



**Format CO
COURSE OUTLINE**

Basic Automotive Electricity and Electronics

Course Title

AM113

Dept. & Course No.

I COURSE DESCRIPTION

This is an introductory course covering the basic principle of automotive electricity and electronic components for a vehicle equip with internal combustion engine using 12 or 24 DC volts. It also includes reading, interpreting electrical circuit diagram, and troubleshooting basic engine electrical and electronic problems.

II SEMESTER CREDITS: 2

III CONTACT HOURS PER WEEK:

<u>1</u>	<u>3</u>	<u>4</u>
Lecture	Laboratory	Total

IV PREREQUISITE: None

V STUDENT LEARNING OUTCOME:

Upon completion of this course the student will be able, with 65% level of accuracy, to:

1. Name automotive battery parts and components and explain their functions as per manual specifications.
2. Explain battery charging and discharging operating principle.
3. Service automotive battery as per manual specifications.

VI. COURSE CONTENT

- A. Automotive battery parts and components
 1. Battery plates
 2. Electrolyte
 3. Electrons flow
 4. Battery terminals
 5. Battery case
- B. Battery charging and discharging operating principle.
 1. Battery discharging
 2. Battery charging
 3. Deep cycling
 4. Ohms law
 5. Watt law
- C. Servicing automotive battery
 1. Check battery fluid
 2. Check battery voltage with or without load
 3. Charge battery
 4. Perform battery connection

(parallel, series connection, and series-parallel connection)

4. Name starting system parts and components and explain their functions as per repair manual specifications.
 5. Explain the operating principle of starting system as per manual specifications.
 6. Service starting system as per repair manual specifications.
 7. Name charging system parts and components and explain their functions as per manual specifications.
 8. Explain charging system operating principle as per manual specification.
 9. Service charging system as per repair manual specifications.
- D. Starting system parts and components
 1. Starting motor
 2. Solenoid switch
 3. Starting switch
 4. Neutral safety switch
 5. Starter relay
 6. Field winding
 7. Armature
 8. Commutator
 9. Carbon brush
 - E. Starting system operating principle
 1. Law of magnetism
 2. Electromagnets
 3. Natural magnets
 4. Types of starter motor
 - F. Checking starting system parts and components
 1. Check solenoid switch
 2. Check starter motor
 3. Check wiring circuitry
 4. Check neutral safety switch
 - G. Charging system parts and components
 1. Ignition switch
 2. Stator winding
 3. Rotor winding
 4. Slip ring
 5. Carbon brush
 6. Voltage regulator (I.C type, computer controlled type)
 7. Rectifier assembly (diode)
 8. Alternator belt
 - H. Charging system operating principle
 1. Alternator assembly
 2. Voltage regulator
 3. Voltage rate
 4. Charging voltage
 5. Rectifier diode
 - I. Servicing procedure for charging system.
 1. Dismantle and assemble alternator assembly.
 2. Check voltage regulator (electronic

10. Name ignition system parts and components and explain their functions as per manual specifications.
 3. Check charging voltage
 4. Check alternator assembly (carbon brush, stator winding, rectifier assembly, slip ring, and stator assembly).
 5. Check charging electrical circuitry
11. Explain ignition system operating principle as per manual specifications.
12. Service ignition system parts and components as per repair manual specifications.
13. Name engine electrical system parts and components and explain their functions as per manual specifications.
14. Explain the operating principle of engine electrical system as per manual specifications.
15. Check engine electrical system parts and components for circuitry and
 - J. Ignition system parts and components
 1. Ignition switch
 2. Ignition coil
 3. High tension wires
 4. Spark plug
 5. Distributor assembly
 6. Ignition system switching device (conventional type, electronic type, and computer controlled type)
 - K. Ignition system operating principle
 1. Ignition system conventional type
 2. Ignition system electronic type
 3. Ignition system computer controlled type
 - L. Servicing procedure for ignition system.
 1. Check ignition coil
 2. Check ignition system electrical circuitry
 3. Check ignition system high voltage electric spark.
 4. Check ignition high tension
 5. Check engine balance
 - M. Engine electrical components
 1. Water temperature sending unit
 2. Radiator fan motor
 3. Oil pressure sending unit
 4. Engine oil level gauge
 5. Engine fuel shut-off valve (for conventional engines)
 - N. Engine electrical operating principle
 1. Water temperature sending unit
 2. Radiator fan motor
 3. Oil pressure sending unit
 4. Engine level gauge
 - O. Checking engine electrical system
 - a. Check water temperature sending

- functionality as per repair manual specifications.
16. Name pre-heating system parts and components and explain their functions as per manual specifications.
17. Explain the operating principle of pre-heating system as per manual specifications.
18. Service diesel engine pre-heating system as per repair manual specifications.
- unit
- b. Check radiator fan motor
- c. Check engine oil pressure sending unit
- d. Check engine oil level gauge
- P. Pre-heating system parts and components
1. Heater relay
 2. Heater timer
 3. Glow plug
 4. Heater switch
- Q. Pre-heating operating principle
1. Types of glow plug
 2. Heater timer (electronic controlled)
 3. Heater relay
 4. Heater switch
- R. Procedures for servicing diesel engine pre-heating system
1. Check glow plugs
 2. Check heater timer
 3. Check heater relay
 4. Check heater switch

VII Tools AND EQUIPMENT

Tools	Equipment
Basic hand tools (tool set)	Digital Storage Oscilloscope
Magnetic finger	Stethoscope
Vise grip	Multimeter (analog and digital)
Flash light	Growler
Hand soap	Alternator drive motor tester
Gasoline fuel	Battery tester
Diesel fuel	Battery charger for 6 volts, 12 volts, and 24 volts
Fuel filter	Timing light
Gasket silicon	
Vellumoid gasket	
Cork gasket	
Washing solvent	
Carburetor and injector cleaner	
Auto wire	
Carbon brush	

VIII TEXT AND REFERENCES

- A Required Text:
 James E. Duffy, **Modern Automotive Technology**, Tinley Park Illinois,
 GOODHEART-WILLCOX COMPANY, INC. 2004
 ISBN-10: 1-59070-186-0
 ISBN-13: 978-1-59070-186-7

IX METHOD OF INSTRUCTION

- A. Lecture
- B. Visual Aid
- C. Demonstration
- D. Discussion

X METHOD OF EVALUATION:

- 1.) The components with corresponding weight in percent included in the computation of the final grade are:

Course work (quizzes / class works / homework / projects)	30%
Skill Tests	40%
Exam (Midterm and final exam)	30%
	100%

The transmutation of the total percent to a letter grade is as of follows:

90 – 100	A
80 – 89	B
70 – 79	C
65 – 69	D
0 – 64	F



**Form NC-2
TASK LISTING SHEET**

AM113 Basic Automotive Electricity and Electronics Credits: 1 1 48
 Course No. & Title Lec. Lab Total lab hours

Laboratory objectives	Time allotment
1. Service automotive battery as per manual specifications. a. Check battery fluid for specific gravity and level. b. Check battery plates for damage and arrangement. c. Charge battery d. Clean battery terminals e. Connect battery terminals correctly. f. Check battery performance	2 hours
2. Service starting system as per repair manual specifications. a. Check starter motor for functionality. b. Check solenoid switch for functionality c. Check starter switch, relay, and safety switch for functionality and circuitry. d. Perform starter motor performance test. e. Overhaul starter motor assembly	10 hours
3. Service charging system as per repair manual specifications. a. Check charging system voltage output. b. Check alternator for functionality. c. Check voltage regulator for functionality. d. Overhaul alternator assembly.	12 hours
4. Service ignition system parts and components as per repair manual specifications. a. Check ignition coil, switching device, and spark plug for functionality. b. Check spark plug conditions and specifications c. Check spark plug wire for voltage leakage and impedance values. d. Check ignition timing, high voltage electric spark, and firing order. e. Check ignition system for electrical circuitry and engine balance.	5 hours
5. Check engine electrical system parts and components for circuitry and functionality as per repair manual specifications. a. Check water temperature sending unit for functionality and circuitry. b. Check radiator fan motor for functionality and circuitry. c. Check engine oil pressure sending unit for functionality and circuitry. d. Check engine oil pressure and level gauge for functionality and circuitry.	12 hours
6. Service diesel engine pre-heating system as per repair manual specifications. a. Check glow plug, heater timer, and heater switch for functionality and circuitry. b. Check heater relay for rationality and functionality.	7 hours



PALAU COMMUNITY COLLEGE
AM113 Basic Automotive Electricity and Electronics
COURSE LEARNING OUTCOMES

During the course experience, the course learning outcomes (CLO's) will be assessed through the use of signature assignments. A rating scale will be used to determine the students' proficiency level of each CLO using specifically aligned assignments. The numerical ratings of 3, 2, and 1 are not intended to represent the traditional school grading system of A, B, C, D, and F. The descriptions associated with each of the numbers focus on the level of student performance of each of the course learning outcomes listed below:

Rating Scale:

- 3 Highly Competent 85% to 100%
- 2 Competent 70% to 84%
- 1 Beginner Below 70%

Course learning Outcome #1: Service Automotive Battery

Paper based assessment: Name automotive battery parts and components and explain their functions, Explain battery charging and discharging principles, draw battery connection (for series and parallel connection, and series-parallel connection), and analyze cause and effect relationship involving battery power supply problems.

Authentic Assessment: Check battery fluid and plates, Check battery voltage with or without load, Charge battery, and/or Perform battery connection (for 12 volts, 24 volts, jump starting and charging battery).

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Automotive Battery with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Automotive Battery with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Automotive Battery with below 70% performance accuracy.

Course learning Outcome #2: Service Starting System

Paper based assessment: Name starting system parts and components and explain their functions, explain the operating principle of starter motor and analyze cause and effect relationship involving engine cranking problems.

Authentic Assessment: Check solenoid switch and starter motor for functionality, Check starting system circuitry, perform starting system wiring connection, and/or Overhaul starter motor assembly.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Starting System with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Starting System with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Starting System with below 70% performance accuracy.

Course learning Outcome #3: Service Charging System

Paper based assessment: Name charging system parts and components and explain their functions, Explain charging system operating principle, and analyze cause and effect relationship involving charging system problems.

Authentic Assessment: Check charging voltage with and without load, overhaul alternator assembly, and/or Check charging system electrical circuitry.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Charging System with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Charging System with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Charging System with below 70% performance accuracy.

Course learning Outcome #4: Service Ignition System

Paper based assessment: Name ignition system parts and components and explain their functions, explain ignition system operating principle, and analyze cause and effect relationship involving ignition system problems.

Authentic Assessment: Check ignition coil for functionality, Check ignition system electrical circuitry, Check ignition timing, Check spark plug and wires for voltage leakage, check switching device for rationality and/or Check engine spark plug condition.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Ignition System with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Ignition System with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Ignition System with below 70% performance accuracy.

Course learning Outcome #5: Service Engine Electrical System

Paper based assessment: Name engine electrical system parts and components and explain their functions, Explain the operating principle of engine electrical system, and analyze cause and effect relationship involving engine electrical problems.

Authentic Assessment: Check water temperature sending unit, and radiator fan motor for functionality and circuitry, Check engine oil pressure sending unit, and/or Check engine oil level gauge functionality.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Engine Electrical System with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Engine Electrical System with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Engine Electrical System with below 70% performance accuracy.

Course learning Outcome #6: Service diesel engine pre-heating system

Paper based assessment: Name pre-heating system parts and components and explain their functions, Explain the operating principle of pre-heating system, and analyze cause and effect relationship involving pre-heating system problems.

Authentic Assessment: Check glow plugs, heater timer, heater relay, heater switch for functionality and rationality, and/or check preheating system electrical circuitry.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing diesel engine pre-heating system with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing diesel engine pre-heating system with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing diesel engine pre-heating system with below 70% performance accuracy.