

**Format CO
COURSE OUTLINE**

AUTOMOTIVE MECHANICS for Non-Majors

Course Title

AM110

Dept & Course No.

I COURSE DESCRIPTION

This is an exploratory course in automotive mechanics for non-majors with primary emphasis on preventive maintenance.

II SEMESTER CREDITS: 3

III CONTACT HOURS PER WEEK:

2

Lecture

3

Laboratory

5

Total

IV PREREQUISITE: None

V STUDENTS LEARNING OUTCOME	VI. COURSE CONTENT
<p>At the end of the semester, the student with a combined accuracy of 65 % should be able to:</p> <p>1. Service Suspension System</p>	<p>A. Double Wishbone Type Suspension</p> <ol style="list-style-type: none"> 1. Control arm 4. Sway bar 5. Shock absorber 6. Suspension spring 7. Rubber damper 8. Suspension bushing 9. Lateral control rod 10. Trailing arm 11. Torsion bar 12. Ride height 13. Bolt tightening procedure and sequence 14. Operating principle of double wishbone type suspension system <p>B. Mac Pherson type suspension</p> <ol style="list-style-type: none"> 1. Mac Pherson strut parts and components 2. Operating principle of Mac Pherson strut suspension system <p>C. Rigid type suspension</p> <ol style="list-style-type: none"> 1. Types of rigid suspension system 2. Rigid Suspension components and their function 3. Rigid Suspension system operating

	<p>principles</p> <ol style="list-style-type: none"> 4. Sprung weight 5. Unsprung weight
2. Service Steering System	<ol style="list-style-type: none"> A. Steering recirculating ball type parts and components <ol style="list-style-type: none"> 1. Parallelogram linkages 2. Types of gear box 3. Manual type steering 4. Types of Power steering 5. Rack and pinion linkages 6. Types of gear box 7. Manual type steering 8. Types of Power steering B. Wheel alignment <ol style="list-style-type: none"> 1. Caster angle 2. Camber angle 3. Toe angle 4. SAI 5. Toe-out on turns 6. Tracking 7. Tire problems
3. Service Brake System	<ol style="list-style-type: none"> A. Brake parts and components and their function <ol style="list-style-type: none"> 1. Brake pedal 2. Brake booster 3. Brake master cylinder 4. Brake lines 5. Brake metering 6. Brake wheel cylinder 7. Brake assembly 8. Brake fluid 9. Brake System Principle of Operation 10. Components of brake system 11. Types of brake system and their classification 12. Pascal law 13. Brake principle of operation 14. Braking ratio 15. Brake system components (conventional type)
4. Service Starting System	<ol style="list-style-type: none"> A. Starting System Operating Principle <ol style="list-style-type: none"> 1. Starting system action 2. Main components of starting system 3. Different types of starting motor 4. Starting System Parts and

	<p>Components</p> <ol style="list-style-type: none"> 5. Pinion gear 6. Overrunning clutch 7. Starter solenoid switch 8. Internal motor circuits 9. Neutral safety switch 10. Electrical circuit diagram
5. Service Charging System	<p>A. Charging System Operating Principle</p> <ol style="list-style-type: none"> 1. Charging system parts 2. Function of charging system 3. Charging system operating principle 4. Charging System Parts and Components 5. Alternator construction 6. Voltage regulator 7. Types of drive belt 8. Charging system electrical circuit 9. Voltage rating 10. Amperage rating
6. Service Lighting System	<p>A. Lighting system and their specification</p> <ol style="list-style-type: none"> 1. Electrical wiring diagram symbols 2. Electrical wiring schematic diagram 3. Electrical Circuit Diagram of Lighting System 4. Head light circuit 5. Park and tail light circuit 6. Signal and hazard light circuit 7. Stop light circuit 8. Plate light circuit 9. Passenger's light circuit
7. Service Engine Auxiliary System	<p>A. Engine auxiliary system</p> <ol style="list-style-type: none"> 1. Cooling system principles of operation 2. Lubrication system principles of operation 3. Ignition system principles of operation 4. EFI (Electronic Fuel Injection) principles of operation 5. Operating principle of carburetor assembly 6. Operating principle of diesel engine fuel system

	<ol style="list-style-type: none"> 7. Operating principle of pre-heating system 8. Engine mechanical system and their specification
8. Interpret Vehicle Preventive Maintenance	<ol style="list-style-type: none"> A. Vehicle maintenance requirements and scheduling <ol style="list-style-type: none"> 1. Interpret and follow maintenance schedule as shown in the specific vehicle owner manual 2. Trip meter basis 3. Monthly or quarterly basis 4. Hourly basis 5. Vehicle preventive maintenance 6. Job order 7. Technical information B. Classification of automotive fluids and lubricants <ol style="list-style-type: none"> 1. Types and class of brake fluids 2. Types of coolant 3. Types of windshield washer 4. Types and classification of Automatic transmission fluid 5. Types and classification of engine lubricants 6. Types and classification of automotive gear oils 7. Types and classification of automotive grease 8. Battery fluid 9. Power steering fluid

VII MATERIALS AND EQUIPMENT

Materials	Equipments
Brake fluid	OBD II (On-Board Diagnostic Generation II)
Transmission gear oil	Stethoscope
ATF	Fuel pressure gauge
Differential gear oil	Compression tester (diesel)
Multi purpose grease	Diesel injector tester
Powder soap	Gas analyzer (gas & diesel)
Sandpaper # 120	Oscilloscope tester
Sand paper # 1000	Fuel injector tester

Engine oil (for gas engine)	crocodile jack 3 tons
Engine oil (for Diesel engine)	vehicle sedan type
Oil filter	vehicle pick-up 4x4
Engine coolant	Jack stand
Spark plug	Rubber stopper
Shop rugs	laying board
Hand soap	Toe bar
Gasoline fuel	Computer wheel aligner
Diesel fuel	Computer wheel balancer
Fuel filter	
Gasket silicon	
Vellumoid gasket	
Cork gasket	
Washing solvent	
Carburetor and injector cleaner	
Auto wire	
Carbon brush	

VIII TEXT AND REFERENCES

A Required Text:

Martin W. Stockel and Martin T. Stockel, **Automotive Fundamentals**,
Tinley Park Illinois, GOODHEART-WILLCOX COMPANY, INC. 2005

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

B Supplementary References:

Toyota Motor Corporation: Repair manual for;

- Toyota sedan
- Toyota RAV-4
- Toyota SURF

Printed by: Toyota Motor Corporation, 1997

Nissan Motor: Repair manual for;

- Nissan QUEST
- Nissan sedan
- Nissan SUV

Printed by: Nissan North America, Inc. 1992

General Motors Corporation; Repair manual for Chevy Trucks Chassis

Printed by: General Motors Corporation USA 1993 to 1998

Mitchell International for domestic cars service and repair

- Engine Performance
- Chassis electrical
- Engine electrical
- Chassis repair
- Engine repair
- Electrical components locator

San Diego, California 1992 to 1998 edition.

Chris Johanson, Auto Brake Technology, Tinley Park Illinois,
GOODHEART-WILLCOX COMPANY, INC. 2000

Chris Johanson, Auto Suspension and Steering Technology, Tinley Park
Illinois, GOODHEART-WILLCOX COMPANY, INC. 2003

James E. Duffy, Automotive Electricity and Electronics Technology,
Tinley Park Illinois, GOODHEART-WILLCOX COMPANY, INC. 2000.

James E. Duffy, Auto Engine Technology, Tinley Park Illinois,
GOODHEART-WILLCOX COMPANY, INC. 2004.

IX METHOD OF INSTRUCTION

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

X METHOD OF EVALUATION:

Mastery of concepts is tested through written examination. Performance on laboratory and shop projects is measured through the following criteria:

- A. Accuracy 25%
- B. Time 10%
- C. Technique 10%
- D. Appearance 10%
- E. Completion 35%
- F. Knowledge 10%

Total: 100%

The components with corresponding weight in percent included in the computation of the final grade are:

- A. Participation (shop projects) 20%
- B. Quizzes and homework 10%
- C. Midterm / Final Exam 20%
- D. Laboratory (Based on task list) 50%

Total: 100%

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

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

Form NC-2
TASK LISTING SHEET

AM110 AUTOMOTIVE MECHANICS for Non-majors
Course No. & Title

Credits: 2 Lec. 1 Lab 48 Total lab hours

Laboratory objectives	Time allotment
<p>1. Service Suspension System</p> <ul style="list-style-type: none"> a. Replace upper and lower ball joint b. Adjust ride height c. Replace shock absorber d. Remove strut type shock absorber assembly e. Assemble strut type shock absorber f. Install strut type shock absorber assembly g. Lubricating spindle bearing h. Replace leaf spring center bolt i. Replace king pin assembly 	6 hours
<p>2. Service Steering System</p> <ul style="list-style-type: none"> a. Replace parallelogram steering linkage b. Overhaul manual steering gear box assembly c. Overhaul power steering gear box assembly d. Overhaul power steering pump assembly e. Bleed power steering hydraulic system circuitry f. Service rack and pinion steering linkage g. Service manual type rack and pinion gear box assembly h. Service power steering type rack and pinion gear box i. Service steering column assembly 	6 hours
<p>3. Service Hydraulically Operated Brake System</p> <ul style="list-style-type: none"> a. Check brake booster operation b. Overhaul brake master cylinder c. Bleed brake lines d. Replacing brake lining e. Replacing brake pad f. Adjusting brake pedal free play g. Adjust parking brake lever 	6 hours
<p>4. Service Starting System</p> <ul style="list-style-type: none"> a. Check starter motor operation b. Check starter switch and relay c. Remove starter motor assembly d. Dismantle starter motor assembly e. Test armature winding 	8 hours

<ul style="list-style-type: none"> f. Test solenoid switch g. Test field coil winding h. Assemble starter motor components i. Install starter motor assembly 	
<p>5. Service Charging System</p> <ul style="list-style-type: none"> a. Check charging output b. Check charging system wiring connection c. Check voltage regulator operation d. Remove alternator assembly e. Dismantle alternator assembly f. Test stator winding g. Test rotor winding h. Replace alternator carbon brush i. Check rectifier diode operation j. Assemble alternator components k. Install alternator assembly 	4 hours
<p>6. Service Lighting System</p> <ul style="list-style-type: none"> a. Check light bulbs b. Check lighting system relay and fuses c. Check light switch terminal contact d. Conduct wiring installation for head light circuit e. Conduct wiring installation for park and tail circuit f. Conduct wiring installation for signal and hazard circuit g. Conduct wiring installation for stop light circuit h. Conduct wiring installation for horn circuit i. Conduct wiring installation for plate light circuit 	8 hours
<p>7. Service engine auxiliary system</p> <ul style="list-style-type: none"> a. Replace engine coolant b. Replace spark plug c. Replace spark plug high tension wire d. Replace EFI fuel filter e. Replace Diesel engine fuel filter f. Replace glow plug g. Clean air filter h. Test engine compression pressure 	6 hours
<p>8. Interpret Vehicle Preventive Maintenance</p> <ul style="list-style-type: none"> a. Interpret maintenance schedules on odometer reading b. Interpret maintenance schedules on monthly or quarterly basis c. Interpret maintenance schedules on hourly basis d. Interpret company vehicle preventive maintenance schedules e. Interpret maintenance schedules on mechanical and auxiliary system 	4 hours

RUBRICS

AM110 AUTOMOTIVE MECHANICS for Non-Majors

Student Name: _____

Semester / Year: _____

Instructor's Name: _____

Direction: Evaluate the student using the rating scale below and check the appropriate numbers to indicate the degree of competency. The numerical rating of 5, 4, 3, 2, and 1 are not intended to represent the traditional school grading system of A, B, C, D, and F. The description associated with each of the number focus on the level of student performance for each of the competencies listed below.

Rating Scale: 5 Excellent Skilled
4 Above average
3 Average
2 Below average
1 Unacceptable

DESCRIPTION	RATING				
A. Service Suspension System	1	2	3	4	5
B. Service Steering System	1	2	3	4	5
C. Service Hydraulically Operated Brake System	1	2	3	4	5
D. Service Starting System	1	2	3	4	5
E. Service Charging System	1	2	3	4	5
F. Service Lighting System	1	2	3	4	5
G. Service Engine Auxiliary System	1	2	3	4	5
H. Interpret Vehicle Preventive Maintenance	1	2	3	4	5

I certify that the student has completed all the competencies in this course and has achieved the competency ratings as shown above.

Instructor's Signature

Date

RUBRICS

AM110 AUTOMOTIVE MECHANICS for Non-Majors

A. Service Suspension System

5. The student demonstrates knowledge and skills in replacing upper and lower ball joint, adjusting ride height, replacing shock absorber, removing strut type shock absorber assembly, lubricating spindle bearing, and replacing leaf spring center bolt with 90% to 100% performance accuracy.
4. The student demonstrates knowledge and skills in replacing upper and lower ball joint, adjusting ride height, replacing shock absorber, removing strut type shock absorber assembly, lubricating spindle bearing, and replacing leaf spring center bolt with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in replacing upper and lower ball joint, adjusting ride height, replacing shock absorber, removing strut type shock absorber assembly, lubricating spindle bearing, and replacing leaf spring center bolt with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in replacing upper and lower ball joint, adjusting ride height, replacing shock absorber, removing strut type shock absorber assembly, lubricating spindle bearing, and replacing leaf spring center bolt with 65% to 69% performance accuracy.
1. The student demonstrates knowledge and skills in replacing upper and lower ball joint, adjusting ride height, replacing shock absorber, removing strut type shock absorber assembly, lubricating spindle bearing, and replacing leaf spring center bolt with below 65% performance accuracy.

B. Service Steering System

5. The student demonstrates knowledge and skills in replacing parallelogram steering linkage, overhauling manual steering gear box assembly, bleeding power steering hydraulic system circuitry, replacing rack and pinion steering linkage, and servicing rack and pinion gear box with 90% to 100% performance accuracy.
4. The student demonstrates knowledge and skills in replacing parallelogram steering linkage, overhauling manual steering gear box assembly, bleeding power steering hydraulic system circuitry, replacing rack and pinion steering linkage, and servicing rack and pinion gear box with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in replacing parallelogram steering linkage, overhauling manual steering gear box assembly, bleeding power steering hydraulic system circuitry, replacing rack and pinion steering linkage, and servicing rack and pinion gear box with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in replacing parallelogram steering linkage, overhauling manual steering gear box assembly, bleeding power steering hydraulic system circuitry, replacing rack and pinion steering linkage, and servicing rack and pinion gear box with 65% to 69% performance accuracy.
1. The student demonstrates knowledge and skills in replacing parallelogram steering linkage, overhauling manual steering gear box assembly, bleeding power steering hydraulic system circuitry, replacing rack and pinion steering linkage, and servicing rack and pinion gear box with below 65% performance accuracy.

C. Service Hydraulically Operated Brake System

5. The student demonstrates knowledge and skills in checking brake booster operation, overhauling brake master cylinder, bleeding brake lines, replacing brake lining, replacing brake pad, adjusting brake pedal free play, and adjusting parking brake lever with 90% to 100% performance accuracy.
4. The student demonstrates knowledge and skills in checking brake booster operation, overhauling brake master cylinder, bleeding brake lines, replacing brake lining, replacing brake pad, adjusting brake pedal free play, and adjusting parking brake lever with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in checking brake booster operation, overhauling brake master cylinder, bleeding brake lines, replacing brake lining, replacing brake pad, adjusting brake pedal free play, and adjusting parking brake lever with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in checking brake booster operation, overhauling brake master cylinder, bleeding brake lines, replacing brake lining, replacing brake pad, adjusting brake pedal free play, and adjusting parking brake lever with 65% to 69% performance accuracy.
1. The student demonstrates knowledge and skills in checking brake booster operation, overhauling brake master cylinder, bleeding brake lines, replacing brake lining, replacing brake pad, adjusting brake pedal free play, and adjusting parking brake lever with below 65% performance accuracy.

D. Service Starting System

5. The student demonstrates knowledge and skills in checking starter motor operation, checking starter switch and relay, removing starter motor assembly, dismantling starter motor assembly, testing armature winding, testing solenoid switch, testing field coil winding, assembling starter motor components, and installing starter motor assembly with 90% to 100% performance accuracy.
4. The student demonstrates knowledge and skills in checking starter motor operation, checking starter switch and relay, removing starter motor assembly, dismantling starter motor assembly, testing armature winding, testing solenoid switch, testing field coil winding, assembling starter motor components, and installing starter motor assembly with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in checking starter motor operation, checking starter switch and relay, removing starter motor assembly, dismantling starter motor assembly, testing armature winding, testing solenoid switch, testing field coil winding, assembling starter motor components, and installing starter motor assembly with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in checking starter motor operation, checking starter switch and relay, removing starter motor assembly, dismantling starter motor assembly, testing armature winding, testing solenoid switch, testing field coil winding, assembling starter motor components, and installing starter motor assembly with 65% to 69% performance accuracy.

1. The student demonstrates knowledge and skills in checking starter motor operation, checking starter switch and relay, removing starter motor assembly, dismantling starter motor assembly, testing armature winding, testing solenoid switch, testing field coil winding, assembling starter motor components, and installing starter motor assembly with below 65% performance accuracy.

E. Service Charging System

5. The student demonstrates knowledge and skills in checking charging output, checking charging system wiring connection, checking voltage regulator operation, removing alternator assembly, dismantling alternator assembly, testing stator winding, test rotor winding, replacing alternator carbon brush, checking rectifier diode operation, assemble alternator components, and installing alternator assembly with 90% to 100% performance accuracy.
4. The student demonstrates knowledge and skills in checking charging output, checking charging system wiring connection, checking voltage regulator operation, removing alternator assembly, dismantling alternator assembly, testing stator winding, test rotor winding, replacing alternator carbon brush, checking rectifier diode operation, assemble alternator components, and installing alternator assembly with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in checking charging output, checking charging system wiring connection, checking voltage regulator operation, removing alternator assembly, dismantling alternator assembly, testing stator winding, test rotor winding, replacing alternator carbon brush, checking rectifier diode operation, assemble alternator components, and installing alternator assembly with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in checking charging output, checking charging system wiring connection, checking voltage regulator operation, removing alternator assembly, dismantling alternator assembly, testing stator winding, test rotor winding, replacing alternator carbon brush, checking rectifier diode operation, assemble alternator components, and installing alternator assembly with 65% to 69% performance accuracy.
1. The student demonstrates knowledge and skills in checking charging output, checking charging system wiring connection, checking voltage regulator operation, removing alternator assembly, dismantling alternator assembly, testing stator winding, test rotor winding, replacing alternator carbon brush, checking rectifier diode operation, assemble alternator components, and installing alternator assembly with below 65% performance accuracy.

F. Service Lighting System

5. The student demonstrates knowledge and skills in checking light bulbs, checking lighting system relay and fuses, checking light switch terminal contact, conducting wiring installation for head light circuit, conducting wiring installation for park and tail circuit, and conducting wiring installation for horn circuit with 90% to 100% performance accuracy.

4. The student demonstrates knowledge and skills in checking light bulbs, checking lighting system relay and fuses, checking light switch terminal contact, conducting wiring installation for head light circuit, conducting wiring installation for park and tail circuit, and conducting wiring installation for horn circuit with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in checking light bulbs, checking lighting system relay and fuses, checking light switch terminal contact, conducting wiring installation for head light circuit, conducting wiring installation for park and tail circuit, and conducting wiring installation for horn circuit with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in checking light bulbs, checking lighting system relay and fuses, checking light switch terminal contact, conducting wiring installation for head light circuit, conducting wiring installation for park and tail circuit, and conducting wiring installation for horn circuit with 65% to 69% performance accuracy.
1. The student demonstrates knowledge and skills in checking light bulbs, checking lighting system relay and fuses, checking light switch terminal contact, conducting wiring installation for head light circuit, conducting wiring installation for park and tail circuit, and conducting wiring installation for horn circuit with below 65% performance accuracy.

G. Service engine auxiliary system

5. The student demonstrates knowledge and skills in replacing engine coolant, replacing spark plug, replacing spark plug high tension wire, replacing EFI fuel filter, replacing Diesel engine fuel filter, replace glow plug, cleaning air filter, and testing engine compression pressure with 90% to 100% performance accuracy.
4. The student demonstrates knowledge and skills in replacing engine coolant, replacing spark plug, replacing spark plug high tension wire, replacing EFI fuel filter, replacing Diesel engine fuel filter, replace glow plug, cleaning air filter, and testing engine compression pressure with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in replacing engine coolant, replacing spark plug, replacing spark plug high tension wire, replacing EFI fuel filter, replacing Diesel engine fuel filter, replace glow plug, cleaning air filter, and testing engine compression pressure with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in replacing engine coolant, replacing spark plug, replacing spark plug high tension wire, replacing EFI fuel filter, replacing Diesel engine fuel filter, replace glow plug, cleaning air filter, and testing engine compression pressure with 65% to 69% performance accuracy.
1. The student demonstrates knowledge and skills in replacing engine coolant, replacing spark plug, replacing spark plug high tension wire, replacing EFI fuel filter, replacing Diesel engine fuel filter, replace glow plug, cleaning air filter, and testing engine compression pressure with below 65% performance accuracy.

H. Interpret Vehicle Preventive Maintenance

5. The student demonstrates knowledge and skills in interpreting maintenance schedules on odometer reading, interpreting maintenance schedules on monthly or quarterly basis, interpreting maintenance schedules on hourly basis, interpreting company vehicle preventive maintenance schedules, and interpreting maintenance schedules on mechanical and auxiliary system with 90% to 100% performance accuracy.
4. The student demonstrates knowledge and skills in interpreting maintenance schedules on odometer reading, interpreting maintenance schedules on monthly or quarterly basis, interpreting maintenance schedules on hourly basis, interpreting company vehicle preventive maintenance schedules, and interpreting maintenance schedules on mechanical and auxiliary system with 80% to 89% performance accuracy.
3. The student demonstrates knowledge and skills in interpreting maintenance schedules on odometer reading, interpreting maintenance schedules on monthly or quarterly basis, interpreting maintenance schedules on hourly basis, interpreting company vehicle preventive maintenance schedules, and interpreting maintenance schedules on mechanical and auxiliary system with 70% to 79% performance accuracy.
2. The student demonstrates knowledge and skills in interpreting maintenance schedules on odometer reading, interpreting maintenance schedules on monthly or quarterly basis, interpreting maintenance schedules on hourly basis, interpreting company vehicle preventive maintenance schedules, and interpreting maintenance schedules on mechanical and auxiliary system with 65% to 69% performance accuracy.
1. The student demonstrates knowledge and skills in interpreting maintenance schedules on odometer reading, interpreting maintenance schedules on monthly or quarterly basis, interpreting maintenance schedules on hourly basis, interpreting company vehicle preventive maintenance schedules, and interpreting maintenance schedules on mechanical and auxiliary system with below 65% performance accuracy.