

AUTOMOTIVE TECHNOLOGY

Course Information

Grade Level:	11-12
Prerequisite:	Successful completion of Small Engines and Automotive Engines
Length:	1 Year
Period(s) Per Day:	2
Credit:	2
Credit Requirement Fulfilled:	Vocational/Elective

Course Description:

This course will give instruction on shop safety, shop layout, automotive/diesel careers, tools and tool safety, power train diagnostics, OBD II diagnostics and system operations, scan tool and waveform meter usages, steering and suspension systems, alignment, A/C systems, brake systems, electrical systems of a motor vehicle. Through lectures, lab time, and written work the students will gain knowledge and demonstrate skills of how these systems operate, and the diagnosis and repair of these systems.

Course Objectives and Expectations:

1. Perform operations of tools and equipment in the shop safely and efficiently.
2. Learn about different careers related to the automotive and diesel industry.
3. Describe the basic principles of ignition systems. This includes HEI, DIS and COP ignition systems.
4. Describe the basic principles of the electronic fuel system, This includes TBI, CFI, PFI and SFI and electronic fuel pumps.
5. Describe the operation of a 12 volt automotive electrical system. Understand and use wiring diagrams to diagnose and fix vehicle electrical systems.
6. Maintain and service engines using scan tools, waveform viewers, multi-meters and smoke testing engines to locate and repair performance problems.
7. Troubleshoot and diagnose problems and do what is necessary to correct the problems the first time for all these systems.
8. Describe the basic parts of a manual transmission system and describe the operation of the unit.
9. Describe the hydraulic brake system and the mechanical brake system on most vehicles.
10. Diagnose and repair the hydraulic brake system, turn drums and rotors on a brake lathe. Rebuild a disc caliper and master cylinder. Replace the disc pads and/or brake shoes on a live vehicle.
11. Describe the alignment angles on a car and identify the steering and suspension system components. Students will perform 2 and 4 wheel alignments using the Bear 4 wheel alignment equipment.
12. Diagnose and repair the steering and suspension systems.
13. Describe the air conditioning system and identify the parts of the two different systems used in automotive vehicles.
14. Students will use the R134a equipment to diagnose a system. Recover refrigerant, evacuate a system and recharge the unit on a vehicle.
15. Students will be able to disassemble and re-assemble front and rear wheel bearings.

Student Objectives:

1. Students will learn to work safely in the automotive shop.
2. Students will learn to use tools and equipment common to automotive vehicle service and repair.
3. Students will learn to maintain tools, equipment, and environment of the automotive repair shop.
4. Students will learn basic measurement and math used in the automotive repair industry.
5. Students will learn about careers common to the automotive and diesel repair industry.

6. Students will learn the construction and operation of the following automotive systems: braking, steering, suspension, electrical, gasoline and diesel fuel systems, ignition, electronic engine controls, emissions controls, clutches, manual transmissions, drivelines and transfer cases, differentials, automatic transmissions, and heating ventilation and air conditioning systems.
7. Students will learn to diagnose, repair, and maintain the following automotive systems: braking, steering, suspension, electrical, gasoline and diesel fuel systems, ignition, electronic engine controls, emissions controls, clutches, manual transmissions, drivelines and transfer cases, differentials, automatic transmissions, and heating ventilation and air conditioning systems.

Pacing

Career and Vocational/Technical Standards

Semester 1, 2

Unit 1- Safety in the Automotive Shop	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 2- Tools/Equipment used in industry	1.II.1, 1.III.2, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 3- Automobile layout, history, and careers	1.III.1, 1.III.2, 1.III.3
Unit 4- Drum and Disc Braking Systems	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 5- Steering and Suspension	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 6- Automotive electrical	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 7- Fuel, Air Induction, and Exhaust Systems	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 8- Computerized engine and emissions controls	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 9- Manual Transmissions and Drivetrains	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 10- Automatic Transmission/Transaxle	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4
Unit 11- Heating, Ventilation, and Air Conditioning	1.II.1, 1.III.2, 2.II.2, 2.II.3, 2.II.4, 2.III.2, 3.II.1, 3.II.2, 3.II.3, 3.III.5, 4.II.4, 4.III.1, 4.III.2, 4.III.3, 5.II.1, 5.III.3, 5.III.4

1st Semester

Safety in the Automotive Shop

- A. Shop Safety
- B. Keeping work area clean
- C. Use tools and equipment properly
- D. Operate Engines/Vehicles safely

Automobile layout, history and careers

- A. Parts, Assemblies, and Systems
- B. The Automotive Technician
- C. ASE Certification
- D. Other automotive service careers

Tools/Equipment used in industry

- A. Basic hand tools
- B. Measuring tools
- C. Power tools
- D. Specialty tools and shop equipment

Brake System Fundamentals

- A. Hydraulic braking system
- B. Parking brake/emergency brake system
- C. Brake system diagnosis
- D. Brake system service

Steering and Suspension

- A. Wheel and tire construction and operation
- B. Wheel and tire diagnosis and service
- C. Wheel bearing/hub construction and operation
- D. Wheel bearing/hub diagnosis and service
- E. Suspension system construction and operation
- F. Suspension system diagnosis and service
- G. Steering system construction and operation
- H. Steering system diagnosis and service
- I. Wheel alignment angles
- J. Wheel alignment diagnosis and service

2nd Semester

Basic Electricity and Electronics

- A. Basic Electrical Theory
- B. Series and Parallel Circuits
- C. Wiring Diagrams/Schematics
- D. Electrical Testing Equipment
- E. Starting and charging systems
- F. Electrical system diagnosis and service

Fuel, Air induction, and Exhaust systems

- A. Fuels and lubricants
- B. Fuel supply systems
- C. Gasoline fuel injection
- D. Diesel fuel systems and components
- E. Turbocharging and Supercharging

Computerized engine and emissions controls

- A. Ignition system construction and operation
- B. Ignition system diagnosis
- C. Computers, sensors, actuators
- D. Computerized diagnostic equipment
- E. Emissions controls
- F. Engine performance diagnosis

Manual transmission and drivetrain

- A. Clutch construction and operation
- B. Clutch diagnosis and service
- C. Manual transmission construction and operation
- D. Driveline and axle construction and operation
- E. Driveline and axle diagnosis and service
- F. Transfer case construction and operation
- G. Differential construction and operation
- H. Differential diagnosis and service

Automatic transmission and transaxle

- A. Automatic transmission construction and operation
- B. Automatic transmission diagnosis and service

Heating, Ventilation, and Air Conditioning

- A. HVAC construction and operation
- B. HVAC service

Timeline:

Unit 1 - Safety in the Automotive Shop	(1 week to cover)
Unit 2 - Tools/equipment used in the industry	(1 week to cover)
Unit 3 - Automobile layout, history, and careers	(1 week to cover)
Unit 4 - Drum and Disc Braking Systems	(4 week to cover)
Unit 5 - Steering and Suspension	(8 weeks to cover)
Unit 6 - Automotive electrical	(6 weeks to cover)
Unit 7 - Fuel, Air Induction, and Exhaust Systems	(4 weeks to cover)
Unit 8 - Computerized engine and emissions controls	(4 week to cover)
Unit 9 - Manual Transmissions and Drivetrains	(5 weeks to cover)
Unit 10- Automatic Transmission/Transaxle	(2 weeks to cover)
Unit 11- Heating, Ventilation, and Air Conditioning	(1 week to cover)

Total =

(37 weeks to cover)

Montana Content Standards/RST

Content Standard 1: Students experience various career opportunities and assess personal career pathways.

Benchmark II.1 Explore and identify personal interests, aptitudes, and abilities and develop strategies to achieve tentative career and life goals.

Benchmark II.1 Develop, evaluate, and modify personal career and life plans.

Benchmark II.2 Experience an internship, job shadow, or work experience related to one's career plan.

Benchmark II.3 Evaluate career choices and the effect on family and lifestyle.

Content Standard 2: Students demonstrate an understanding and apply principles of Resource Management (i.e., financial, time, personal management).

Benchmark II.2 Prioritize, allocate time, and prepare and follow schedules to complete a project.

Benchmark II.3 Apply appropriate time to task.

Benchmark II.4 Use physical resources wisely to accomplish a goal.

Benchmark III.2 Select, design, complete, and evaluate a project (e.g., manage multiple facets of a project).

Content Standard 3: Students acquire and utilize personal leadership skills to become successful, productive citizens.

Benchmark II.1 Demonstrate active leadership skills by participation in group activities and projects.

Benchmark II.2 Demonstrate positive personal and work ethics.

Benchmark II.3 Demonstrate skills to be a productive citizen.

Benchmark II.6 Practice several methods of effective communication.

Benchmark III.5 Respect differences and work well with individuals from diverse backgrounds and philosophies.

Content Standard 4: Students acquire and demonstrate current technical skills leading to an occupation.

Benchmark II.4 Manage and maintain technological tools and follow troubleshooting protocol

Benchmark III.1 Master the technical skills required for an entry level job or advanced training.

Benchmark III.2 Practice safe and appropriate use of technology.

Benchmark III.3 Master tools and equipment needed for an entry level job or advanced training.

Content Standard 5: Students know and demonstrate the requirements of the workplace through authentic application.

Benchmark II.1 Practice and demonstrate academic and technical skills in a workplace setting.

Benchmark III.3 Demonstrate decision-making and problem-solving skills.

Benchmark III.4 Use appropriate equipment and processes reflecting industry standards for school setting or other learning environment.

Resources:

[K-12-Content-Standards-Career-Technical-Education](#)