PALAU COMMUNITY COLLEGE

Format CO
COURSE OUTLINE

BASIC AUTOMOTIVE MAINTENANCE — Course Title

AM - 111 — Dept & Course No.

I COURSE DESCRIPTION

This course deals with servicing of suspension system, brake system, steering system, wheel alignment, under chassis preventive maintenance, troubleshooting of early worn-out of tires, body vibration, and steering wheel maneuvering problem. It also includes maintaining automotive shop and practice occupational health safety.

II SEMESTER CREDITS: **3**

III CONTACT HOURS PER WEEK:

1	**6**	**7**
Lecture	Laboratory	Total

IV PREREQUISITE: None

V STUDENTS LEARNING OUTCOME

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

1.) Tighten bolts and nuts as per manual specifications.

2.) Name tools and equipment used in automotive industries and explain their functions.

3.) Use Automotive tools and equipment as per manual specification

VI. COURSE CONTENT

A. Bolts and nuts specifications
   1. Elastic region bolts
   2. Plastic region bolts
   3. Tightening sequence
   4. Loosening sequence
   5. Metric bolts and nuts
   6. Customary bolts and nuts
   7. Bolt and nut torque specification

B. Tools and equipment
   1. Hand tools
   2. Power tools
   3. Pneumatic tools
   4. Scan tools
   5. Measuring tools
   6. Special tools

C. Automotive tools and equipment specification
   1. Hand tools
   2. Power tools
   3. Pneumatic tools
   4. Scan tools
   5. Measuring tools
   6. Special tools

4.) Apply 5s to maintain shop tidiness and safety.

D. 5s for good house keeping
   1. Sorting
   2. Systematizing
   3. Sweeping
   4. Standardizing
   5. Self-discipline

5.) Explain suspension system operating principles.

E. Suspension system operating principles
   1. Unsprung weight
   2. Sprung weight
   3. Riding comfort
   4. Spring oscillation
   5. Vehicle load capacity

6.) Name suspension system parts and components and explain their functions as per repair manual specification.

F. Suspension system parts and components
   1. Types of suspension system
   2. Suspension arms
   3. Stabilizer bar, bushing, and link
   4. Types of suspension springs
   5. Strut bar and bushing
   6. Types of suspension shock absorber
   7. Suspension trailing arm
   8. Suspension lateral rod
   9. Axle beam
   10. Rubber damper
   11. Axle bearings
   12. Spindle bearing

7.) Perform suspension system servicing in a correct procedure.

G. Procedures in servicing Suspension system.
   1. Under chassis preventive maintenance
   2. Suspension arms
   3. Stabilizer bar, bushing, and link
   4. Types of suspension springs
   5. Strut bar and bushing
   6. Types of suspension shock absorber
   7. Suspension trailing arm
   8. Suspension lateral rod
   9. Axle beam
   10. Rubber damper
   11. Axle bearings
   12. Spindle bearing

8.) Troubleshoot suspension system problems in a correct procedure.	H. Suspension system troubleshooting procedure 1. Car wonder 2. Excessive camber and/or caster angle 3. Sagging 4. Bouncing 5. Bottoming 6. Rolling
9.) Name steering system parts and components and explain their functions as per repair manual specifications.	I. Steering system 1. Types of steering gear box 2. Types of steering linkage 3. Steering column assembly 4. Steering column mechanism
10.) Explain steering system operating principles.	J. Steering system operating principle 1. Rack and pinion type (manual and hydraulic power assist steering). 2. Recirculating ball type (manual and hydraulic power assist). 3. Power steering pump assembly 4. Power steering fluid specification
11.) Perform steering system servicing in a correct procedure.	K. Procedures in servicing Steering system 1. Procedures in servicing steering linkages Parallelogram type, rack and pinion type, and cross linkage type. 2. Procedures in servicing steering gear box recirculating ball type (manual and hydraulic assist type). 3. Procedures in servicing rack and pinion type gear box (manual and hydraulic assist type).
12.) Troubleshoot steering system problems in a correct procedure.	L. Steering system troubleshooting procedures 1. Hard steering 2. Car wondering 3. Excessive steering wheel free-play
13.) Name brake system parts and components and explain their functions as per repair manual specifications.	M. Brake parts and components 1. Types of brakes 2. Classification of brakes 3. Brake booster

4. Brake master assembly
5. Brake lines
6. Brake pedal
7. Brake caliper
8. Brake cylinders
9. Brake proportioning valve
10. Brake fluid
11. Parking brake

14.) Explain brake system operating principle.

N. Brake system operating principle
1. Pascal law
2. Hydraulic brake system operating principle
3. Operating principle of brake equip with proportioning valve
4. Brake ratio
5. Anti-lock brake system operating principle

15.) Perform brake system servicing in correct procedure.

O. Servicing brake system
1. Brake system preventive maintenance
2. Replace brake pads and linings
3. Replace brake master repair kit
4. Replace brake wheel cylinder repair kit
5. Bleed brake system

16.) Troubleshoot brake system problems in a correct procedure.

P. Common problems of brake system and their remedies
1. Spongy pedal
2. Hard pedal
3. Brake fading
4. Dragging brake
5. Pulling brake
6. Locking brakes

17.) Explain the importance of wheel alignment as per vehicle specification.

Q. Wheel alignment angles
1. Caster angle
2. Camber angles
3. Toe angles
4. SAI angles
5. Trust Angle
6. Toe-in turns

18.) Perform wheel alignment in a correct procedure.

R. Wheel alignment procedures
1. Caster angle adjustments
2. Camber angle adjustments
3. Toe angle adjustments
4. Thrust angle adjustments

19.) Troubleshoot wheel alignment problems that correlate to maneuvering and early tire wear problems.

S. Tire wear that correlates to steering wheel maneuvering problems.
   1. Spotted wear
   2. Side wear
   3. Center wear
   4. Saw tooth

VII MATERIALS AND EQUIPMENT

Materials	Equipments
Brake fluid	Crocodile jack 3 tons
Power steering fluid	Vehicle sedan type
Multipurpose grease	Vehicle pick-up 4x4
Penetrating oil (WD-40)	Jack stand
Powder soap	Rubber stopper
Sandpaper # 120	Car lifter
Sand paper # 1000	Laying board
Brake rubber caps	Toe bar
Tie-rod end	Computer wheel aligner
Rack-end and pinion gear box assembly	Computer wheel balancer
Brake master	Torque wrench
Plastic tie	Tap and die
	Brake piston presser
	Ball peen hammer
	Brake cylinder honing
	Pneumatic tire changer
	Bench vise

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%

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-111 BASIC AUTOMOTIVE MAINTENANCE Credits: 1 2 96
Course No. & Title Lec. Lab Total lab hours

Laboratory objectives	Time allotment
1.) Tighten bolts and nuts as per manual specifications. a. Tighten or loosen Elastic region bolts in a correct sequence and specifications. b. Tighten or loosen Plastic region bolts in a correct sequence and specifications. c. Tightening metric and customary bolts and nuts in a correct sequence and specifications. d. Repair bolts and nuts thread in a correct procedure.	4 hours
2.) Use Automotive tools and equipment as per manual specification a. Safely use basic hand tools, power tools, and special standard tools and as per manual specifications. b. Safely use scan tools, measuring tools, and precession tools and as per manual specifications.	3 hours
3.) Apply 5s to maintain shop tidiness and safety. a. Apply Sorting, Systematizing, Sweeping, Standardizing, and Self-discipline to maintain shop tidiness and safety. b. Apply 5 minutes cleaning before and after laboratory activities to maintain shop tidiness and safety. c. Apply 5s at all times to maintain shop tidiness and safety.	4 hours
4.) Perform suspension system servicing in a correct procedure. a. Service rigid type suspension system as per manual specification. b. Service Mc Pherson type suspension system as per manual specification. c. Service double wishbone type suspension system as per manual specification.	20 hours
5.) Troubleshoot suspension system problems in a correct procedure. a. Analyze cause and effect involving car wonder and rolling problems. b. Identify sagging suspension, excessive car bouncing and bottoming problems.	10 hours
6.) Perform steering system servicing in a correct procedure. a. Remove and replace steering parts linkage. b. Overhaul steering gear box. c. Remove and replace steering column bushing.	15 hours

7.) Troubleshoot steering system problems in a correct procedure. a. Analyze cause and effect involving hard steering or maneuvering problems. b. Troubleshoot car wondering that correlates to steering system. c. Troubleshoot unusual sound on steering linkages and column assembly.	5 hours
8.) Perform brake system servicing in correct procedure. a. Remove and replace brake pads and lining. b. Overhaul brake master cylinder and wheel cylinder. c. Adjust brake pedal height and parking brake clearance. d. Bleed brake system.	15 hours
9.) Perform wheel alignment in a correct procedure. a. Adjust Caster angle as per manufacturer specification. b. Adjust Camber angles, Toe angles, and Toe-in turns to prevent early tire wear. c. Adjust SAI angles and thrust angle to correct stability and maneuvering problems.	10 hours
10.) Troubleshoot wheel alignment problems that correlate to maneuvering and early tire wear problems. a. Analyze cause and effect involving spotted wear on tires, side wear on tires, center wear on tires, and saw tooth wear on tire problems. b. Identify geometrical angle that causes early worn-out of tires.	10 hours

PALAU COMMUNITY COLLEGE
AM-111 BASIC AUTOMOTIVE MAINTENANCE
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: Perform Suspension System Servicing

Paper based assessment: Name suspension system parts and components and explain their functions, explain the operating principle of suspension system, name basic hand tools and automotive equipment and/or explain Bolt specifications and tightening procedure and sequence, and differentiate metric bolts and customary bolts,

Authentic Assessment: Inspect suspension parts for looseness, remove and replace suspension worn-out parts and components, and/or conduct under chassis bolt tightening.

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

Course learning Outcome #2: Perform Steering System Servicing

Paper based assessment: Name steering system parts and components and explain their function, explain the operating principle of power steering system for both rack and pinion type and recirculating ball type.

Authentic Assessment: Overhaul steering gear box, replace worn-out steering linkages, repack front wheel bearings, and/or adjust steering spoke.

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

Course learning Outcome #3: Perform Brake System servicing

Paper based assessment: Name brake system parts and components and explain their function, explain the operating principle of hydraulically operated brake system, and analyze cause and effect involving brake system failure.

Authentic Assessment: Overhaul brake master cylinder and brake wheel cylinder, remove and replace brake pads and linings, bleed brake system and/or conduct Brake system preventive maintenance.

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

Course learning Outcome #4: Perform Wheel Alignment

Paper based assessment: Explain the importance of wheel alignment and differentiate the different Types of geometrical angle of tires and wheels, and explain tire specifications, and analyze cause and effect involving wheel alignment problems.

Authentic Assessment: Conduct front wheel and four wheel alignment, and/or check tire wear pattern and perform tire rotation, and wheel balancing.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in performing Wheel Alignment with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in performing Wheel Alignment with 70% to 84% performance accuracy.

Beginner 1 (3 points)	Student demonstrates the knowledge and skills in performing Wheel Alignment with below 70% performance accuracy.

Course learning Outcome #5: Solve Under chassis Problems

Paper based assessment: Explain the cause and effect involving under chassis problem, such as; knocking sound, side swaying, car wondering, steering wheel vibrations, hard steering and maneuvering problems, excessive bouncing, excessive tire wear, and ride height problems.

Authentic Assessment: Conduct road testing and troubleshoot under chassis problems.

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