<table>
<thead>
<tr>
<th>Name</th>
<th>City</th>
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<tr>
<td>MARTIN C. BARELL, Chancellor, B.A., I.A., LL.B</td>
<td>Muttontown</td>
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<tr>
<td>R. CARLOS CARBALLADA, Vice Chancellor, B.S.</td>
<td>Rochester</td>
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<td>WILLARD A. GENRICH, LL.B.</td>
<td>Buffalo</td>
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<td>EMLYN I. GRIFFITH, A.B., J.D.</td>
<td>Rome</td>
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<td>JORGE L. BATISTA, B.A., J.D.</td>
<td>Bronx</td>
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<td>LAURA BRADLEY CHODOS, B.A., M.A.</td>
<td>Vischer Ferry</td>
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<td>Bayside</td>
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<td>Miller Place</td>
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<td>MIMI LEVIN LIEBER, B.A., M.A.</td>
<td>Manhattan</td>
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<td>SHIRLEY C. BROWN, B.A., M.A., Ph.D.</td>
<td>Albany</td>
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<td>NORMA GLUCK, B.A., M.S.W.</td>
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<td>ADELAIDE L. SANFORD, B.A., M.A., P.D.</td>
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<td>WALTER COOPER, B.A., Ph.D.</td>
<td>Rochester</td>
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<td>CARL T. HAYDEN, A.B., J.D.</td>
<td>Elmira</td>
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<tr>
<td>DIANE O'NEILL MC GIVERN, B.S.N., M.A., Ph.D.</td>
<td>Staten Island</td>
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**President of The University and Commissioner of Education**

THOMAS SOBOL

**Executive Deputy Commissioner of Education**

THOMAS E. SHELDON

**Deputy Commissioner for Elementary, Middle, and Secondary Education**

ARTHUR L. WALTON

**Assistant Commissioner for General and Occupational Education**

LORRAINE R. MERRICK

**Acting Director, Division of Occupational Education**

LEE A. TRAVER

**Chief, Bureau of Home Economics and Technology Education Programs**

JEAN C. STEVENS

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Overview and Rationale

This course and specified focused sequence will provide interested Regents and non-Regents students with a broad base of technical knowledge and skill. It also will develop in students limited entry level skills and appropriate work place attitudes for specific areas in the auto service industry that technology is dramatically changing.

Students wishing to develop more advanced skills in these areas will be informed of the possibilities for additional training which is available from BOCES and local community colleges.

This one-unit course of instruction has been designed to be offered as two 1/2-unit instructional components to afford local school districts greater flexibility in meeting the scheduling needs of individual students.

It is hoped that school districts will articulate this focused sequence with local area community colleges and establish procedures to facilitate the granting of advanced placement.

USE IN SEQUENCE: Elective course

This course is one of the New York State approved electives in Technology Education. It is one of several electives courses designed to give students a firm but broad exploration of the technical world in which they live.

Students completing a high school sequence in Technology Education must take a total of 1-3 units of elective course work to fulfill the "elective" portion of their sequence requirement. This course may also be taken by any student as an elective. If the instructor uses this syllabus as a guide for instruction, students may be granted Regents credit for the experience.

Several courses within Technology Education offerings can be offered on a 1/2-unit or 1-unit basis. Course work earning 1/2-unit must comprise a minimum of 54 hours of instruction and course work earning 1-unit must comprise a minimum of 108 hours of instructional time.
Students with Disabilities

The Board of Regents, through the part 100 Regulations of the Commissioner, the Action Plan, and The Compact for Learning, has made a strong commitment to integrating the education of students with disabilities into the total school program. According to Section 100.2(s) of the Regulations of the Commissioner of Education, "Each student with a handicapping condition as such term is defined in Section 200.1(ii) of this Chapter, shall have access to the full range of programs and services set forth in this Part to the extent that such programs and services are appropriate to such student's special educational needs." Districts must have policies and procedures in place to make sure that students with disabilities have equal opportunities to access diploma credits, courses, and requirements.

The majority of students with disabilities have the intellectual potential to master the curricula content requirements for a high school diploma. Most students who require special education attend regular education classes in conjunction with specialized instruction and/or related services. These students must attain the same academic standards as their nondisabled peers to meet graduation requirements, and, therefore, must receive instruction in the same content areas, at all grade levels. This will ensure that they have the same informational base necessary to pass statewide testing programs and meet diploma requirements.

Teachers certified in the subject area should become aware of the needs of students with disabilities who are participating in their classes. Instructional techniques and materials must be modified to the extent appropriate to provide students with disabilities the opportunity to meet diploma requirements. Information or assistance is available through special education teachers, administrators, the Committee on Special Education (CSE) or student's Individualized Education Program (IEP).

Strategies for Modifying Instructional Techniques and Materials

1. Students with disabilities may use alternative testing techniques. The needed testing modification must be identified in the student’s Individualized Education Program (IEP). Both special and regular education teachers need to work in close cooperation so that the testing modifications can be used consistently throughout the student’s program.

2. Identify, define and pre-teach key vocabulary. Many terms in this syllabus are specific and some students with disabilities will need continuous reinforcement to learn them. It would be helpful to provide a list of these key words to the special education teacher in order to provide additional reinforcement in the special educational setting.
3. Assign a partner for the duration of a unit to a student as an additional resource to facilitate clarification of daily assignments, timelines for assignments, and access to daily class notes.

4. When assigning long-term projects or reports, provide a timeline with benchmarks as indicators for completion of major sections. Students who have difficulty with organizational skills and time sequence may need to see completion of sections to maintain the organization of a lengthy project or report.

**Infusing Awareness of Persons with Disabilities Through Curriculum**

In keeping with the concept of integration, the following subgoal of the Action plan was established.

In all subject areas, revisions in the syllabi will include materials and activities related to generic subgoals such as problem solving, reasoning skills, speaking, capacity to search for information, the use of libraries and increasing student awareness of and information about the disabled.

The purpose of this subgoal is to ensure that appropriate activities and materials are available to increase student awareness of disabilities.

This curriculum, by design, includes information, activities, and materials regarding persons with disabilities. Teachers are encouraged to include other examples as may be appropriate to their classroom or the situation at hand.
STUDENT LEADERSHIP SKILLS

Development of leadership skills is an integral part of occupational education in New York State. The New York State Education Department states that, "Each education agency should provide to every student the opportunity to participate in student leadership development activities. All occupational education students should be provided the opportunity to participate in the educational activities of the student organization(s) which most directly relate(s) to their chosen educational program."

Leadership skills should be incorporated in the New York State occupational education curricula to assist students to become better citizens with positive qualities and attitudes. Each individual should develop skills in communications, decision making/problem solving, human relations, management, and motivational techniques.

Leadership skills may be incorporated into the curricula as competencies (Performance Objectives) to be developed by every student or included within the Suggested Instructional Strategies. Teachers providing instruction through occupational educational curricula should familiarize themselves with the competencies. Assistance may be requested from the State advisor of the occupational student organization related to the program area.

Students who elect to become active members of one of the student leadership organizations chartered by the New York State Education Department have the advantage of the practical forum to practice leadership skills in an action oriented format and have the potential for recognition of their achievements at the local, State, and national level.

Syllabus Objectives

Through the implementation of this syllabus, the student will be able to:

- Demonstrate an understanding of automotive technology and its place in our society.

- Describe careers in automotive technology and their requirements.

- Perform a wide variety of pre-specialization activities with materials, tools, equipment and procedures common to the automotive area.

- Pursue the area of automotive technology in greater depth as he or she assesses personal interests, abilities, potentials and limitations.
# SYLLABUS OUTLINE

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## AUTOMOTIVE TECHNOLOGY

<table>
<thead>
<tr>
<th>Module:</th>
<th>Estimated Learning Time</th>
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<tr>
<td><strong>I. Module: Introduction</strong></td>
<td>10 hours</td>
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<tr>
<td>Topics:</td>
<td></td>
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<tr>
<td>A. Careers</td>
<td>2 hours</td>
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<tr>
<td>B. Tools</td>
<td>2 hours</td>
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<tr>
<td>C. Work habits</td>
<td>2 hours</td>
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<tr>
<td>D. Safety</td>
<td>2 hours</td>
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<tr>
<td>E. References</td>
<td>2 hours</td>
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<tr>
<td><strong>II. Module: Basic Electricity/Electronics</strong></td>
<td>9 hours</td>
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<tr>
<td>Topics:</td>
<td></td>
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<tr>
<td>A. Ohms Law</td>
<td>2 hours</td>
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<tr>
<td>B. DC Motors</td>
<td>2 hours</td>
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<tr>
<td>C. Meters</td>
<td>2 hours</td>
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<tr>
<td>D. Semiconductors</td>
<td>1 hour</td>
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<tr>
<td>E. Introduction to Computers</td>
<td>2 hours</td>
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<tr>
<td><strong>III. Module: Automotive Systems</strong></td>
<td>72 hours</td>
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<tr>
<td>Topics:</td>
<td></td>
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<tr>
<td>A. Engine Theory</td>
<td>4 hours</td>
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<tr>
<td>B. Electrical Systems</td>
<td>4 hours</td>
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<tr>
<td>C. Ignition Systems</td>
<td>6 hours</td>
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<tr>
<td>D. Charging Systems/Starting Systems</td>
<td>4 hours</td>
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<tr>
<td>E. Fuel Systems</td>
<td>7 hours</td>
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<tr>
<td>F. Computer/Emission Systems</td>
<td>6 hours</td>
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<tr>
<td>G. Engine Performance/Diagnosis</td>
<td>7 hours</td>
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<tr>
<td>H. Lubrication Systems</td>
<td>4 hours</td>
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<tr>
<td>I. Cooling, Heating/AC Systems</td>
<td>3 hours</td>
</tr>
<tr>
<td>J. Brake Systems</td>
<td>6 hours</td>
</tr>
<tr>
<td>K. Steering/Suspension/Tires/Alignment</td>
<td>8 hours</td>
</tr>
<tr>
<td>L. Drive Trains</td>
<td>7 hours</td>
</tr>
<tr>
<td>M. Vehicle Surfaces</td>
<td>5 hours</td>
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</table>
IV. Module: Environmental Impacts
   
   Topics:
   A. Hazardous/Toxic Wastes and Controls
   B. Air Quality
   C. New York State "Right to Know"
   
   4 hours

V. Module: Work Place Communications
   
   Topics:
   A. Customer Relations
   B. Parts and Inventory Control
   C. Service Records
   D. Management Skills
   E. Billing
   F. Marketing
   
   8 hours

VI. Module: Consumer Issues
   
   Topics:
   A. Purchasing
   B. Repair Facilities
   C. Maintenance and Prevention Records
   D. Car Insurance
   E. New York State Inspection
   
   6 hours

Total Estimated Learning Time: 108 Hours

Performance Objectives

The performance objectives of the syllabus are intended to clearly present what students are expected to know, do and be like, following instruction in a given topic. The knowledge (K), skills (S) and attitudes (A) that students should acquire are identified for each topic, under "competencies to be developed".
Syllabus Component

AUTOMOTIVE TECHNOLOGY

I. Module: Introduction
   A. Topic: Careers
      • Performance Statement:
        Upon satisfactory completion of this topic, the student will be knowledgeable in careers associated with the automobile.

      • Competencies to be Developed:
        After studying this topic, the student will be able to:
        a. Classify as to professional, technical, skilled, semi-skilled or unskilled. (K)
        b. Identify the type of training and physical characteristics needed to perform the duties. (K)
        c. Describe conditions under which the duties will be performed. (K)
        d. Evaluate the future of each career. (K)

      • Suggested Instructional Strategies:
        1. Set up "shadowing" experiences for students in selected occupational areas.
        2. Have students take independent field trips to observe occupations and report their findings to the class.
        3. Have students make a collection of classified ads dealing with automotive careers.

   B. Topic: Tools
      • Performance Statement:
        Upon satisfactory completion of this topic, the student will be knowledgeable about automotive tools and related accurate measurement instruments.

      • Competencies to be Developed:
        After studying this topic, the student will be able to:
        a. Identify common hand tools associated with the automobile. (K)
        b. Operate power tools commonly used on an automobile. (K) S
        c. Measure with an accuracy of .001" selected automobile components. (K) (S)
• Suggested Instructional Strategies:

1. Hand out activity sheets depicting automotive tools. Have students label and define the proper tools for specific tasks.

2. Have students choose the correct tool for specific task.

3. Have students measure selected components using micrometers, dial indicators, and verniers.

C. Topic: Work Habits

• Performance Statement:
Upon satisfactory completion of this topic, the student will work in a safe, orderly and cooperative manner.

• Competencies to be Developed:
After studying this topic, the student will be able to:
  a. Complete a questionnaire regarding safe, orderly and cooperative working habits. (K) (A)
  b. Perform tasks in a safe, orderly and cooperative manner. (A)

• Suggested Instructional Strategies:

1. Demonstrate an orderly placement of tools and components during a service operation.

2. Encourage students to work in teams.

D. Topic: Safety

• Performance Statement:
Upon satisfactory completion of this topic, the student will know the location of and procedures for the use of various safety and emergency equipment (e.g., fire alarm, power kill switch, fire blanket, fire extinguishers, eyewash station and emergency exits).

• Competencies to be Developed:
After studying this topic, the student will be able to:
  a. Satisfactorily complete a safety quiz that identifies dangerous elements and the corresponding safety precautions in the automotive laboratory. (K) (A)
  b. Recognize a class A, B or C fire extinguisher. (K)
  c. Demonstrate the safe storage of flammables and chemicals.
  d. Recognize hazardous situations in the automotive laboratory and report them to the instructor. (A)
• Suggested Instructional Strategies:

1. Have students complete and sign a safety quiz.

2. Have students view a film on safety.

3. Have students prepare a bulletin board on safety.

E. Topic: References

• Performance Statement:
Upon satisfactory completion of this topic, the student will successfully use automotive reference materials.

• Competencies to be Developed:
After studying this topic, the student will be able to:
   a. Collect information using written, video, audio, and other means as needed. (K) (S)
   b. Use references to locate information. (K)
   c. Use a computer to gain information by loading a program, manipulating data and storing information. (S) (K)

• Suggested Instructional Strategies:

1. As an introduction, have students complete an activity sheet that requires the use of all available references (e.g., service manuals, texts, computer programs, microfiche, CD ROM, estimating guides, service records).

2. With each topic, have students complete activity sheets that require the use of references (e.g., cost estimating, parts/inventory, specifications records).

II. Module: Basic Electricity/Electronics

A. Topic: Ohms Law

• Performance Statement:
Upon satisfactory completion of this topic, the student will use Ohms Law to determine voltage, current and resistance in circuits.

• Competencies to be Developed:
After studying this topic, the student will be able to:
   a. Understand the theory and principles of basic electricity/electronics. (K)
   b. Calculate voltage drops in a circuit. (K) (S)
   c. Calculate current drops in a circuit. (K) (S)
   d. Calculate resistance totals in a circuit. (K) (S)
• Suggested Instructional Strategies:

1. Have students calculate values using prepared activity sheets.

2. Demonstrate the effects on voltage and current when resistances are placed in series and parallel circuits.

B. Topic: DC Motors

• Performance Statement:
Upon satisfactory completion of this topic, the student will understand the theory and principles of magnetism and DC electric motors.

• Competencies to be Developed:
After studying this topic, the student will be able to:
  a. Demonstrate the principles of magnetism using permanent and electromagnets. (K)
  b. Operate a DC electric motor and be able to describe the applied scientific principles. (S) (K)

• Suggested Instructional Strategies:

1. Using permanent and electromagnets, have students demonstrate magnetic theory.

2. Using a DC electric motor, have students demonstrate the principles of operation.

C. Topic: Meters

• Performance Statement:
Upon satisfactory completion of this topic, the student will operate multimeters to measure values related to electricity/electronics.

• Competencies to be Developed:
After studying this topic, the student will be able to:
  a. Use multimeters to measure voltage, current and resistance in circuits. (K) (S)
  b. Understand and appreciate the proper use and care of delicate measuring instruments. (K) (A)
• Suggested Instructional Strategies:

1. Have students measure the resistance of several selected automotive components.
2. Have students measure voltage and current in given circuits.

D. Topic:  Semiconductors
• Performance Statement:
Upon satisfactory completion of this topic, the student will be able to identify common automotive semiconductors.

• Competencies to be Developed:
After studying this topic, the student will be able to:
a. Identify the use and application of various semiconductors in automotive applications. (K)
b. Describe the theory of semiconductor materials. (K)

• Suggested Instructional Strategies:

1. Have students complete an activity sheet that requires them to identify and describe various semiconductors.

2. Have students place various semiconductors in a circuit and measure and describe the results.

E. Topic:  Introduction to Computers
• Performance Statement:
Upon satisfactory completion of this topic, the student will understand the basic operation of computers.

• Competencies to be Developed:
After studying this topic, the student will be able to:
a. Describe the input, process and feedback of a computer system. (K)

• Suggested Instructional Strategies:

1. Have the students complete a flow chart pictorial of a computer system.

2. Have the students describe and identify various computer components.
III. Module: Automotive Systems
   A. Topic: Engine Theory
      - Performance Statement:
        Upon satisfactory completion of this topic, the student will understand the theory and operation of an internal combustion engine.

      - Competencies to be Developed:
        After studying this topic, the student will be able to:
        a. Identify the various components of an automobile engine. (K)
        b. Describe the theory and operation of an internal combustion engine. (K)

      - Suggested Instructional Strategies:
        1. Have students obtain general engine specifications from a reference manual.
        2. Have students complete an activity sheet which asks them to identify all the major components of an automobile engine.
        3. Have students view the film "ABC's of the Automobile Engine" from General Motors.

   B. Topic: Electrical Systems
      - Performance Statement:
        Upon satisfactory completion of this topic, the student will be able to read electrical circuit diagrams, identify various electrical components and connect and diagnose their operation in a circuit.

      - Competencies to be Developed:
        After studying this topic, the student will be able to:
        a. Troubleshoot and correct inoperable automotive circuits using circuit diagrams and test equipment. (S)
        b. Use meters and test light to detect faults in automotive circuits. (S)
        c. Connect various automotive electrical components in a circuit and diagnose their operation.
Suggested Instructional Strategies:

1. Have students connect various automotive electrical components into a circuit following a given circuit diagram.

2. Have students test components for proper operation.

3. Have students use a multimeter and test light to trace and troubleshoot circuits.

C. Topic:  Ignition Systems

Performance Statement:
Upon satisfactory completion of this topic, the student will be able to identify the various components of an automotive ignition system and perform the various adjustments and maintenance procedures that are associated with a tune up.

Competencies to be Developed:
After studying this topic, the student will be able to:

a. Identify the various components of an ignition system. (K)
b. Operate an engine and/or ignition simulator and demonstrate proper tune up procedures. (K) (S)
c. Use hand tools, timing light, reference manuals, gapping tools, etc., to perform a tune up and maintenance procedures. (K)

Suggested Instructional Strategies:

1. Have students adjust a simulator to a given car's ignition specifications.

2. Have students view the film "ABC's of High Energy Ignition" from General Motors.

3. Have students adjust an operating engine to the proper specifications.

4. Have students complete activity sheets on specifications, cost estimating and maintenance records.

D. Topic:  Charging Systems/Starting Systems

Performance Statement:
Upon satisfactory completion of this topic, the student will be able to identify the various components and explain the operation associated with each system.
• Competencies to be Developed:
  After studying this topic, the student will be able to:
  a. Identify and describe the components and operation of an automobile starter. (K)
  b. Identify and describe the components and operation of an automobile alternator. (K)
  c. Disassemble and reassemble an automotive starter and alternator. (K) (S)
  d. Test the components for proper operation. (K) (S)

• Suggested Instructional Strategies:

1. Have students disassemble and reassemble starters and alternators, then test components and assemblies for proper operation.

2. Have students test an alternator on an automobile for voltage output.

3. Have students perform a cranking voltage test on a vehicle.

E. Topic: Fuel Systems

• Performance Statement:
  Upon satisfactory completion of this topic, the student will be able to identify and describe the operation of the various components of the fuel system.

• Competencies to be Developed:
  After studying this topic, the student will be able to:
  a. Describe Bernoulli’s principle. (K)
  b. Identify and describe the operation of the various parts of an automotive carburetor. (K)
  c. Identify and describe the operation of an automotive fuel injection system. (K)

• Suggested Instructional Strategies:

1. Have students disassemble a carburetor and describe the function and related parts.

2. Have students disassemble, describe and identify a fuel injection system.
F. **Topic:** Computer/Emission Systems

- **Performance Statement:**
  Upon satisfactory completion of this topic, the student will be able to identify the various automobile emissions and describe the function of each control system.

- **Competencies to be Developed:**
  After studying this topic, the student will be able to:
  a. Name the emissions from an automobile engines exhaust. (K)
  b. Identify the control systems for each type of emission. (K)
  c. Service and inspect the various emission control components. (S)
  d. Describe the function of the computer in controlling performance and exhaust emissions. (K)

- **Suggested Instructional Strategies:**
  1. Have students service and inspect emission control components.
  2. Have students view the film "ABC's of the Catalytic Converter" from General Motors.

G. **Topic:** Engine Performance/Diagnosis

- **Performance Statement:**
  Upon satisfactory completion of this topic, the student will be able to use the various types of analyzing equipment to diagnose engine problems and adjust for optimum performance.

- **Competencies to be Developed:**
  After studying this topic, the student will be able to:
  a. Use an automotive oscilloscope to diagnose an engine. (K) (S)
  b. Analyze exhaust gas emissions from a vehicle to determine emission control and computer sensor conditions. (K) (S)
  c. Make effective decisions on replacement and/or adjustment of ignition, fuel, emission and computer components. (K) (S)
• Suggested Instructional Strategies:

1. Have students attach an automotive oscilloscope to an engine.

2. Have students use a hand-held monitor to examine the computer and related sensors.

3. Have students use troubleshooting charts in reference manuals to determine faults, if any.

H. Topic: Lubrication Systems

• Performance Statement:
Upon satisfactory completion of this topic, the student will understand the importance and function of lubrication.

• Competencies to be Developed:
After studying this topic, the student will be able to:
   a. Identify components of a lubrication system. (K)
   b. Use lubricants on various automobile components. (S)
   c. Interpret codes on oil containers for proper selection. (K)

• Suggested Instructional Strategies:

1. Have students view a film from one of the oil companies.

2. Have students perform an oil change and lubrication on a car.

3. Have students properly dispose of the used oil.

I. Topic: Cooling, Heating/AC Systems

• Performance Statement:
Upon satisfactory completion of this topic, the student will be able to identify and describe the function of the components associated with cooling, heating and air conditioning.

• Competencies to be Developed:
After studying this topic, the student will be able to:
   a. Determine the correct operation of system components. (S)
   b. Identify the various components associated with each system. (K)
   c. Perform routine maintenance on a cooling/heating system. (S)
• Suggested Instructional Strategies:

1. Have students flush, clean, and refill a cooling/heating system and then test for freezing point.

2. Have students check the opening temperatures of thermostats.

3. On a pictorial diagram, have the students trace the flow and label the parts of a typical cooling, heating/AC system.

4. Have students calculate the boiling and freezing points of a cooling/heating system.

J. Topic: Brake Systems

• Performance Statement:
Upon satisfactory completion of this topic, the student will be able to identify the components of an automobile brake system and perform routine maintenance and service checks.

• Competencies to be Developed:
After studying this topic, the student will be able to:
a. Identify the components of both disc and drum systems. (K)
b. Perform a service check to inspect for wear and proper operation. (S)

• Suggested Instructional Strategies:

1. Have students remove and replace disc brake pads.

2. Have students remove, replace and adjust drum brake shoes.

3. Have students inspect fluid level, lines and master cylinder.

4. Have students complete an activity sheet on troubleshooting and cost estimating.

5. Arrange for a demonstration of a car with hand brakes. Have students inspect how it is the same/different.

K. Topic: Steering/Suspension/Tires/Alignment

• Performance Statement:
Upon satisfactory completion of this topic, the student will be able to perform a safety inspection on the related components.
• Competencies to be Developed:
After studying this topic, the student will be able to:
  a. Identify the components associated with steering and suspension. (K)
  b. Analyze wear characteristics and determine tire condition. (S)
  c. Inspect a vehicle for worn steering/suspension parts. (S)
  d. Demonstrate knowledge of wheel alignment procedures. (K) (S)
  e. Demonstrate the ability to mount, balance and rotate tires. (K) (S)

• Suggested Instructional Strategies:

1. Have students view the film "ABC's of the Automobile Chassis" from General Motors.

2. Have students use front end simulator to perform wheel alignment and safety inspections.

3. Have students complete a cost estimating activity sheet pertaining to the unit.

L. Topic: Drive Trains

• Performance Statement:
Upon satisfactory completion of this topic, the student will be able to identify the major components and perform service checks on drive trains.

• Competencies to be Developed:
After studying this topic, the student will be able to:
  a. Identify and explain the function of the major components associated with drive trains. (K)
  b. Calculate gear ratios and understand effect on speed and power. (S)
  c. Use a troubleshooting chart to identify problems and their probable causes. (K) (S)

• Suggested Instructional Strategies:

1. Have students disassemble, reassemble and inspect differentials, automatic and manual transmissions.

2. Have students label major components of various power trains on pictorial drawings.

3. Have students complete activity sheets relating to troubleshooting and cost estimating.
M. Topic: Vehicle Surfaces

- Performance Statement:
  Upon satisfactory completion of this topic, the student will be able to perform the various procedures associated with paint touch up and maintenance.

- Competencies to be Developed:
  After studying this topic, the student will be able to,
  a. Recognize surface blemishes. (K)
  b. Perform maintenance operations. (S)

- Suggested Instructional Strategies:
  1. Given a 12"x12" piece of sheet steel have students use the appropriate materials, (see 3) to apply a finish coat of paint.
  2. Have students use appropriate materials, to repair and refinish the panel (e.g. metal etch, prep sol, body filler, primer/surfacer, spot putty, paint, clear coat, rubbing compound, and wax).

IV. Module: Environmental Impacts

A. Topic: Hazardous/Toxic Wastes and Controls

- Performance Statement:
  Upon satisfactory completion of this topic, the student will have an awareness of, and a sensitivity to, the environmental impacts caused by the auto industry.

- Competencies to be Developed:
  After studying this topic, the student will be able to:
  a. Use proper procedures for the handling and disposal of hazardous/toxic wastes associated with the automobile (e.g., oil, paints, solvents, battery acid). (K) (S)
  b. Identify common hazardous/toxic wastes associated with the auto industry. (K)
  c. Understand the environmental impact of hazardous/toxic wastes. (A)
• **Suggested Instructional Strategies:**

1. In conjunction with the Social Studies and English departments have students prepare a report on environmental impacts.

2. Have students participate in recycling of all waste products in the automotive laboratory.

3. Have students visit a recycling or reclaiming center.

**B. Topic: Air Quality**

• **Performance Statement:**
Upon satisfactory completion of this topic, the student will be able to identify the environmental impacts of auto exhaust emissions impacts on air quality.

• **Competencies to be Developed:**
After studying this topic, the student will be able to:
   a. Identify common airborne pollutants associated with the automobile. (K)
   b. Understand the environmental impact of airborne pollutants. (A)
   c. Use proper procedures to ensure safe air quality in the automotive laboratory. (K) (A)

• **Suggested Instructional Strategies:**

1. Have students work in conjunction with other curriculums to gain knowledge (e.g., research, write reports, give presentations, collect data, compute conclusions, prepare audio/video communications).

2. Have students use HC/CO detecting equipment to analyze exhaust emissions from an automobile.

3. Have students use proper procedures and equipment to ensure safe air quality in the automotive laboratory (e.g., dust collectors, exhaust fans, engine emissions, paint booths, respirators, asbestos disposal).

**C. Topic: New York State "Right to Know"**

• **Performance Statement:**
Upon satisfactory completion of this topic, the student will be aware of the New York State law, "Right to Know."
• Competencies to be Developed:
  After studying this topic, the student will be able to:
  a. Read and interpret Material Safety Data Sheets. (K) (S)
  b. Be aware of the hazards and environmental implications associated with
     the various materials in the automotive laboratory. (K) (A)

• Suggested Instructional Strategies:

  1. Have students complete an activity sheet designed to provide knowledge
     about Material Safety Data Sheets.

  2. Have students work in conjunction with other curriculums to gain
     knowledge (e.g., research, write reports, give presentations, collect data,
     compute conclusions, prepare audio/video communications).

V. Module: Work Place Communications
A. Topic: Customer Relations
  • Performance Statement:
    Upon satisfactory completion of this topic, the student will demonstrate
    effective listening and communication skills in dealing with customers.

  • Competencies to be Developed:
    After studying this topic, the student will be able to:
    a. Demonstrate an understanding of customer attitudes/needs, and strategies
       to conduct good customer relations. (A)
    b. Demonstrate good listening skills. (S)
    c. Demonstrate effective communication skills. (S) (A)

  • Suggested Instructional Strategies:

    1. Have students view the video "Customer Relations: The Winning
       Formula" from American Honda Corporation.

    2. Have students relay a whispered message to one another. The intent is
       a distorted end result, thereby demonstrating poor listening skills.

    3. Have students role play a counter situation and record it using a video
       camera. As a class, critique the performances.

B. Topic: Parts and Inventory Control
  • Performance Statement:
    Upon satisfactory completion of this topic, the student will demonstrate the
    effective use of a computer and parts/inventory control system.
• Competencies to be Developed:
After studying this topic, the student will be able to:
a. Use a computer to manipulate data. (S)
b. Use parts/inventory programs. (S)

• Suggested Instructional Strategies:

1. Have students use the computer program "Microbiz" in conjunction with each related activity.

2. Have students visit an auto dealership to see how it develops service records.

3. Have students write a warranty claim using service records as evidence.

D. Topic: Management Skills
• Performance Statement:
Upon satisfactory completion of this topic, the student will demonstrate good management skills.

• Competencies to be Developed:
After studying this topic, the student will be able to:
a. Demonstrate an understanding of worker attitudes/needs. (A)
b. Describe strategies for being a good manager. (A) (K)
c. Demonstrate good communication skills. (S)

• Suggested Instructional Strategies:

1. Have students view the video "Customer Relations: the Winning Formula" from American Honda Corporation.

2. Have students role play a worker/management situation and record it with a video camera. As a class, critique the performance.

3. Have students rotate the duty of "Foreman."

E. Topic: Billing
• Performance Statement:
Upon satisfactory completion of this topic, the student will demonstrate the proper use of parts/time references and complete related invoices.
• Competencies to be Developed:
  After studying this topic, the student will be able to:
  a. Use parts/time references. (K)
  b. Calculate "Flat Rate" hours, sales tax and total parts costs on an invoice. (S)

• Suggested Instructional Strategies:
  1. Have students use parts/time references to generate invoices for each applicable topic.
  2. Have the students work with the business department students.
  3. Have the students use the computer program "Microbiz."

F. Topic: Marketing
• Performance Statement:
  Upon satisfactory completion of this topic, the student will demonstrate effective marketing of automotive parts or service.

• Competencies to be Developed:
  After studying this topic, the student will be able to:
  a. Identify marketing strategies. (K)
  b. Make use of demographic profiles. (K)
  c. Communicate the advantages of an automotive product or service to a consumer. (S)

• Suggested Instructional Strategies:
  1. Have students prepare a bulletin board of local automotive advertisements.
  2. Have students prepare a project in conjunction with the marketing students.
  3. Using a demographic profile of the local area, have students select the most cost-effective method of local advertisement.
VI. Module: Consumer Issues

A. Topic: Purchasing

- Performance Statement:
  Upon satisfactory completion of this topic, the student will demonstrate knowledge relating to the purchase and financing of new and used cars.

- Competencies to be Developed:
  After studying this topic, the student will be able to:
  a. Complete a "Buying a Used Car" analysis. (K) (S) (A)
  b. Demonstrate component selection and financing of a new car. (K) (S)

- Suggested Instructional Strategies:
  1. Have students view a film about "Buying a Used Car."
  2. Have students use a "used car checklist" on a vehicle of their choice.
  3. Have students use the computer program "Chevy Tech".

B. Topic: Repair Facilities

- Performance Statement:
  Upon satisfactory completion of this topic, the student will be able to list sources to determine reputable repair facilities.

- Competencies to be Developed:
  After studying this topic the student will be able to:
  a. Identify the characteristics of the following businesses: dealership, independent garage, specialty shop, gas station, home mechanic. (K)
  b. Describe manufacturer's and shop warranties. (K)
  c. Describe the importance of estimates. (K)

- Suggested Instructional Activities:
  1. Have students call auto repair facilities for estimates.
  2. Have students contact the Better Business Bureau for a list of local repair facilities with complaints against their service.
  3. Collect samples of work orders from area businesses and have students complete a specific repair job.
C. **Topic:** Maintenance and Prevention Records
   - **Performance Statement:**
     Upon satisfactory completion of this topic, the student will understand the importance of maintaining accurate maintenance records.

   - **Competencies to be Developed:**
     After studying this topic, the student will be able to:
     a. Describe manufacturer's warranties. (K)
     b. Complete a maintenance record similar to the owner's manual. (K) (S)

   - **Suggested Instructional Strategies:**
     1. Have students write a simulated warranty claim letter to a regional zone office of an auto manufacturer, supporting the claim with maintenance records.
     2. Have students listen to a guest speaker on the subject of warranty claims.

D. **Topic:** Car Insurance
   - **Performance Statement:**
     Upon satisfactory completion of this topic, the student will understand the minimum requirements for car insurance in New York State.

   - **Competencies to be Developed:**
     After studying this topic, the student will be able to:
     a. Describe the terms liability, collision, and comprehensive insurance. (K)
     b. Describe the minimum coverage required in New York State. (K)

   - **Suggested Instructional Strategies:**
     1. Have students call an insurance company to determine the cost of minimum coverage.

E. **Topic:** New York State Inspection
   - **Performance Statement:**
     Upon satisfactory completion of this topic, the student will understand the requirements for New York State vehicle inspection.

   - **Competencies to be Developed:**
     After studying this topic, the student will be able to:
     a. Identify the components covered under New York State inspection. (K)
• Suggested Instructional Strategies:

1. Have students perform a New York State inspection on a selected vehicle.

2. Have students complete an activity sheet listing all the requirements of a New York State inspection.

3. Have the students visit a licensed New York State inspection station.
# SUGGESTED TOOLS AND EQUIPMENT

**Student Hand Tools:**  
(Individual or Tool Crib In Sufficient Quantities To Permit Efficient Instruction)

<table>
<thead>
<tr>
<th>Tools/Equipment</th>
<th>Different Types/Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allen Wrench</td>
<td>2mm - 7mm.</td>
</tr>
<tr>
<td>Adjustable Wrench</td>
<td>.050 thru 3/8</td>
</tr>
<tr>
<td>Battery Tools</td>
<td>10 inch</td>
</tr>
<tr>
<td>Blow Gun</td>
<td>Battery Nut Pliers</td>
</tr>
<tr>
<td>Brake Spoon</td>
<td>Battery Terminal Clamp Fuller</td>
</tr>
<tr>
<td>Chisel</td>
<td>Battery Post Cleaner</td>
</tr>
<tr>
<td>Combination Wrenches</td>
<td>Rubber Tip (OSHA approved)</td>
</tr>
<tr>
<td>Files</td>
<td>5/8&quot; Cold Chisel</td>
</tr>
<tr>
<td>Hack Saw</td>
<td>5/16&quot; Cape Chisel</td>
</tr>
<tr>
<td>Hammers</td>
<td>7/16&quot; - 1&quot;, 7mm - 19mm</td>
</tr>
<tr>
<td>Magnetic Pickup Tool</td>
<td>10&quot; Coarse, 6&quot; Fine</td>
</tr>
<tr>
<td>Mechanics Steel Ruler</td>
<td></td>
</tr>
<tr>
<td>Pliers</td>
<td>Medium Ball Peen</td>
</tr>
<tr>
<td>Punches</td>
<td>Soft Face</td>
</tr>
<tr>
<td>Safety Glasses</td>
<td></td>
</tr>
<tr>
<td>Scraper</td>
<td></td>
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<tr>
<td>Screwdrivers (Common)</td>
<td></td>
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<tr>
<td>(Phillips)</td>
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<tr>
<td>(Torx)</td>
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<tr>
<td>Screw Starter (Standard and Phillips)</td>
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</tbody>
</table>

Punches

Safety Glasses
Scraper
Screwdrivers (Common)  
(Phillips)

Needle Nose
All Purpose
Hose Clamp
Side Cutters
Vice Grip
Slip Joint (water pump)
1/4" and 1/8" Pin Punch
3/8" Taper Punch
3" Center Punch

1 1/2" Wide
Stubby 6", 12", 9" Offset
Stubby #1 and #2
6", #1 and #2
12", #3
Offset #2
T-15, T-20, T-25, T-30
Tools/Equipment

Socket Set 1/4 Drive

Socket Set 3/8" Drive

Spark Plug Gap Gauge
Tape Measure
Tire Pressure Gauge
Tool Box
Wire Brush

Additional Tools

The tools on this list are used in the specialty areas. Program personnel must determine which tools are needed in each area.

Tools/Equipment

Adjustable Wrench
Allen Wrench
Box End Wrench Set

Belt Tension Gauge
Brake Tools

Creepers

Different Types/Sizes

3/8" - 1/2" Standard and Deep
6mm - 12mm Standard and Deep
Rachet
Long and Short Extension
5/16" thru 3/4" Standard (6 pt)
3/8" thru 3/4" Deep (6 pt)
6mm to 19mm
9mm to 19mm Deep
Universal Joint
Rachet Handle
Short, medium and long extension
Spark Plug Sockets - 5/8" and 13/16"
Speed Handle
Breaker Bar

Different Types/Sizes

6"
2mm thru 7mm.
.050" thru 3/8"
3/8" - 1 1/8" 7mm - 18mm
3/8" - 3/4" Offset -- Optional
7mm - 15mm Offset

Brake Cylinder Hone
Brake Cylinder Clamps
Brake Spring Installer
Brake Plier
Brake Rotor Gauge
### Tools/Equipment

- Chisels
- Compression Tester
- Continuity Test Light
- Dial Indicator Set
- Digital Electronic Volt Meter
- Drag Link & Shock Tool
- Drill
- Drill Bits
- East Outs
- Filter Wrench
- Engine Tools

### Different Types/Sizes

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot;, 3/4&quot; Cold Chisel</td>
<td></td>
</tr>
</tbody>
</table>
| 3/8" Variable Speed, Reversible | 1/16" - 3/8"
| 1 set | Oil and Gas
| Cylinder Hone | Piston Ring Extender
| Piston Ring Compressor | Piston Ring Grove Cleaner
| Ridge Remover | Telescopic Gauge
| Valve Spring Compressor | .002" - .040" Set, .006mm - .070mm set
| 4", 10" and 12" fine | 6" and 12" coarse
| 6" and 12" half round | 3/8" - 11/16"
| 7mm - 17mm | Heavy Ball Peen, 25 oz. Brass, Hand Sledge 5 lb.
| Metric Set | Standard Set
| 3/8" Drive with Socket Set | 1/2" Drive with Sockets
| Standard and Metric | 0-1", 1-2", 2-3", 3-4", and 4-5"
| 0-25mm, 25-50mm, 50-75mm, 75-125mm | 5/16" - 7/8", 8mm - 19mm
| Snap Ring | Wheel Weight
| 5/16", 3/16", Pin, 1/2", 5/8" Tapered | 6" Center Punch
| 16" | Two Way
| Three Way |
Tools/Equipment

Scaper
Screw Pitch Gauge
Screwdriver (Clutch Head)
Socket Set 1/2" Drive

Socket Set 1/4" Drive

Soldering Gun
Spark Plug Wire Remover
Tach/Dwell Meter

Tap and Die Set
Timing Light With Inductive Pickup
Magnetic Timer
Top Tool Chest
Torque Wrench

Tubing Cutter With Flaring Tool, Double Flare Type
Vacuum/Pressure Gauge
Water Manometer
Battery Post Cleaner, Top/Side Post
Brake Adjusting Gauge/Universal Brake Spoon
Combination Wrenches
Feeler Gauge
Flare Nut Wrench Set
Tubing Cutter
East Out Set
Hammer
Inspection Mirror
Mallet
Hammer
Magnetic Pickup Tool
Fingers

Different Types/Sizes

Carbon Remover
N.F., N.C., Metric
3/16", 5/16", 1/4", 3/8"
10mm - 25mm Standard
10mm - 25mm Deep
7/16" - 1 1/8" Standard
1/2" - 1 1/8" Deep
Ratchet
Speed Handle
Flex Handle (Breaker Bar)
Short, Medium and Long Extension
3/8" - 1/2" Standard and Deep
6mm - 12mm Standard and Deep
Ratchet
Short and Long Extension

Electronic Capabilities With Digital and Analogue
Standard and Metric

6 Drawer Minimum
1/2" Drive, 0-150 ft./lbs. -- 0-200 Nm
3/8" Drive, 5-75 ft./lbs. -- 5-100 Nm

Start With 9/32 to 7/8, 6mm to 19mm
.002" - .040" + .006mm - 1070mm
3/8" - 3/4", 10mm - 17mm

32 oz., S 12 oz. Ball Peen Hammer

Plastic or Wooden
Brass
Three sizes
**Tools/Equipment**

Fender and Seat Covers  
Punch  
Test Light  
Pry Bar  
Tire Chuck  
Tire Valve Core Remover  
Ignition Wrench Set  
Special Scraper for Aluminum Parts  
Torx Complete Set  
Allen Wrench  
Remote Starter Switch  
Box End Wrench Set  
Open End Wrench Sets  
Chisels  
Drill Bits  
Torque Wrench Set  
Flashlight  
Adjustable Wrench  
Crows Foot Wrench Set  
Thread Chaser Set  
Drill  
Files and Handle  
Impact Wrench  
Flare Nut Wrench Set  
Inside Micrometers  
Pliers Snap Ring  
Aligning Punch  
Flex Socket Set  
On Board Computer Tester  

**Different Types/Sizes**

Brass or Aluminum - 6"  
12 Volt  
16"  
Metric and Standard  
All Sizes  
2mm - 14mm  
.50 - 3/8"  
1/2" - 1 1/8", 7mm - 19mm  
3/8" - 3/4" Offset  
5/16" - 7/8", 8mm - 19mm  
3/8" - 3/4"  
1/64" - 1/2"  
3/8" Drive 0-200 in./lbs.  
1/2" Drive 5-150 in./lbs.  
6", 8", 12"  
Metric and Standard  
1/2", Variable Speed, Reversible  
Complete Set  
1/2" Drive With Complete Socket  
Set/Deep and Standard  
To 3/4", to 19mm  
0-6" and 0-150mm  
Add Complete Set Reversible  
12"  
1/4", 3/8", and 1/2" Drives Metric and Standard  
Hand Held

**Shop Tools and Equipment**

This section covers the tools and equipment a laboratory should have for training in any given specialty area. Many of the tools and equipment are the same for some or all of the specialty areas, but some equipment is specialized and must be available in the laboratory to provide quality instruction. No specific type or brand names are identified because they will vary in each local situation.
**NOTE:** It is assumed that all laboratories have an air compressor, adequate electrical capability, fender covers and steel work benches with vises.

### Front End

#### Tools/Equipment

- Axle Stands
- Bearing Packer
- Chassis Lubricator System
- Floor Jack(s)
- Hoist(s)
- Oxy-Acetylene Welder and Cutting Torch
- Parts Cleaning Tank
- Tire Mounting Machine
- Wheel Balancer

- Compressor Tool
- Air Chisel With Adapter
- Tie Rod Puller
- Ball Joint Press and Other Special Tools
- Pressure Gauge
- Dial Indicator Sets
- Impact Wrench

#### Different Types/Sizes

- Hand Operated
- 2 Ton Minimum
- Swing Arm Frame Contact

- On Car Spin Balancer
- Off Car Electronic Type
- Spring/Strut

- Tire

- 1/2" Drive, and Sockets

### Brakes

#### Tools/Equipment

- Axle Stands
- Bearing Packet
- Bench Grinder
- Brake Bleeder, Pressure
- Floor Jack
- Hoist(s)
- Hydraulic Press (with adapters)
- Oxy-Acetylene Welder - Cutting Torch
- Parts Cleaning Tank
- Puller(s)
- Torque Wrench

- Brake Drum Micrometers
- Rotor Gauge
- Brake Disk Micrometer

#### Method for Removing Asbestos Contamination

#### Different Types/Sizes

- Hand Operated
- 2 Ton
- Swing Arm Frame Contact
- 25 Ton

- 1/2" Drive 0-150 ft./lbs.
- 3/8" Drive 5-75 ft./lbs.
Heating and Air Conditioning

Tools/Equipment

Air Conditioner Repair Unit

Axle Stands
Bench Grinder
Cooling System Tester
Dial Indicator
Floor Jack
Gear Puller(s)
Hydraulic Press
Oxy-Acetylene Welder
Digital Volt, Ohm, Amp Meter With Adapters
Torque Wrench Set

Belt Tension Gauge
Service Port Adapter Set

Performance

Tools/Equipment

Arbor Press or Hydraulic Press
Axle Stands
Battery Charger
Battery/Starter Tester
Bench Grinder
Dial Indicator Set
Engine Analyzer
Four Gas Analyzer
Floor Jack
Parts Cleaning Tank
Puller Set
Spark Plug Cleaner
Digital Volt Meter - With Adapters
Cylinder Leakage Tester
Belt Tension Gauge
Torque Wrench Set

Different Types/Sizes

Consisting of pullers, removers, adapters, special feeler gauges, tools, system analyzer, necessary hoses, leak detector, circuit tester, thermometer, ratchet, refrigerant can, dispenser valves, and portable vacuum pump

2 Ton Minimum
25 Ton

1/2" Drive 0-150 ft./lbs.
3/8" Drive 0-75 ft./lbs.

25 Ton With Adapters

With or Without Scope
2 Ton Minimum

1/2" Drive 0-150 ft./lbs.
3/8" Drive 0-75 ft./lbs.
**Tools/Equipment**

Computer Diagnostic Tester
Fuel Injection Pressure Gauge Sets
Advanced Timing Light
Dwell Meters
Computer Carburetor Tools
Carburetor Plug and Angle Gauge Set
Fuel Injection Cleaner
Pyrometer
Vacuum Gauges and Vacuum Pump
Manometer

**Different Types/Sizes**

Hand Held

Hand Held

**Automatic Transmission/Transaxle**

**Tools/Equipment**

Arbor Press
Axle Stands
Bench Grinder
Floor Jack(s)
Hoist(s)
Transmission Cleaning System
Hydraulic Press
Parts Cleaning Tank
Puller Sets
Transmission Jack(s)
Transmission Holding Fixtures
Transmission Special Tool Sets
Hydraulic Pressure Gauge Set
Front Wheel Engine Support Fixture
Dial Indicator Set
Digital Electronic Volt/Ohm Meter
Tach Dwell Meter
Torque Wrench
Tap and Die Set
Waste Oil Receptacle
Computer Diagnostic Tester

**Different Types/Sizes**

2 Ton Minimum
Swing Arm Contact
25 Ton With Adapters
1/2" Drive 0-150 ft./lbs.
3/8" Drive 0-75 ft./lbs.
Standard and Metric
With Extension Neck and Funnel
Hand Held

**Electrical Systems**

**Tools/Equipment**

Arbor Press
Axle Stand(s)
<table>
<thead>
<tr>
<th>Tools/Equipment</th>
<th>Different Types/Sizes</th>
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<tbody>
<tr>
<td>Battery Charger</td>
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<tr>
<td>Battery/Starter Tester</td>
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<tr>
<td>Floor Jack(s)</td>
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<tr>
<td>Grinder</td>
<td></td>
</tr>
<tr>
<td>Parts Cleaning Tank</td>
<td>2 Ton Minimum</td>
</tr>
<tr>
<td>Puller Set</td>
<td></td>
</tr>
<tr>
<td>Volt-Ampere Tester</td>
<td>Hand Held</td>
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<tr>
<td>DOVM Digital</td>
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<tr>
<td>Computer Diagnostic Tester</td>
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<tr>
<td>Engine Analyzer (Scope)</td>
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</tr>
<tr>
<td>Analog Volt/Ohmmeter</td>
<td></td>
</tr>
<tr>
<td>Alternator Service Tools</td>
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</tr>
</tbody>
</table>

**Manual Drive Train and Axles**

<table>
<thead>
<tr>
<th>Tools/Equipment</th>
<th>Different Types/Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axle Stand(s)</td>
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</tr>
<tr>
<td>Bench Grinder</td>
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<tr>
<td>Brake Bleeder</td>
<td></td>
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<tr>
<td>Dial Indicator Set</td>
<td></td>
</tr>
<tr>
<td>Floor Jack(s)</td>
<td>2 Ton Minimum</td>
</tr>
<tr>
<td>Hoist(s)</td>
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<tr>
<td>Holding Fixtures</td>
<td></td>
</tr>
<tr>
<td>Cleaning System</td>
<td></td>
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<tr>
<td>Hydraulic Press</td>
<td></td>
</tr>
<tr>
<td>Lube Dispenser</td>
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<tr>
<td>Oxy-Acetylene Welder</td>
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<tr>
<td>Parts Cleaning Tank</td>
<td></td>
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<tr>
<td>Portable Crane</td>
<td></td>
</tr>
<tr>
<td>Puller Sets</td>
<td>2 Ton</td>
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<tr>
<td>Transmission Jack(s)</td>
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<tr>
<td>Drain Pans</td>
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<tr>
<td>Special Tools for Transaxles</td>
<td></td>
</tr>
<tr>
<td>Front Wheel Drive Engine Support Fixture</td>
<td></td>
</tr>
<tr>
<td>Torque Wrench</td>
<td>1/2&quot; Drive 0-150 ft./lbs.</td>
</tr>
<tr>
<td></td>
<td>3/8&quot; Drive 0-75 ft./lbs.</td>
</tr>
<tr>
<td></td>
<td>1/4&quot; Drive 0-75 in./lbs.</td>
</tr>
<tr>
<td>C V Joint Tools</td>
<td></td>
</tr>
<tr>
<td>Universal Joint Tools</td>
<td></td>
</tr>
</tbody>
</table>
Engine

Tools/Equipment

Axle Stand
Bench Grinder(s)
Engine Analyzer
Floor Jack(s)
Gear Puller Set
Hydraulic Press
Parts Cleaner
Portable Crane
"Valve Shop"

Drill Motor
Drive Impact Wrench
Impact Socket Sets
Cam Bearing Driver Set
Valve Spring Tester
Engine Stands
Piston Pin Press and Adaptors
Compression Gauge
Cylinder Leakage Tester
Cylinder Hone
Dial Indicator Sets
Electronic Digital Volt/Ohm/Amp Meter
Tap and Die Set
Torque Wrench

Telescopic Gauges
Ball Gauges

Different Types/Sizes

2 Ton Minimum

25 Ton With Adapters

2 Ton
Including Refacer and Seat Grinder, and
Valve Guide Repair Unit
1/2"
1/2"
1/2" Drive, Standard and Deep

Business Operations

- One computer station with appropriate software to prepare work orders, customer receipts and maintain inventory and related service records.

- Computer station with CD Rom player and appropriate reference software to provide information needed for diagnosis and repair of automobiles and light trucks.