Transportation Technology II: Basic Automotive Maintenance and Repair

Course Information

Grade(s):	9-12
Discipline/Course:	Technology Education
Course Title:	Transportation Technology 2 - Introduction to Basic Auto Maintenance and Repair
Prerequisite(s):	Transportation Technology 1 or with permission of the Instructor
Course Description: *Program of Studies*	In Transportation Technology 2, students will continue the study of transportation systems, with an introduction to Basic Auto Maintenance and Repair. Students will build their knowledge of basic automobile maintenance through hands-on experiences in the Automotive Lab. Additional elements of the course will include the investigation of other forms of transportation and transportation systems.
Course Essential Questions:	● How do mechanical skills and technological problem-solving methods interact to diagnose and repair automotive systems? ● How do various technologies in mechanical, electrical and fuel systems play a role in the function, efficiency, and emission control of automotive systems? ● How do alternate sources of energy provide alternatives to present and future automotive systems? ● How do I troubleshoot problems that arise during mechanical repair? ● How do I evaluate success while working on mechanical projects?
Course Enduring Understandings:	● Transportation systems utilize natural resources which benefit society. ● Mechanical skills and technological problem solving can be rewarding to diagnose and repair automotive systems and related technologies. ● Various technologies in mechanical, electrical and fuel systems play an important role in the function, efficiency, and emission control of automotive systems. ● Various Sources of energy are being utilized in automotive systems both now and in the future. ● Logical problem-solving methods are utilized to efficiently and correctly use resources, tools and machines to diagnose and repair automotive systems.

	• Math and science concepts are applied in automotive systems to solve practical mechanical problems.
Duration: **Credit:**	½ year; .5 credit(s)
Course Materials/ Resources:	Consumables Textbook - Modern Automotive Technology - by J. E. Duffy
FPS Course Academic Expectation(s):	EU - Exploring and Understanding CC - Creating and Constructing
Year at a Glance (Units)	Unit 1 - Introduction and Safety in the Automobile Repair Facility (1 week) Unit 2 - Review of Tools and Measuring Instruments (2 weeks) Unit 3 - Tires and Wheels (2 weeks) Unit 4 - Fluid Maintenance and Servicing (3 weeks) Unit 5 - Brake Systems Technology (4 weeks) Unit 6 - Suspension Systems Technology (4 weeks) Unit 7- Vehicle Design Experience (4 weeks)

Unit No. and Title:	Unit 1 – Introduction and Safety in the Automobile Repair Facility
Duration:	1 Week
Resource(s):	Equipment & Consumables
Unit Overview:	Students will learn how to actively incorporate safety while working in a mechanics shop/lab and become aware of general shop safety practices.
Learning Goals	
Standard(s):	CT State Dept of Education: Technology Education Standards 2014 - **Automotive Technology** CT State Dept of Education: Technology Education Standards 2014 - **Transportation Technology** AUTO.01 Students demonstrate the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards. AUTO.01.01, AUTO.01.02, AUTO.01.04, AUTO.01.05 TRAN.01 Identify historical, social, economic, environmental, and government regulations impact transportation technology. TRAN.01.01, TRAN.01.02, TRAN.01.03
Essential Question(s):	● How does knowledge from other content areas (Math, Science, the Arts), help us solve problems? ● How can I demonstrate the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards?
Enduring Understanding(s):	● Transportation systems use energy sources to work. ● Technology and engineering are fundamental human activities requiring a range of skills. ● Technology and engineering are interdisciplinary, requiring the application of knowledge and skills related to science, math, and the arts.
Learning Goal(s): *Students will know and*	**Content:** (Students will know…) ● safety rules and procedures for the Transportation/Auto shop.

will be able to use their learning to: (Content/ Skills)	● selected tools for working on engines. ● energy sources used in transportation systems and their impact on the worker and the work environment. **Skills:** (Students will be able to…) ● demonstrate proper tool use. ● demonstrate proper safety skills. ● use common hand tools properly. ● demonstrate several of the common measuring techniques.

Unit No. and Title:	Unit 2 – Introduction to Tools, Machines and Measuring Instruments
Duration:	2 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	Students will gain an understanding of the basic tools, machines and measuring instruments utilized in Automobile repair.
Learning Goals	
Standard(s):	AUTO.01 Students demonstrate the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards. AUTO.01.04 Describe a safe working environment for both employees and the shop environment. AUTO.01.05 Demonstrate and explain knowledge of personal safety practices such as eyewear, clothing, footwear, and personal protective equipment (PPE). AUTO.01.06 Demonstrate and explain knowledge of shop safety procedures when performing tasks, such as raising a vehicle with a floor jack. AUTO.01.07 Identify basic hand tools and their usage in the automotive industry. AUTO.03.05 Describe principles of pneumatic and hydraulic power and their applications.
Essential Question(s):	● How do I choose the best tools to use for a particular task or to solve a problem? ● How do I demonstrate the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards?
Enduring Understanding(s):	● Technology and engineering are fundamental human activities requiring a range of skills. ● Technology and engineering are interdisciplinary, requiring the application of knowledge and skills related to science, math, and the arts.
Learning Goal(s): *Students will know and will be able to use their*	**Content:** (Students will know…) ● safety rules and procedures for the Transportation/Auto Repair Lab. ● selected tools for working on automotive systems.

learning to: (Content/ Skills)	**Skills:** (Students will be able to…) ● select the appropriate tool(s) to complete the task at hand. ● practice appropriate general shop safety and awareness. ● practice appropriate personal safety while utilizing tools and performing repair(s).

Unit No. and Title:	Unit 3 – Wheels and Tires
Duration:	2 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	Students will be able to identify and apply the proper tools and techniques to select, service and maintain Wheels and Tires found in the common automotive environment.
Learning Goals	
Standard(s):	Automotive Technology AUTO.08.04 Identify factors that cause abnormal tire wear. AUTO.09 Demonstrate function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with portable national industry standards.
Essential Question(s):	● Why is it important to understand relationships between systems which function together? ● How does knowledge from other content areas (Math, Science, the Arts), help us solve problems?
Enduring Understanding(s):	● Technology and engineering are fundamental human activities requiring a range of skills. ● Technology and engineering are interdisciplinary, requiring the application of knowledge and skills related to science, math, and the arts.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● parts of a tire and wheel assembly. ● different methods of tire construction. ● types and sizes of tires. ● tire ratings and designations. ● different types of wheels. ● valve stems, valve cores, lug nuts, lug studs and lug bolts. ● the parts of driving and non driving hub and wheel bearing assemblies. **Skills:** (Students will be able to…)

	● demonstrate how to properly and safely change a tire on a vehicle. ● evaluate the condition of a tire and wheel assembly. ● utilize the tire changer and wheel balancer to create a balanced wheel and tire assembly. ● demonstrate how to evaluate and properly maintain tire pressure. ● assess the condition of wheel bearing assemblies. ● torque wheels on a vehicle and describe the importance of doing this correctly.

Unit No. and Title:	Unit 4 – Fluid Maintenance and Servicing
Duration:	3 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	Students will perform fluid maintenance service using proper tools and following proper safety procedures. They will learn how to actively follow shop safety procedures while performing the required auto maintenance service procedures and become more aware of general shop safety practices.
Learning Goals	
Standard(s):	Automotive Technology AUTO.04 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer. AUTO.04.01 Follow the procedures and practices of various manufacturers regarding repair and maintenance schedules. AUTO.04.02 Demonstrate how to properly document maintenance procedures in accordance with applicable rules, laws, and regulations. AUTO.04.03 Use reference books, technical service bulletins, and other documents and materials related to the automotive service industry available in print and through electronic retrieval systems to accurately diagnose and repair vehicles. AUTO.01 Students demonstrate the value and necessity of practicing personal and occupational safety and protecting the environment by using materials and processes in accordance with manufacturer and industry standards.
Essential Question(s):	● What has been the impact of tools and machines on mankind? ● How can we choose the best tools to use for a particular task or to solve a problem? ● How does knowledge from other content areas (Math, Science, the Arts), help us solve problems?
Enduring Understanding(s):	● Technology and engineering are fundamental human activities requiring a range of skills. ● Technology and engineering are interdisciplinary, requiring the application of knowledge and skills related to science, math, and the arts.

Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● safety practices while performing fluid maintenance procedures on an automobile. ● the correct application of selected tools and supplies for fluid maintenance procedures. **Skills:** (Students will be able to…) ● explain the importance of vehicle fluid maintenance. ● demonstrate proper tool use. ● demonstrate safe practices while perming fluid maintenance procedures. ● check a cars fluid levels. ● replace engine oil and filter. ● locate fluid leaks. ● replace Coolant.

Unit No. and Title:	Unit 5 – Brake Systems Technology
Duration:	4 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	Students will understand and demonstrate the basic functions and principles involved in the inspection, maintaining and replacement of brake systems, parts and assemblies utilized in modern vehicles.
Learning Goals	
Standard(s):	Transportation Technology AUTO.09 Demonstrate function and principles of automotive drivetrain, steering and suspension, brake, and tire and wheel components and systems in accordance with portable national industry standards. AUTO.09.01 Explain hydraulic systems as they pertain to the service braking systems. AUTO.09.02 Describe the purpose, operation, and basic components of drum brakes. UTO.09.03 Describe the purpose, operation, and basic components of disc brakes. AUTO.09.04 Describe the components of power assist braking systems. AUTO.09.05 Describe the purpose, operation, and basic components of parking brake systems. AUTO.09.06 Describe the purpose, operation, and basic components of anti-lock braking systems (ABS) and traction control systems (TCS).
Essential Question(s):	● Why is knowledge of how machines work essential in mechanics? ● What is transportation technology? ● How can we choose the best tools to use for a particular task or to solve a problem? ● How does knowledge from other content areas (Math, Science, the Arts), help us solve problems?
Enduring Understanding(s):	● Transportation systems use energy sources to work ● Technology and engineering are fundamental human activities requiring a range of skills ● Technology and engineering are interdisciplinary, requiring the application of knowledge and skills related to science, math, and the arts
Learning Goal(s):	**Content: (**Students will know…)

Students will know and will be able to use their learning to: (Content/ Skills)	● the function and principles of brake components and systems. ● hydraulic systems as they pertain to the service braking systems. ● the purpose, operation, and basic components of drum brakes. ● the purpose, operation, and basic components of disc brakes. ● the components of power assist braking systems. ● the purpose, operation, and basic components of parking brake systems. ● the purpose, operation, and basic components of anti-lock braking systems (ABS) and traction control systems. **Skills:** (Students will be able to…) ● identify the components of a brake system ● describe the operation of a brake system ● perform brake inspections ● perform brake component maintenance and replacement

Unit No. and Title:	Unit 6 – Suspension and Steering Systems Technology
Duration:	4 weeks
Resource(s):	Textbook, Equipment & Consumables
Unit Overview:	Students will understand and demonstrate the basic functions and principles involved in the inspection, maintaining and replacement of common systems, parts and assemblies utilized in Suspension and Steering Systems.
Learning Goals	
Standard(s):	AUTO.08 Suspension and Steering: Identify and describe the function of the components that make up suspension and steering systems. AUTO.08.01 Describe the purpose, operation, and basic components of the steering system. AUTO.08.02 Describe the purpose, operation, and basic components of the suspension system. AUTO.08.03 Explain caster, camber, and toe-in wheel alignment angles. AUTO.08.04 Identify factors that cause abnormal tire wear.
Essential Question(s):	● What are the major components found in a basic suspension system and how do they work together to perform the suspension function? ● What are the major components found in a basic steering system and how do they work together to perform the steering function? ● What mechanical factors of the automotive system may affect the tire and wheel components and systems of a vehicle?
Enduring Understanding(s):	● Suspension systems add comfort and useability to automobiles. ● Steering systems are utilized to properly operate a vehicle, and proper maintenance and repair are essential to the safety and operation of a vehicle. ● Tires provide traction between the vehicle and the driving surface. The many problems associated with the tire / wheel system directly affect the operability and safety of the vehicle.
Learning Goal(s): *Students will know and*	**Content:** (Students will know…) ● the function of the components that make up suspension and steering systems.

will be able to use their learning to: (Content/ Skills)	● the operating principles of a steering system. ● the operation of a suspension system. ● how to identify basic problems with steering and suspension systems. **Skills:** (Students will be able to…) ● identify and describe the function of the components that make up suspension and steering systems. ● describe the function of the components that make up suspension and steering systems. ● describe the purpose, operation, and basic components of the suspension system. ● explain caster, camber, and toe-in wheel alignment angles. ● identify factors that cause abnormal tire wear.

Unit No. and Title:	Unit 7 – Vehicle Design Experience
Duration:	4 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	Students will design, build and evaluate a simple fixed path or variable path transportation system. Exploration of aerodynamics and vehicle design factors will be evaluated.
Learning Goals	
Standard(s):	ITEEA (International Technology and Engineering Educators Association) Standards for Technological and Engineering Literacy (STEL) STEL-2M. Differentiate between inputs, processes, outputs, and feedback in technological systems. STEL-3G. Explain how knowledge gained from other content areas affects the development of technological products and systems STEL-7N. Practice successful design skills. STEL-7O. Apply tools, techniques and materials in a safe manner as part of the design process. STEL-7Q. Apply the technology and engineering design process. STEL-7V. Improve essential skills necessary to successfully design. Transportation Technology TRAN.02 Define transportation technology systems. TRAN.02.04, TRAN.02.09
Essential Question(s):	● How does knowledge from other content areas (Math, Science, the Arts), help us solve problems? ● What type of front, top and rear end design will benefit the aerodynamics of the vehicle? ● How does vehicle weight factor into the vehicle efficiencies? ● How does friction impact vehicles speed and performance?
Enduring Understanding(s):	● Transportation systems use energy sources to work. ● Technology and engineering are fundamental human activities requiring a range of skills.

	● Technology and engineering are interdisciplinary, requiring the application of knowledge and skills related to science, math, and the arts.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● the benefits of aerodynamics related to vehicle design. ● the impact of vehicle weight on efficiency. ● how design factors influence vehicle performance. **Skills:** (Students will be able to…) ● design, build, a vehicle to meet design parameters. ● create a scale drawing of the vehicle to be built. ● design a vehicle considering aerodynamics and weight and friction factors. ● Test a vehicle design to evaluate design criteria.