC.

3G E-Learning FZ LLC. (2016). *Basic Mechanics*. 3G E-Learning FZ LLC.

Anglin, D. L., & Crouse, W. H. (2004). *Automotive Mechanics* (10th ed.). Glencoe Division of Macmillan/McGraw-Hill School Publishing Company.

Department of Education. (2016). *K to 12 Basic Education Curriculum Guide for Automotive Servicing NC I*. Retrieved from www.deped.gov.ph.

Duffy, J. E. (2009). *Modern Automotive Technology* (7th ed.). The Goodheart-Willcox Company, Inc. ISBN 978-1-59070-956-6.

EC&M Web. (n.d.). *Understanding Labor Hours and Labor Costs*. Retrieved from <https://www.ecmweb.com/construction/estimating/article/21251577/understanding-labor-hours-and-labor-costs>.

Eichhorn, L., Corinchock, D., & Erjavec, J. (1996). *Shop Manual for Automotive Brake Systems*. Delmar Publishers.

Francisco, F. Y. (1985). *Automobile Trouble Shooting: Fundamentals*. National Bookstore, Inc.

Gilles, T. (2008). *Automotive Service: Inspection, Maintenance, Repair* (3rd ed.). Delmar Cengage Learning.

Hollembek, B. (1999). *Automotive Electricity, Electronics, & Computer Controls*. Delmar Publishers.

Institute of Chartered Accountants of India. (n.d.). *Service Costing (Cost accounting, Chapter 12)*. Retrieved from <https://resource.cdn.icai.org/66537bos53753-cp12.pdf>.

Land Transportation Office. (2023). *Road and traffic rules, signs, signals, and markings*. Retrieved from https://lto.gov.ph/wp-content/uploads/2023/09/RO102_CDE_Road_and_Traffic_Rules_Signs-Signals-Markings.pdf.

Land Transportation Office. (n.d.). *Driver's license guide*. Retrieved from <https://ltoportal.ph/lto-drivers-license/>.

Land Transportation Office. (n.d.). *Tollway Vehicle Classes*. Retrieved from <https://ltoportal.ph/tollway-vehicle-classes/>

Land Transportation Office. (n.d.). *Traffic Signs and Symbols in the Philippines*. Retrieved from <https://ltoportal.ph/lto-traffic-signs-symbols-philippines/>

Technical Education and Skills Development Authority Qualification Standards Office. (2013). *Training Regulations for Automotive Servicing NC I*.

Technical Education and Skills Development Authority Qualification Standards Office. (2020). *Training Regulations for Automotive Servicing (Electrical Repair) NC II*.

Technical Education and Skills Development Authority Qualification Standards Office. (2004). *Training Regulations for Driving NC II*.

TOOLS, MATERIALS, AND EQUIPMENT

TOOLS	MATERIALS	EQUIPMENT
Basic hand tools (Mechanical pliers, Screwdriver, socket wrench, spanner, hammer)	Soldering lead	Alternator assembly
AC clutch coil puller	Cotton gloves	AC compressor assembly
Alternator bearing puller	Cotton rags	AC Refrigerant recovery, recharging, and recycling machine
Snap ring plier	Eye Terminal	Digital multimeter
Straight hexagon wrench	Female terminal	Soldering iron
Torque wrench	Refrigerant, 134A	Crocodile jack (or equivalent)
Feeler gauge	Alligator clip - Medium	Trouble light (or equivalent)
Service type Thermometer (10 to 100 degrees C)	Shaft seal (assorted)	Belt tension gauge
hygrometer	Cotton Rags	Vernier caliper
Timing light	O-ring (assorted sizes and thickness)	Dial gauge w/ magnetic stand
Bench vice	Male terminal	Spring scale
Belt tension gauge	Nitrogen gas	Manifold charging gauge with hose
Wire splicer	Compressor oil	Halogen leak detector
Feeler gauge	Butyl tape	Vacuum pump
Spark plug wrench (14mm,16mm,21mm)	Electrical tape	Jack stand

Vernier Caliper	Automotive wire (#10 AWG, #12 AWG, #14 AWG, #16 AWG)	Creeper
Bench vice (6")	Non-conductive electrical connector spray cleaner	Working table (4ft x 2ft- wood)
Jumper cable (400amp)	Desiccant materials	Wheel wedge
Trouble light LED (15w)	70% Alcohol*	Graduated cylinder
Battery/Load tester	Grease	Soldering stand
Soldering iron (60-100w)	Penetrating oil	Vehicle lifter
Extension/power cable (10m)	Contact cleaner	Battery charger
Impact wrench	Shrinkable tube (5 mm)	PPEs
Electrical wire(gauge 10,12,14,16)	Soldering paste	- Face mask
Clamp Type Ammeter	Cleaning agent	- Face shield*
	Distilled water	- Goggles
	Heat gun	- Gloves
	Sandpaper (Grit- 600,1000)	- Coverall suit
	Cable tie (8")	- Safety shoes
	Carbon brush	
	Switches (Toggle switch - 6 terminal Push pull switch, Push button switch)	
	Relays (30-60 Amp) 12 volts	
	Fusible link for the battery	
	Bulbs (12 volts)	
	▪ Double contact	
	▪ Single Contact	
	▪ Headlight bulb	
	▪ Peanut bulb	
	Fuses	
	▪ 7.5 Amp	
	▪ 10 Amp	
	▪ 15 Amp	
	▪ 20 Amp	
	▪ 30 Amp	

	Car Protective Equipment (CPE)- all UCs and 3 Qualifications	
	• Steering wheel cover	
	• Fender cover	
	• Shift knob cover	
	• Floor mat	
	• Seat cover	