PALAU COMMUNITY COLLEGE

**Format CO**
**COURSE OUTLINE**

**AUTOMOTIVE ELECTRICITY** — **AM 125**
Course Title — Dept & Course No.

I COURSE DESCRIPTION

This course covers wiring installation of automotive electrical components, servicing of lighting system, servicing chassis electrical components, servicing automotive electrical security system, and servicing automotive sound system. And it also includes reading, interpreting, and designing electrical circuit diagram, and troubleshooting of electrical problem; such as faulty switch, short circuit, and open circuit.

II SEMESTER CREDITS: 3

III CONTACT HOURS PER WEEK:

| 1 | 6 | 7 |
|---|---|---|
| Lecture | Laboratory | Total |

IV PREREQUISITE: AM113

V STUDENTS LEARNING OUTCOMES

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

1.) Define Watt and Ohm's law.

2.) Draw wiring circuit diagram of lighting system.

VI. COURSE CONTENT

A. Watt and Ohms law
   1. Electrons theory
   2. Voltage
   3. Current
   4. Resistance
   5. Ohms law formula
   6. Wattage
   7. Power
   8. Watt formula
   9. Series connection
   10. Parallel connection
   11. Series-Parallel connection
   12. Electrical relays operating principle
   13. Fuse and fusible link
   14. Manual and electrical switch

B. Lighting system wiring diagram
   1. Head light circuit
   2. Park and tail light circuit
   3. Plate light
   4. Signal / hazard circuit
   5. Stop light circuit
   6. Reverse light circuit
   7. Fog lamp
   8. Horn circuit

9. Door lamp
10. Passengers lamp

3.) Read lighting circuit diagram as per vehicle manufacturer specifications.

C. Lighting system wiring diagram
1. Wiring diagram electrical symbol
2. Schematic diagram
3. Block diagram
4. Head light circuit
5. Park and tail light circuit
6. Signal / hazard circuit
7. Stop light circuit
8. Reverse light circuit
9. Fog lamp
10. Horn circuit

4.) Install lighting system wiring harness.

D. Procedures in installing Lighting system wiring harness
1. Head light circuit
2. Park and tail light circuit
3. Signal / hazard circuit
4. Stop light circuit
5. Reverse light circuit
6. Fog lamp
7. Passenger light
8. Plate light

5.) Check lighting system component functionality, rationality, and circuitry.

E. Lighting system Functionality, Rationality, and Circuitry.
1. Head light circuit
2. Park and tail light circuit
3. Signal / hazard circuit
4. Stop light circuit
5. Reverse light circuit
6. Fog lamp
7. Passenger light
8. Plate light

6.) Explain the law of magnetism and their applications in automotive technology.

F. Law of magnetism
1. Repel magnets
2. Attraction magnets
3. North pole
4. South pole
5. Current direction
6. Electric motors

7.) Name chassis electrical parts and components and their functions as per manual specifications.

G. Chassis electrical parts and components and their functions
1. Wiper
2. Power window
3. Windshield washer
4. Motor controlled side mirror
5. Door lock
6. Horn
7. Panel board

8.) Check chassis electrical component for rationality, functionality, and circuitry as per repair manual specification.

H. Procedures in checking chassis electrical components.
   1. Wiper
   2. Power window
   3. Windshield washer
   4. Motor controlled side mirror
   5. Door lock
   6. Horn
   7. Panel board

9.) Explain automotive electrical security system operating principles.

I. Electrical security system operating principles
   1. Frequency signals
   2. Signal receiver
   3. Actuator
   4. Sensors
   5. Relays
   6. Control module

10.) Read automotive electrical security system circuit diagram as per repair manual specification.

J. Automotive electrical security system circuit diagram
   1. Toyota
   2. Honda
   3. Nissan
   4. Kia
   5. Mazda

11.) Install automotive electrical security system wiring harness.

K. Automotive electrical security system wiring harness
   1. Control module
   2. Relays
   3. Sensors
   4. Actuator
   5. Signal receiver

12.) Check automotive electrical security system circuitry and component functionality.

L. Automotive electrical security system functionality and circuitry check.
   1. Control module
   2. Relays
   3. Sensors
   4. Actuator
   5. Signal receiver

13.) Explain automotive sound system operating principle.

M. Automotive sound system
   1. Basic components of radio system
   2. Radio signals
   3. Antennas
   4. Speakers
   5. Radio players
   6. Radio suppressors
   7. Circuits diagrams
   8. Power booster
   9. Equalizer

| | |
|---|---|
| 14.) Read automotive sound system circuit diagram | N. Automotive sound system circuit diagram<br>1. Honda sound system<br>2. Toyota sound system<br>3. Nissan sound system<br>4. Mazda sound system<br>5. Mitsubishi sound system |
| 15.) Check automotive sound system circuitry and component functionality. | O. Automotive sound system circuitry and functionality check.<br>1. Radio<br>2. Antenna<br>3. Speaker<br>4. Amplifier<br>5. Tweeter<br>6. Booster |
| 16.) Name restraint system parts and components and explain their functions as per manufacturer specification. | P. Restraint system parts and components and explain their functions<br>1. Air bag<br>2. Air bag module<br>3. Air bag controller<br>4. Air bag sensors<br>5. Supplemental restraint system (SRS) indicator light |
| 17.) Explain the operating principle of active and passive restraint system | Q. Operating principle of active and passive restraint system<br>1. Types of air bag<br>2. Active restraint system<br>3. Passive restraint system<br>4. Air bag sensors and their characteristic |
| 18.) Service restraint system as per vehicle specification. | R. Restraint system servicing procedure<br>1. Check seat belt<br>2. Service belt retractor<br>3. Service air bag system<br>4. Service air bag module<br>5. Install air bag<br>6. Service air bag controller |

VII MATERIALS AND EQUIPMENT

| Materials | Equipment |
|---|---|
| Switches (manual, electrical, and electronics) | DSO (Digital Storage Oscilloscope) |
| Relay | Multi meter digital |
| Fuse box | Multi meter analog |
| Electrical security control unit | Test light |
| Wiper motor | OBD II (On-board diagnostic generation II) |
| Terminal sockets | |
| Battery lug terminal | |

| | |
|---|---|
| Soldering lead | |
| Electrical tape | |
| Auto electrical fuse | |
| Power window motor assembly | |
| Horn single and double terminal | |
| Power window linkages | |
| Alligator clip | |
| Plastic tie | |
| Auto wire | |
| Carbon brush | |
| Ply board | |

VIII TEXT AND REFERENCES

A Required Text:
James E. Duffy. **Modern Automotive Technology.** Tinley Park Illinois: GOODHEART-WILLCOX COMPANY, INC, 2004.

IX *METHOD OF* INSTRUCTION

A. Lecture
B. Visual Aid / Film viewing
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% |

**2.)** 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

PALAU COMMUNITY COLLEGE

**Form NC-2**
**TASK LISTING SHEET**

**AM 125 AUTOMOTIVE ELECTRICITY** Credits: 1 2 96
Course No. & Title Lec. Lab Total lab hours

| | Laboratory objectives | Time allotment |
|---|---|---|
| 1. | **Install lighting system wiring harness in a correct procedure**<br>a. Install head light circuit, park and tail light and tail light circuit.<br>b. Wire signal and hazard circuit.<br>c. Connect reverse light circuit. | 24 hours |
| 2. | **Check lighting system component functionality, rationality, and circuitry.**<br>a. Check head lamp, park and tail lamp, signal and hazard light, stop light, and reverse light for functionality and circuitry.<br>b. Check lighting system switches, relay, and fuse for functionality, rationality, and circuitry. | 14 hours |
| 3. | **Check chassis electrical component for rationality, functionality, and circuitry as per repair manual specification.**<br>a. Check power window parts and components for functionality and circuitry.<br>b. Check wiper parts and components for functionality and circuitry.<br>c. Check panel board parts and components for rationality, functionality, and circuitry.<br>d. Remove and replace parts and components of chassis system. | 20 hours |
| 4. | **Install automotive electrical security system wiring harness.**<br>a. Install electrical security control module terminals.<br>b. Connect electrical security sensors, actuators, and signal receiver. | 17 hours |
| 5. | **Check automotive electrical security system circuitry and component functionality.**<br>a. Check electrical security control module terminals for functionality, and circuitry.<br>b. Check electrical security sensors, actuators, and signal receiver for functionality, rationality, and circuitry. | 5 hours |
| 6. | **Check automotive sound system circuitry and component functionality.**<br>a. Check car stereo, antenna, speakers, amplifier, tweeter, and booster for functionality and circuitry.<br>b. Analyze cause and effect involving automotive sound system problems. | 10 hours |
| 7. | **Service restraint system as per vehicle specification.**<br>a. Check seat belt retractor mechanism for functionality.<br>b. Scan air bag system to analyze DTCs and component failure.<br>c. Disarm and dispose air bag in a correct procedure. | 6 hours |

PALAU COMMUNITY COLLEGE
AM125 AUTOMOTIVE ELECTRICITY
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 Lighting System**

**Paper based assessment:** Define Watt and Ohm's law, Name lighting system parts and components and explain their functions, explain the operating principle of manual switch, and electrical switch, Draw wiring circuit diagram of lighting system, and Read lighting circuit diagram, and explain the operating principle of electrical relays, manual and electrical switch, circuit breaker, fuse and fusible link.

**Authentic Assessment:** Install Head light circuit, Park and tail light circuit, Signal / hazard circuit, Stop light circuit, Reverse light circuit, Fog lamp, Passenger light, Plate light, and/or check their functionality, rationality, and circuitry.

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

**Course learning Outcome #2: Service Chassis Electrical System**

**Paper based assessment:** Explain the law of magnetism and their applications in automotive technology, Name chassis electrical parts and components and their functions, and analyze cause and effect involving Chassis Electrical Components problems.

**Authentic Assessment:** Check Wiper, Power window, Windshield washer, Motor controlled side mirror, Door lock, Horn, and/or Panel board for functionality, rationality, and circuitry.

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

**Course learning Outcome #3: Service Electrical Security System**

**Paper based assessment:** Name automotive electrical security system parts and components, Explain automotive electrical security system operating principles, Read automotive electrical security system circuit diagram, and analyze cause and effect involving Automotive Electrical Security System problems.

**Authentic Assessment:** Install Control module, Relays, Sensors, Actuators, Signal receiver, and/or check component functionality, rationality, and circuitry.

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

**Course learning Outcome #4: Service Automotive Sounds System**

**Paper based assessment:** Name Automotive Sound System parts and components and explain their functions, Explain automotive sound system operating principle, read automotive sound system circuit diagram, and analyze cause and effect involving Automotive Sound System problems.

**Authentic Assessment:** Install Radio, Antenna, Speaker, Amplifier, Tweeter, Booster, and/or check component functionality, rationality, and circuitry.

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

**Course learning Outcome #5: Diagnose Automotive Electrical system**

**Paper based assessment:** Define *open circuit, short circuit,* voltage drop, polarity, and explain the operating principle of diode, transistors, relays, actuators, sensors, electrical and electronic switches.

**Authentic Assessment:** Diagnose wiring connection for open circuit, Diagnose wiring connection for short circuit, Check power supply, Check voltage drop, Check wiring circuit polarity, Check electrical switches, sensors, and/or check actuator for functionality, rationality, and circuitry.

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