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ABSTRACT

These instructional objectives have been selected from materials submitted to the Curriculum Laboratory of the Graduate School of Education at UCLA. Arranged by major course goals, these objectives are offered simply as samples that may be used where they correspond to the skills, abilities, and attitudes instructors want their students to acquire. These objectives may also serve as models for assisting instructors to translate other instructional units into specific measurable terms. (MB)

Instructional Objectives for a Junior College Course in Auto Mechanics

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AUTO MECHANICS 70A

I. SHOP SAFETY AND FIRE PREVENTION

A. You will demonstrate your knowledge of shop safety rules by correctly answering all questions on the standard shop safety test.

B. You will demonstrate that you are a safe worker by obeying all safety rules while working in the shop.

C. In a manipulative test, observed by the instructor, you will select the correct type of fire extinguisher for either a class A or class B fire and explain proper use of both types.

II. TOOLS AND EQUIPMENT

A. By the conclusion of this course, in a written identification test, you will correctly name the following hand, measuring, or power tools which are used in automotive technology:

1. box wrench
2. end wrench
3. 1/4" drive sockets, ratchets, and extensions
4. 3/8" drive sockets, ratchets, and extensions
5. 1/2" drive sockets, ratchets, and extensions
6. universal sockets
7. flat, phillips, and clutch head screw drivers
8. pliers, channel locks, and vise-grips
9. ball-peen, plastic, and raw hide hammer
10. tapered and pin punches
11. cold chisels
12. hack saw

13. mill, bastard, and second cut file
14. starting and bottoming tap
15. tap wrench
16. foot-pound torque wrench
17. inch-pound torque wrench
18. 0-1" micrometer
19. 1-2" micrometer
20. 2-3" micrometer
21. 3-4" micrometer
22. inside micrometer
23. vernier caliber
24. telescoping gauge
25. dial indicator
26. cylinder wear gauge
27. piston pull gauge
28. plastigauge
29. ring compressor
30. ring groove cleaner
31. ridge reamer
32. slide hammer puller
33. screw type puller
34. bushing drivers

B. In written identification tests you will correctly identify by proper name all of the following special tools:

1. tip cleaner

2. chipping hammer
3. cutting tip
4. welding tip
5. oxygen regulator
6. acetylene regulator
7. torsion bar gauge
8. caster-camber gauge
9. toe-in gauge
10. ball joint gauge
11. ball joint socket
12. caster-camber special box end wrench
13. tire scriber
14. dial indicator for lateral run-out
15. tie rod fork
16. static wheel balancer
17. dynamic wheel balancer
18. wheel weight hammer
19. axle thread chaser
20. tubing cutter and flaring tool
21. tubing wrench
22. brake spring pliers
23. brake bleeding wrench
24. hold down spring tool
25. wheel cylinder hone
26. pressure brake bleeder

27. wheel bearing packer
28. chrysler return spring tool
29. bendix return spring tool

C. Use of lifting equipment

You will demonstrate your ability to safely use lifting equipment by:

1. lifting a vehicle with a hydraulic jack and placing it securely on jackstands.
2. listing a vehicle with an air bumper jack and placing it securely on jackstands.
3. properly raise a vehicle with a twin-post hoist.

D. In a 15 minute identification test, you will correctly identify by name, diameter, thread, and/or length the following:

1. studs
2. cap screws
3. nuts
4. machine screws
5. flat washers
6. lock washers
7. brake shoe rivets
8. woodruff keys
9. cotter keys

E. In a performance type test under general shop conditions you will:

1. sharpen a twist drill, cold chisel, and screw driver to industrial standards. 20 minutes will be allowed to sharpen each tool.

2. drill and tap (4) holes in a mild steel plate within 1 hour. Holes shall be equally spaced and of the following diameter and thread:
   a. 1/4-24
   b. 5/16-20
   c. 5/16-24
   d. 3/8-18
3. weld two flat straight beads 1/2" apart on a piece of 1/4" mild steel plate, using oxy-acetylene welding equipment.
4. weld two straight flat beads 1/2" apart on a piece of 1/4" mild steel plate using electric arc.

III. SUSPENSION AND STEERING

A. In a 15 minute written identification test you will identify and correctly name all of the following steering and suspension parts:

1. coil and leaf springs
2. lower control arm
3. upper control arm
4. upper and lower inner control arm bushings
5. ball joints (loaded and unloaded type)
6. torsion bar
7. shock absorber
8. sway bar
9. strut rod
10. steering arm

11. tie rod end
12. tie rod adjusting sleeve
13. drag link
14. idler arm
15. pitman arm
16. steering knuckle

B. In a paper and pencil test you will answer questions in writing and by drawing diagrams concerning caster, camber, steering axis inclination, toe-in and turning radius with a minimum of 70% accuracy.

C. In a performance test under general shop conditions, working as a team with another student, you will perform at least three of the following jobs on one side of a late model American built vehicle:

1. replace upper or lower inner control arm bushing
2. replace front coil spring
3. replace torsion bar
4. replace two ball joints
5. replace idler arm and bushings
6. replace tie rod ends

Each student team will be responsible for locating their own repair jobs.

D. In a performance test under general shop conditions you will align the front wheels of an instructor-assigned late model American built automobile without air conditioning. Such

alignment shall include checking and adjusting as necessary the caster, camber, toe-in, steering axis inclination, turning radius, torsion bars and centering the steering wheel. Time allotted for alignment will be twice the time allowed by the Motors flat rate manual.

IV. WHEEL BALANCING

A. In a thirty minute written test, you will demonstrate your understanding of wheel balancing principles by correctly answering 70% of the multiple choice questions concerning dynamic and static wheel balancing and radial and lateral run-out.

B. In a performance test under general shop conditions you will:

1. within 20 minutes, balance one front tire of an American built vehicle within 1/4 ounce using a dynamic type wheel balancer.

2. within 20 minutes remove and replace one front tire of an American built vehicle and correctly balance tire using a static type wheel balancer.

V. BRAKES

A. In a written test you will correctly answer 70% of the multiple choice and true-false questions concerning the following brake system topics:

1. hydraulic principles

2. hydraulic brake system

3. bendix type brakes

4. lockhead type brakes

5. total contact Chrysler type

6. vehicle code brake section

B. In a performance test under general shop conditions using tools outlined in section I, you will:

1. within twice the time allotted by Motors flat rate manual, do a complete brake job to manufacturer's specifications and standards on one wheel of an American built automobile. The job will include the following tasks:

a. remove and replace brake shoes

b. overhaul wheel cylinder

c. machine drum

d. arc grind brake shoe to conform to brake drum radius

e. adjust brake shoes

f. bleed hydraulic system

2. within twice the time allotted by Motors flat rate manual, overhaul to manufacturer's specification and standards a conventional type master cylinder of an American built automobile. Such overhaul shall include:

a. removal from vehicle

b. disassemble and clean

c. hone cylinder

d. install repair kit

e. reinstall on vehicle

f. adjust brake pedal travel

g. bleed hydraulic system

VI. CLUTCHES

A. In a written test you will correctly answer 16 of 20 multiple choice questions on the following topics concerning the standard clutch:

1. function of the clutch
2. clutch replacement procedure
3. clutch adjustments

B. In a written identification test you will correctly identify and name the following:

1. clutch fork
2. friction disk
3. pressure plate
4. throw-out bearing
5. pilot bushing

VII. STANDARD TRANSMISSIONS

A. In a written type test you will correctly answer 16 of 20 multiple choice questions concerning the following:

1. gear design
2. gear ratio
3. torque

B. In a written identification test you will identify and correctly name the following:

1. main input shaft
2. syncromesh assembly
3. output shaft

4. reverse idler gear
5. low and reverse sliding gear
6. thrust washer
7. second gear
8. cluster gear
9. speedometer drive gear
10. shift fork
11. needle bearing

C. In a 15 minute performance test using a standard three speed transmission with the side cut away to expose all internal gears, you will trace the power flow through the three forward gears, reverse gear, and the neutral position.

VIII. DRIVE LINES, DIFFERENTIALS, AND REAR AXLES

A. In a 15 minute written test you will correctly answer 16 of 20 multiple choice questions, without reference material, on the following topics:

1. purpose of the differential
2. gear ratio in the differential
3. standard differential
4. non-slip differential

B. In a performance test under general shop conditions you will:

1. within twice the time allotted by Motors flat rate manual, using a standard mounted differential adjust the following to manufacturer's specifications and standards:

a. pinion bearing preload

b. backlash

c. carrier bearing preload

d. ring gear run-out

2. within twice the time allotted by Motors flat rate manual, remove, clean, and repack two universal joints on a late model American built automobile in accordance with manufacturer's specifications and standards.

C. within twice the time allotted by Motors flat rate manual, replace rear axle bearing and grease seal of a late model American built automobile in accordance with manufacturer's procedures as follows:

1. remove axle shaft from housing
2. remove old bearing
3. install new bearing
4. repack new bearing if necessary
5. install new grease seal
6. replace axle shaft in housing

AUTO MECHANICS 70B

I. SPECIAL TOOLS

A. In a thirty minute written identification test you will identify and correctly name all of the following special tools:

1. distributor wrench
2. spark plug socket
3. screw starter
4. compression gauge
5. vacuum gauge
6. fuel pump tester
7. remote starter control
8. alternator pulley puller
9. timing lite
10. test lite
11. spring tension gauge
12. point alignment tool
13. carburetor float gauge

II. ELECTRICAL FUNDAMENTALS

A. You will demonstrate your understanding of electrical fundamentals by:

1. correctly answering 25 of 30 multiple choice questions, within 20 minutes and without reference material, based on voltage, amperage, resistance, ohm's law, and series and parallel circuits.
2. correctly solving 8 of 10 circuit diagrams for unknown values of voltagee amperage, or resistance using ohm's law.

III. BATTERIES

A. In performance tests under general shop conditions you will:

1. within 10 minutes determine the state of charge within 10% and ampere-hour capacity of a lead-acid storage battery using a battery hydrometer and high rate discharge tester
2. recharge a lead-acid storage battery, to at least 90% of full charge, using the Sun Electric Company quick charge method.
3. within 30 minutes, fill with electrolyte and activate a lead-acid storage battery in accordance with manufacturer's recommendations.
4. within 15 minutes, clean the battery posts and battery cable terminals of a randomly selected vehicle in accordance with industry standards. The cables and terminals will be deemed clean when all corrosion and copper oxide has been removed and no voltage loss can be measured between the posts and terminals.

IV. IGNITION SYSTEM

A. In performance tests under general shop conditions you will:

1. demonstrate your understanding of ignition timing by installing the ignition distributor, distributor cap and all spark plug wires on a randomly selected American built engine in correct time, firing order, and location, within 20 minutes.
2. further demonstrate your understanding of ignition timing by setting the initial distributor timing of a randomly

selected American built engine to within 2° of factory specifications using either a test lite or an ohmmeter.

3. within 15 minutes, locate, by the voltage loss method, all resistances in the primary ignition circuit of an American built engine.
4. within twice the time allotted by Motors flat rate manual, tune-up the ignition system of an American built engine without air conditioning. Tune-up shall include adjustment or replacement of items required to restore manufacturer's specifications and standards of the following:
   a. distributor contact points
   b. dwell angle
   c. mechanical advance curve
   d. vacuum advance curve
   e. spark plugs
   f. spark plug wires
   g. ignition condenser
   h. ignition coil
   j. ignition resistor
   k. initial ignition timing
   l. idle speed and fuel mixture
5. demonstrate your ability to use and interpret the waveform pattern of a Sun 820 oscilloscope by analyzing the ignition system operation of an American built engine and locate two instructor caused defects. 15 minutes will be allowed

for analysis and shall include

a. firing voltage of each cylinder

b. condition of each spark line

c. coil and condenser operation

d. point close condition

e. length of the dwell period

f. point open condition

g. maximum secondary voltage

V. D. C. CHARGING SYSTEM

A. In a performance test under general shop conditions you will:

1. within twice the time allotted by Motors flat rate manual, overhaul either a A type or B type d-c generator to manufacturer's specifications.

Overhaul shall include:

a. removal from vehicle

b. testing and evaluating the armature and field coils for shorted, grounded or open windings

c. true commutator on the armature lathe

d. undercut commutator segments

e. replace brushes

f. polorize generator

g. test generator output on Sun 620 generator tester

h. reinstall generator on vehicle

i. adjust drive belt tension

2. within 30 minutes, adjust the cutout relay, voltage limiter,

and current regulator of a d-c generator control to manufacturer's specifications.

3. within 15 minutes, measure voltage loss between the generator and generator control unit using a VAT-20 voltmeter. Accuracy of this test must be within 5/100 volt.

VI. A. C. CHARGING SYSTEM

A. In performance tests under general shop conditions you will:

1. overhaul one Delcotron, one Autolite, and one Chrysler alternator to manufacturer's specifications and standards. Time allotted for each alternator will be twice the time allowed by the manufacturer's labor schedule. Overhaul shall include:

a. removal from vehicle

b. testing and evaluation of the rotor, stator, and diodes

c. replacement of any defective parts

d. testing alternator operation on the Sun 620 alternator tester

e. reinstall alternator on the vehicle

f. adjust drive belt tension

2. within 35 minutes, adjust the air gap, point gap, and voltage limiter setting of one Delco-remy, one Autolite, and one Chrysler alternator regulator to manufacturer's specifications.

VII. FUEL SYSTEM

A. In performance tests under general shop conditions you will:

1. within twice the time allotted for each carburetor, overhaul (2) two-bore carburetors and (2) four-bore carburetors from the following make and designs:

   a. Holley two-bore, 1960 or later

   b. Holley four-bore, 1960 or later

   c. Rochester 2G, 2GC, or 2GV; 1960 or later

   d. Rochester 4G, 4GC, or 4GV, 1960 or later

   e. Rochester 4M or 4MV, 1966 or later

   f. Ford two-bore; 1960 or later

   g. Ford four-bore; 1960 or later

   h. Autolite 4300; 1967 or later

   i. Carter two-bore; 1960 or later

   j. Carter four-bore, 1958 or later

   Overhaul shall include the disassembly, cleaning, and re-assembling of the carburetor and the setting to factory specifications and standard of the following:

   a. fuel or float level

   b. float drop

   c. accelerator pump rod

   d. choke pull down or vacuum break

   e. choke unloader

   f. secondary throttle lockout

   g. automatic choke thermostat

   h. fast idle speed

   i. curb idle speed

j. idle fuel mixture

k. dashpot

2. concurrent with each of the above carburetor overhauls you will test the fuel pump pressure and volume of each vehicle to determine if the fuel pump is operating within manufacturer's tolerance. 15 additional minutes will be allowed for each fuel pump test.

VIII. SMOG CONTROL DEVICES

A. You will demonstrate your knowledge of smog control devices, laws, and regulations by correctly answering 16 of 20 multiple choice questions in twenty minutes without reference material.

B. In a performance test under general shop conditions you will service a complete positive crankcase ventilation system on an instructor-assigned vehicle in accordance with manufacturer's recommendations, including the P.C.V. valve, all hoses, fittings and screens and prove with the AC-2 PCV tester that the system is operating correctly.

IX. STARTERS

A. In a performance test under general shop conditions you will:

1. within twice the time allotted by Motors flat rate manual, overhaul the starter motor of an American built engine to manufacturer's specifications and standards. Overhaul shall include:

a. removal from vehicle

b. test and evaluate the armature and field coils for

shorted, grounded, or open windings.

c. true commutator on an armature lathe

d. install new brushes

e. install front and rear bushings

f. replace starter drive assembly

g. reinstall on vehicle

2. within 10 minutes, measure starter motor current draw, within 10 amperes, of a randomly selected vehicle using the Sun Battery-starter tester and voltmeter.

3. within 10 minutes, measure the individual voltage losses, within .1 volt, across the ungrounded battery cable, the grounded battery cable, the starter cable, and the starter solenoid of a randomly selected American built engine.