DOCUMENT RESUME

ED 139 928 CE 010 946

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TITLE Gasoline Engine Mechanics. Performance Objectives. Intermediate Course.
INSTITUTION Duval County School Board, Jacksonville, Fla.
PUB DATE Jul 73
NOTE 20p.; For related document see CE 010 947

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Auto Mechanics; *Behavioral Objectives; *Criterion Referenced Tests; Curriculum Guides; *Engines; *Repair; Secondary Education; Shop Curriculum; *Skill Development; Student Evaluation; Trade and Industrial Education

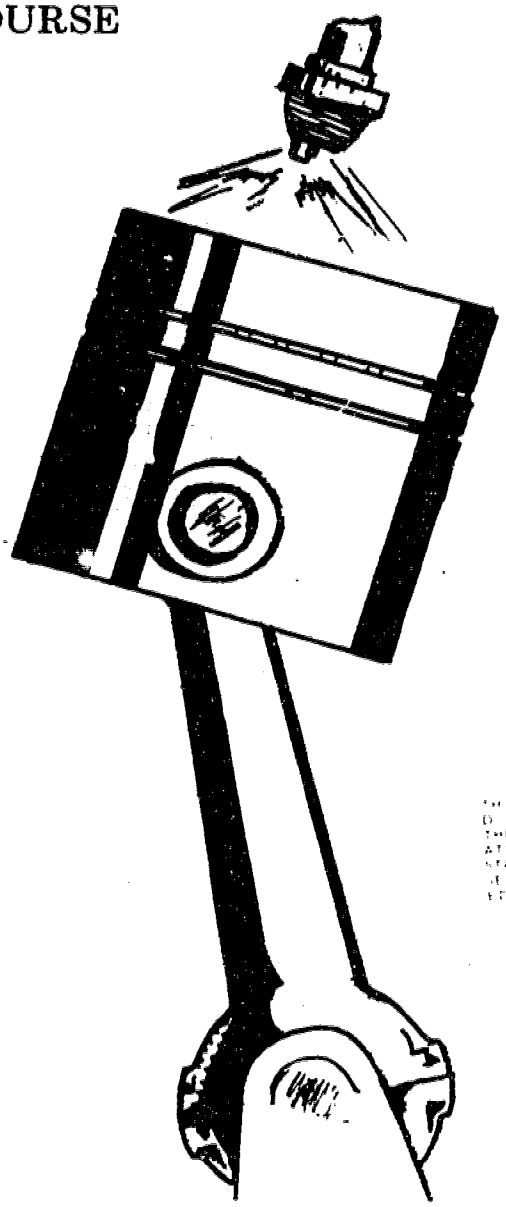
ABSTRACT

Several intermediate performance objectives and corresponding criterion measures are listed for each of six terminal objectives presented in this curriculum guide for an intermediate gasoline engine mechanics course at the secondary level. (For the beginning course guide see CE 010 947.) The materials were developed for a two-semester (2 hour daily) course that includes all phases of small gasoline engine repair, operation, and maintenance. This coursework includes basic theory and practical experience on actual engines and installations, the use of machine and hand tools, measuring instruments, manuals and publications pertinent to the trade. Titles of the six terminal objective sections are Engine Disassembly/Assembly, Electrical System, Ignition System, Carburetion, Parts Inventory, Shop Management, and S.I.E. Program. (This manual and 54 others were developed for various secondary level vocational courses using the System Approach for Education (SAFE) guidelines.) (ED)

GASOLINE ENGINE MECHANICS

PERFORMANCE OBJECTIVES

INTERMEDIATE COURSE



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July, 1973

A C K N O W L E D G E M E N T S

This manual was developed using System Approach For Education (SAFE) Guidelines.

Appreciation and recognition are extended to the following educators who have assisted in the preparation of this manual:

Writer: Marion Jones, Instructor

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GASOLINE ENGINE MECHANICS - INTERMEDIATE

Accreditation No. 9365

Length of Course: 2 semesters

Time Block: 3 hours daily

Course Description

This 540 hour course includes all phases of small gasoline engine repair, operation and maintenance. This coursework includes basic theory and practical experience on actual engines and installations, the use of machine and hand tools, measuring instruments, manuals and publications pertinent to the trade.

a. Safety

b. Engine Construction

c. Theory of Operation

d. Ignition and Electrical

e. Carburetion

f. Manuals & Publications

g. Troubleshooting

h. Shop Management

GASOLINE ENGINE MECHANICS - INTERMEDIATE

9365

Syllabus of Terminal Performance Objectives

ACCREDITATION NUMBER 9309

COURSE TITLE: Gasoline Engine Mechanics (Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 6.0

Engine Disassembly/Assembly

The learner will demonstrate his knowledge and ability to disassemble/assemble an engine. Procedures will be 100% complete as defined in the manufacturer's - in addition - 85% of the learners will upon completion of this unit of instruction, correctly 75% of the criterion test questions.

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
	6.0	1. Die cast aluminum is used in engine construction because: a. of it's light weight b. divisions in the crank-case are small and fit closely around the moving parts. c. Divisions in the crank-case are used to keep each cylinder separate. d. all of the above 2. Main bearing oil seals must be in good condition to: a. keep engine tight b. prevent oil leaks c. seal the crankcase d. all the above 3. The water pump _____ should be checked when ever there is no evidence of water circulation. 4. On most one-cylinder engines end play of the crankshaft is adjusted by the _____ of the crankcase cover gasket.

ACCREDITATION NUMBER 9502

COURSE TITLE: Gasoline Engine Mechanics -(Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 6.0 — Engine Disassembly/Assembly

	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
1	Given a sketch of a two-cycle engine the student will identify the flow of air and fuel, exhaust gases and pressure involved in each event with 70% accuracy.	6.1	Indentify air and fuel flow, exhaust gas flow and pressure on the sketch of a two cycle engine given you by the instructor.
.2	Given a small gas engine power head, the student will disassemble completely and using the proper manual will measure all dimensions and clearances. These will be used to determine proper specifications, marginal tolerances, and wear, if any with 90% accuracy.	6.2	Disassemble the powerhead assigned you, choose the correct manual. Measure and compare all dimensions and clearances. Determine from your measurements and the given specifications the wear on the engine parts.
.3	Following assignment contained in I.P.O. 6.2 the student will determine cause of wear if any, and order replacement parts, noting date, and corrective action required on work order with 90% accuracy.	6.3	Determine cause of wear on the engine parts and write replacement parts order also stating corrective action needed to place engine in working order.
.4	On a used 4-cycle engine, the student will remove the valves, inspect, grind, re-install and adjust valve lash to manufacturer's specifications.	6.4	Remove, inspect, grind, reinstall, and adjust valves to manufacturer's specs on the engine assigned you.
.5	Given a 4-cycle engine the student will remove a piston, inspect piston, pin, rings, rod bearings and cylinder walls. After cleaning he will re-install rings on piston, reassemble, rod and re-install assembly in cylinder. This must be done with 100% accuracy utilizing the appropriate service manual.	6.5	Remove a piston, inspect piston, pin, rings, bearings and cylinder walls. Clean and then re-install and re-assemble engine to manufacturer's specs.

ACCREDITATION NUMBER [illegible]

COURSE TITLE: Gasoline Engine Mechanics (Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 7.0 — Electrical System

Upon completion of the electrical unit of instruction 90% of the students will answer 75% of the attached criterion questions correctly, will label parts of a storage battery and will disassemble and reassemble a starter to manufacturers specifications.

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
	7.0	1. The storage battery converts chemical energy into _____ energy. 2. The battery plates are prevented from touching each other by means of: a. separators b. connectors c. terminals 3. The battery is filled with a solution of sulphuric acid and: a. light weight oil b. muriatic acid c. **water** 4. Electrical generators are used to convert _____ energy into electrical energy. 5. The D.C. generator has a lower "coming in" speed than an alternator. T.F.

ACCREDITATION NUMBER 9365

COURSE TITLE: Gasoline Engine Mechanics (Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 7.0

Electrical System

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
	7.0	6. The voltage of alternating current can be stepped up or down by means of: a. rectifiers b. regulators c. transformers 7. The starting safety switch prevents the motor from being _____ at advanced throttle. 8. The voltage regulator prevents: a. overcharging b. short circuits c. battery leakage

ACCREDITATION NUMBER 4389

COURSE TITLE: Gasoline Engine Mechanics (Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 7.0

Electrical System

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
Given a print-out of a storage battery, the student will label parts as specified with 75% accuracy.	7.1	Label all parts on the storage battery sheet provided you.
The student will remove, disassemble. re-assemble, and re-install a manual starter, utilizing the proper service manual with 100% accuracy.	7.2	Remove, disassemble, reassemble re-install the starter on the engine assigned you to manufacturers specifications given in the service manual.
The student will answer correctly 75% of the criterion questions on the small engine starter correctly.	7.3	1. The starter _____ is mounted on the _____. 2. The clutch ratchet has a _____ action when moved in one direction and rotates _____ in the opposite direction. 3. The balls must move freely up and _____ the ramp. Failure to do this will cause _____. 4. The starter clutch screws on _____ while holding the flywheel with a special _____.

ACCREDITATION NUMBER 7507

COURSE TITLE: Gasoline Engine Mechanics -(Intermediate)

TERMINAL PERFORMANCE
OBJECTIVE NO. 8.0 Ignition Systems

The student will demonstrate his knowledge and ability to disassemble and assemble, time and adjust, troubleshoot and repair ignition systems of small gasoline engines according to manufacturers specifications and will with 75% accuracy answer given criterion questions about ignition systems.

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
	8.0	1. When experiencing trouble in the ignition system the first item that you should check is the: a. condenser b. breaker points c. spark plug d. stator plate 2. Dirty or loose connections or deteriorated insulation may cause a _____ drop through the primary circuit. 3. The ignition system consists of the _____ and _____ circuits. 4. The condenser should always be replaced when replacing the breaker contact points. T. F. 5. Glazed deposits on the spark plug points are easily removed. T. F. 6. Breaker contact points which appear, dull gray, and slightly pitted indicate a: a. normal b. abnormal ignition condition. 7. Magnets edge gap can change (and the spark intensity thereby reduced) due to the following: a. Flywheel drive key sheared. b. Excessive wear on breaker cam. c. loose flywheel retaining met. d. all the above.

ACCREDITATION NUMBER 9382

COURSE TITLE: Gasoline Engine Mechanics -(Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 8.0

Ignition Systems

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
Given the problem of drawing a sketch of a simple battery ignition system, the student will draw a. label the 12 main components with 75% accuracy.	8.1	Sketch a simple battery ignition system and label the 12 main components.
Given a print out of a cut away coil, the student will label the 8 parts with 75% accuracy.	8.2	Label the 8 parts of a coil on the drawing provided.
The learner will define the main difference between the battery ignition and the magneto ignition systems, by matching given statements to either a magneto or a battery system.	8.3	Match the ignition system with the statements: M=Magneto, B=Battery 1. ( ) uses stored chemical energy. 2. ( ) countant direct current. 3. ( ) pulsating alternating current. 4. ( ) uses permanent magneto. 5. ( ) used by most small engines, especially outboards. 6. ( ) used in an automobile. 7. ( ) needs no outside electric energy. 8. ( ) The secondary circuit ground polarity cannot be reversed.
Given the problem of repairing/replacing breaker points, the learner, will diagnose the systems condition by the physical aspects of the contacts, and adjust points to proper clearance as given in service manual.	8.4	Repair or replace the breaker points as necessary on the engine assigned you, adjust points to clearance shown in service manual.

ACCREDITATION NUMBER 9309

COURSE TITLE: Gasoline Engine Mechanics - (Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 8.0

Ignition Systems

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
The student will sketch a spark plug, label the parts and designate the heat range with 75% accuracy.	8.5	Sketch a spark plug labeling its parts and designate its heat range.
Given 8 questions pertaining to spark plugs the learner will correctly answer 7 of them.	8.6	1. Variation in the speed of heat transfer from the plugs to the cooling system is the heat range of spark plugs. T F 2. The final selection of the proper "heat range" should be governed by the actual operating conditions. T F 3. A plug designated for a hot engine has shorter insulator firing tip. T F 4. Spark plug gap clearance may be found in the parts manual. T F 5. All spark plugs are basically the same but they do differ in the: a. threadsize b. reach c. gap clearance d. heat range e. all the above 6. The plug gap should be set with: a. feeler gage b. micrometer c. wire gage d. calipers 7. Over torquing a plug could possibly alter the gap. T F 8. Deposits on a normal firing plug would be:

ACCREDITATION NUMBER 9503

COURSE TITLE: Gasoline Engine Mechanics - (Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 8.0

Ignition Systems

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
	8.6	a. black b. light tan c. gray metallic d. damp
Using an approved tester, the student will run tests on the ignition system of a small engine for defective parts, leakage, and malfunction and will determine the condition of the system with 100% accuracy.	8.7	Choose the correct tester, test the ignition system of the engine assigned you and list all defective parts, leakages and malfunctions.
Given a magneto ignition system, which is functioning, the student will disassemble, clean and repair, assemble and adjust timing, so that engine operates normally.	8.8	Disassemble, clean and repair, assemble and adjust timing on the magneto ignition system assigned you so that the engine runs normally.

ACCREDITATION NUMBER 9365

COURSE TITLE: Gasoline Engine Mechanics - (Intermediate)

TERMINAL PERFORMANCE
OBJECTIVE NO. 9.0 Carburetion

The learner will demonstrate his knowledge and ability to trouble shoot problems, disassemble, clean, repair, assemble and adjust given small engine carburetors to manufacturers specifications and will with 75% accuracy answer questions concerning carburetion.

O.	INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
		9.0	1. Air-fuel ratio is extremely important to efficient engine _____. 2. Carburetor operation is based on: a. Newton's Law. b. pressure differential c. vaccuum d. Carlton's Theory 3. The choke valve controls: a. the air flow b. the fuel flow c. the fuel-air flow 4. The reed valve is essentially a check valve which: a. Traps the fuel-air charge in th crank-case. b. Permits the fuel-air mixture to move in only one directions through the engine. c. does both a & b 5. In the venturi the speed up of air flow causes a resultant: a. drop in pressure b. increase in pressure c. does not affect pressure 6. The bulk of carburetor service consists of: a. overhaul b. replacing parts and assemblies c. cleaning, inspection and adjust ment. 7. The governor spring tends to hold the throttle: a. closed b. open c. partially open 8. When spring pressure and air pressure equalize it is known as: a. operating speed b. governed speed c. balance speed

ACCREDITATION NUMBER 9362

COURSE TITLE: Gasoline Engine Mechanics -(Intermediate)

TERMINAL PERFORMANCE
OBJECTIVE NO. 9.0 Carburetion

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
.1 Given the problem of sketching a simple fuel system, labeling the 8 main components and explaining the function of each, the student will perform with 75% accuracy.	9.1	Sketch a simple fuel system and label and explain the function of the 8 main components.
.2 The student will be required to disassemble, inspect, assemble and adjust a reed valve assembly to specification given in the service manual.	9.2	Disassemble, inspect, assemble and adjust a reed valve assembly to specifications given in the service manual.
.3 The student will analyze instructor created discrepancies on a fuel system and carburetor and make proper repair/adjustment to return engine to normal operating condition according to the manufacturer's specifications to 100% accuracy.	9.3	Troubleshoot and repair to original specifications the fuel system assigned you.
.4 The student will disassemble a carburetor completely, identifying each part by name and function-then reassemble and and adjust to service manual specifications.	9.4	Disassemble the carburetor assigned you, identify each part as to name and function then reassemble and adjust to service manual specs.
.5 Utlizing the Handbook of Service Instructions for a 2-cycle engine, the learner will determine the proper fuel-oil ratio.	9.5	Use the service instructions to determine the proper fuel-oil ratio for the 2-cycle engine assigned you.

ACCREDITATION NUMBER [illegible]

COURSE TITLE: Gasoline Engine Mechanics - (Intermediate)

TERMINAL PERFORMANCE OBJECTIVE NO. 10.0

Parts Inventory

The student will with 75% proficiency make up an initial parts order for a 6 man service shop and set up a sample inventory control Kardex System.

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
The learner will with 75% proficiency write up a parts order for functional parts for a 6 man service shop.	10.1	Write up a functional parts order for a 6 man service shop.
The learner will draw a sample inventory control card and set-up a sample Kardex System.	10.2	Draw an inventory control card and and set up sample Kardex System for inventory control.

ACCREDITATION NUMBER 928

COURSE TITLE: Gasoline Engine Mechanics (Intermediate)

TERMINAL PERFORMANCE
OBJECTIVE NO. 11.0 Shop Management

The student will with 80% proficiency draw up an organization chart for a 6 man service department and make up a years' operating budget.

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
The student will draw an organization chart for a 6 man small engine service shop with 80% proficiency.	11.0	Draw an organization chart for a 6 man engine service department.
The learner will prepare with 80% proficiency a yearly operating budget for a 6 man service shop.	11.2	Prepare an operating budget for a 6 man service shop.

ACCREDITATION NUMBER 9305

COURSE TITLE: Gasoline Engine Mechanics (Intermediate)

TERMINAL PERFORMANCE
OBJECTIVE NO. 12.0

S.I.E. Program

The learner will demonstrate 75% proficiency in all of the basic and intermediate course objectives and will display good work habits and attitudes as determined by the instructor before being assigned to the S.I.E. Program.

INTERMEDIATE PERFORMANCE OBJECTIVES	NO.	CRITERION MEASURES
	12.0	You must demonstrate 75% proficiency in all basic and intermediate course objectives and display good work habits and attitudes before being considered to participate in the S.I.E. program.