This automotive power flow system course sets the foundation in the theory of operation of the standard and automatic transmission, clutch assemblies, drive-line and rear axle assemblies. This is a one or two quinmester credit course covering 45 clock hours. In the fourth quinmester course in the tenth year, instruction consists of lectures, demonstrations and group discussions. Audiovisual aids are used to supplement instruction. Included is a course outline and eight pages of post tests. (DS)
Course Outline
AUTOMOTIVE MECHANICS 1 - 9043
(Automotive Power Flow System)
Department 48 - Min 9043.04

DIVISION OF INSTRUCTION 1973
DADE COUNTY PUBLIC SCHOOLS

AUTHORIZED COURSE OF INSTRUCTION FOR THE
QUINNMASTER PROGRAM
Course Outline

AUTOMOTIVE MECHANICS I - 3043
(Automotive Power Flow System)

Department 48 - Code 9043.04
THE SCHOOL BOARD OF DADE COUNTY

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Dade County Public Schools
Miami, Florida 33132

February, 1973

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A foundation course in the theory of operation of the standard and automatic transmission, clutch assemblies, drive-line and rear axle assemblies. Demonstrations will be made by the instructor when necessary. This is a one or two quinmester credit course. Prior to entry into this course, the vocational student will display mastery of the skills indicated in Automotive Engines (9043.03).

Clock Hours: 45
The following pages contain a course outline entitled, "Automotive Power Flow System", course number 9043.04. This is the fourth quinmester course in the tenth year and is available to all students who satisfactorily complete "Automotive Engines", course number 9043.03.

This quinmester course is 45 hours in length and consists of seven blocks of instructions which are subdivided into several units each. It includes an introduction to the theory and functions of the units that make up the power flow system of the automobile. The instruction consists of lectures, demonstrations and group discussions. Audiovisual aids are used to supplement instruction. The students perform only minor disassembly and service as a group, with the instructor explaining the function of the parts as they are disassembled. The operating principles of the units and their relationship with the other vehicle systems will be explained.

The bibliography appearing on the last page of the outline lists several basic references along with supplementary references and audiovisual aids.

This outline was developed through the cooperative efforts of the instructional and supervisory personnel, the Quinmester Advisory Committee and the Vocational Curriculum Materials Service, and has been approved by the Dade County Vocational Curriculum Committee.
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VIII. QUINMESTER POST TEST

APPENDIX: QUINMESTER POST-TEST SAMPLE ................. 9
GOALS

The automotive mechanic trainee must be able to demonstrate:

1. An understanding of the function and theory of operation of the power flow system.

2. The ability to interpret the sectional drawings of the power flow units in the manufacturer's shop manuals and identify the major parts.

3. Attitudes which are acceptable to the automotive repair industry. These attitudes will be measured by the student's record of attendance, completion of assignments, and cooperation with instructors and fellow students.
SPECIFIC BLOCK OBJECTIVES

BLOCK I - THE POWER FLOW SYSTEM

The student must be able to:

1. Identify the five assemblies that make up the power flow system.
2. Explain, in writing, the purpose of each assembly.
3. Trace the power flow through the power flow assemblies in the proper sequence.

BLOCK II - CLUTCH ASSEMBLIES

The student must be able to:

1. Identify the various types and classification of clutches.
2. Identify, in writing, the various parts of a clutch assembly working from a sectional view and an exploded view in a manufacturer's manual.
3. Demonstrate an understanding of the operation of the clutch assembly by successfully passing a written test.

BLOCK III - STANDARD TRANSMISSIONS

The student must be able to:

1. Identify, in writing, the various parts of a three-speed standard transmission assembly working from a sectional and an exploded view in a manufacturer's manual.
2. In writing, trace the power flow through the three-speed transmission in proper sequence through all gear shift positions.
3. Determine, in writing, the gear ratios in all gear shift positions, given the number of gear teeth in the transmission gears.
4. Demonstrate an understanding of the operation of the standard transmission assembly by successfully passing a written test.

BLOCK IV - AUTOMATIC TRANSMISSION

The student must be able to:

1. Identify, in writing, the parts of the torque conveyor working from an exploded and sectional view in a manufacturer's manual.
2. Demonstrate an understanding of the operation of a torque converter by successfully passing a written test.
3. Identify, in writing, the parts of a simple planetary gear system working from a sectional view and an exploded view in a manufacturer's manual.
4. Write a paragraph on the general purposes of the bands, clutches and other controls that are part of an automatic transmission.
BLOCK V - DRIVE LINES

The student must be able to:

1. Identify, orally, the various types of drive lines.
2. Identify, in writing, the various parts of a drive line working from an exploded view in a manufacturer's manual.
3. Demonstrate an understanding of the function and operation of the units that make up the drive line assembly by successfully passing a written test.

BLOCK VI - DIFFERENTIALS

The student must be able to:

1. Identify, in writing, the various parts of a differential assembly working from a sectional view and an exploded view in a manufacturer's manual.
2. Trace, in writing, the power flow through the differential parts in proper sequence.
3. Demonstrate an understanding of the function and operation of the differential assembly by successfully passing a written test.

BLOCK VII - REAR AXLES

The student must be able to:

1. Identify orally the various types of rear axles.
2. Identify, in writing, the various parts of the rear axle assembly working from a sectional view, or an exploded view in a manufacturer's manual.
3. Demonstrate an understanding of the construction and principles of operation of the rear axle assembly by successfully passing a written test.
I. THE POWER FLOW SYSTEM

A. Identification of Units
   1. Clutch assembly
   2. Transmission
   3. Drive line
   4. Differential
   5. Rear axle

B. Purpose of Each Unit

C. Power Flow Through the System

II. CLUTCH ASSEMBLIES

A. Types and Classifications
   1. Wet and dry
   2. Diaphragm and coil spring
   3. Single and multiple disc

B. Nomenclature

C. Function of parts
   1. Flywheel
   2. Pressure plate
   3. Friction disc
   4. Pilot bearing
   5. Release bearing
   6. Clutch fork

D. Theory of Operation

III. STANDARD TRANSMISSIONS

A. Types and Classification
   1. Synchromesh
   2. Constant mesh

B. Nomenclature and Construction

C. Function and Principles of Operation
   1. Gear train
      a. Gear ratios
      b. Multiplication of torque
      c. Speed reduction
   2. Synchronizers
   3. Bearings, lubrication and seals
   4. Shifting mechanisms
D. Overdrive

IV. AUTOMATIC TRANSMISSIONS

A. Fluid Couplings
   1. Principles of operation
   2. Function

B. Torque Converters
   1. Nomenclature and construction
      a. Pump
      b. Turbine
      c. Stator
   2. Torque multiplication

C. Planetary Gear Systems
   1. Principles of operation
   2. Function
   3. Gear ratios

D. Transmission Control Devices
   1. Servo and band assemblies
   2. Clutches
   3. Vacuum operated controls
   4. Hydraulic operated controls
   5. Mechanical controls

V. DRIVE LINES

A. Types and Classification
   1. Torque tube drive
   2. Hotchkiss drive

B. Function

C. Nomenclature and Construction
   1. Propeller shaft
   2. Slip joints
   3. Universal joints

VI. DIFFERENTIALS

A. Types
   1. Standard
   2. Non-slip

B. Function

C. Nomenclature and Construction
   1. Drive pinion
   2. Ring gear
   3. Differential pinion
   4. Lubrication
VI. DIFFERENTIALS

D. Principles of Operation
   1. Gear ratio
   2. Differential action

VII. REAR AXLES

A. Types and Classification
   1. Full floating
   2. Semifloating
   3. Three-quarter floating
   4. Swing axles

B. Function

C. Nomenclature and Construction
   1. Axle shafts
   2. Bearings and seals

VIII. QUINMESTER POST-TEST
BIBLIOGRAPHY

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Basic References:

1. Crouse, William H. _Automotive Transmission and Power Trains_. New

2. __________. _Automotive Mechanics_. 5th ed. New York: Webster

Supplementary References:


7. __________. _Auto Mechanics Fundamentals_. Illinois: Goodheart-

8. Tobolt, William K., and Johnson, Larry. _Motor Services Automotive
   Pp. 768.
APPENDIX

Quinmester Post Test Sample
Identification Test

Clutch Sectional View

Directions - Illustrated below is a sectional view of a clutch assembly. In the spaces provided, write in the names of the parts identified by the numbers.
Transmission Exploded View

Directions - Illustrated below is an exploded view of a three-speed standard transmission. In the spaces provided, write in the names of the parts identified by the numbers.

1. ___________
2. ___________
3. ___________
4. ___________
5. ___________
6. ___________
7. ___________
8. ___________
9. ___________
10. ___________
11. ___________
12. ___________
13. ___________
14. ___________
15. ___________
Identification Test

Clutch Exploded View

Directions - Illustrated below is an exploded view of a clutch assembly. In the spaces provided, write in the names of the parts identified by the numbers.

1. 
2. 
3. 
4. 
5. 
6. 
7. 
8.
Name ___________________________ Date _____________________ Score ___

True-False Test

Power Flow System

Directions: Illustrated below is a drawing of an automatic power flow system. The system is made up of five major assemblies. Vertical lines separate the system into these five assemblies identified by numbers. In the space provided below, write in the correct name of these assemblies and answer the true or false questions relating to the function of these assemblies. Draw a circle around the T if the statement is true and around the F if the statement is false. The illustration does not have an automatic transmission.

1. No. 1 is a __________________________ assembly.
2. T F It balances the engine.
3. T F It allows the driver to disconnect the engine from the rest of the power flow system.
4. T F It must be used when shifting gears.
5. T F It prevents the engine from overspeeding.
6. T F It is operated by a hand lever on the steering column.
7. T F It is cooled by water from the cooling system.

8. No. 2 is a __________________________ assembly.
9. T F It can be used to increase engine torque.
10. T F It is useful in starting the car from a dead stop.
11. T F It softens the ride of the car.
12. T F It slips its gears when rounding a corner.
13. T F It is operated by a foot pedal.
14. T F It is lubricated by a heavy wheel bearing grease.

15. No. 3 is a __________________________ assembly.
16. T F It has a slip joint.
17. T F It has U joints.
18. T F It has U joints to allow the wheels to slip on a corner.
19. T F Its only purpose is to allow the car to back up.
20. No. 4 is a ________________ assembly.
21. T  F  It has more than 4 gears inside.
22. T  F  It has no gears inside.
23. T  F  It is filled with water to keep it cool.
24. T  F  It allows the rear wheels to turn at different speeds.
25. T  F  It is operated by a foot pedal.

26. No. 5 is a ________________ assembly.
27. T  F  It drives and supports the rear wheels.
28. T  F  It has gears at the outer ends to reduce the speed of the wheels.
29. T  F  It supports the weight of the vehicle.
30. T  F  The inner shaft has a bearing near the outer end and a gear on the inner end.
Clutch Sectional View

1. Retracting spring
2. Clutch fork
3. Release bearing
4. Clutch cover
5. Diaphragm spring
6. Pressure plate
7. Clutch disc
8. Pilot bearing
9. Input shaft
10. Flywheel

Clutch Exploded View

1. Pilot bearing
2. Clutch disc
3. Pressure plate
4. Clutch cover
5. Release bearing
6. Release bearing
7. Clutch fork
8. Pullback springs

Transmission Exploded View

1. Bearing retainer
2. Front bearing
3. Transmission case
4. Clutch gear (input shaft)
5. Countergear
6. Counter shaft
7. Synchronizer assembly
8. 2nd speed gear
9. Main shaft
10. 1st speed gear
11. Reverse idler gear
12. Reverse gear
13. Shift fork
14. Rear case extension
15. Side cover

Power Flow System

1. Clutch assembly
2. F
3. T
4. T
5. F
6. F
7. F
8. Transmission assembly
9. T
10. T
11. F
12. F
13. F
14. F
15. Driveline assembly
16. T
17. T
18. F
19. F
20. Differential assembly
21. T
22. F
23. F
24. T
25. F
26. Rear axle assembly
27. T
28. F
29. T
30. T