Transportation Technology V: Applied Mechanics - Auto Technician Preparation

Course Information

Grade(s):	12th Grade
Discipline/Course:	Technology Education; Transportation Technology V
Course Title:	Transportation Technology V: Applied Mechanics - Auto Technician Preparation
Prerequisite(s):	Transportation Technology IV: Advanced Automotive Mechanics (Full Year) *or* Transportation Technology IV: Advanced Automotive Mechanics (Semester) with teacher's permission *or* Teacher Permission
Course Description: *Program of Studies*	This advanced level course offers Seniors an opportunity for leadership experience. Students build their automobile technician skills while working on actual vehicles in preparation for post-secondary educational/ training environments. Students will focus on completely overhauling, repairing, servicing and troubleshooting major automotive systems in a small-team environment. Emphasis is placed on researching system functions and issues, and problem-solving through a methodical practical hands-on process.
Course Essential Questions:	● How does one use leadership skills to accomplish organizational goals and objectives? ● How does one identify and demonstrate positive work behaviors and personal qualities needed to be employable? ● How does a knowledge of vehicle systems and how they operate enable an accurate diagnosis of a problem? ● How does an understanding of how major systems function enhance one's ability to analyze a system and come up with solutions? ● Why is it important to gather information to gain background knowledge related to a problem?
Course Enduring Understandings:	● To be successful in the automotive industry, it is important to have a strong understanding of automotive systems, and diagnostic and repair/maintenance technologies. ● Technology is constantly evolving, and those working in the automotive industry need to be able to adapt to new technologies and tools. ● Adaptability and problem-solving skills are essential for overcoming unexpected challenges.

Duration/ Credit:	1 year; 1 credit
Course Materials/ Resources:	Equipment and Consumables Textbook - Modern Automotive Technology - by J. E. Duffy
FPS Course Academic Expectation(s):	SE-Synthesizing and Evaluating CS-Collaborating Strategically
Year at a Glance (Units):	Unit 1- ASE Certification Research/Safety Review & Service Information and Work Orders Unit 2 - Interpersonal Skills-Team Leadership Unit 3 - Engine Diagnostics, Service and Repair and Removal/Installation Unit 4 - Front Drive Axle and Differential Diagnosis and Repair Unit 5 - Electrical System and Accessories Diagnosis and Repair Unit 6- Major Systems Project-Auto Capstone Experience

Unit Number and Title:	Unit 1 - ASE Certification Research/Safety Review & Service Information and Work Orders
Duration:	2 weeks
Resource(s):	Online Resources
Unit Overview:	This unit discusses the proper way to gain ASE certifications in order to become a qualified automotive technician. The unit also reviews the shop as a functioning business and discusses proper record keeping and work order write up found in the modern garage.
Learning Goals	
Standard(s):	AUTO.02 Customer Relations and Shop Procedures: Explain the basic processes and procedures for maintaining a clean, safe and customer-friendly shop. AUTO.04 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer.
Essential Question(s):	● Why are procedures and practices of various manufacturers regarding repair and maintenance schedules to be followed?
Enduring Understanding(s):	● Automotive technicians must always be learning to stay current in the field as technologies continue to change.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content** (Students will know …) ● the responsibilities and requirements of a qualified automotive technician. ● the proper route to become a qualified automotive technician. **Skills** (Students will be able to …) ● use computer based service information in solving part replacements and repairs. ● explain basic processes and procedures for maintaining a clean, safe and customer-friendly shop. ● interpret repair and work orders, differentiating between parts and labor cost.

	● differentiate between flat rate and hourly labor. ● explain what is included in an automobile maintenance schedule ● perform and document maintenance procedures in accordance with the recommendations of the manufacturer. ● follow procedures and practices of various manufacturers regarding repair and maintenance schedules. ● document maintenance procedures in accordance with applicable rules, laws, and regulations. ● 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. ● evaluate the advantages and disadvantages of existing, new, and emerging systems and the effects of those systems on the environment. ● complete a work order, including customer information, description of repair.

Unit Number and Title:	Unit 2 - Interpersonal Skills-Team Leadership
Duration:	2 weeks
Resource(s):	Online Resources
Unit Overview:	This unit covers the important interpersonal skills necessary to be able to lead a team and demonstrate skill-based proficiencies to others in the auto repair environment. Students will research skills and traits associated with successful interpersonal business practices with leading small teams.
Learning Goals	
Standard(s):	EKS.07 Employ leadership skills to accomplish organizational goals and objectives. EKS.08 Identify and demonstrate positive work behaviors and personal qualities needed to be employable.
Essential Question(s):	● How does one use leadership skills to accomplish organizational goals and objectives? ● How does one identify and demonstrate positive work behaviors and personal qualities needed to be employable?
Enduring Understanding(s):	● Issues related to self, team, community, diversity, environment, and global awareness when leading others need to be considered. ● Traits such as innovation, intuition, adaptation, life-long learning and coachable skills to develop leadership potential over time need to be exhibited.

Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● issues related to self, team, community, diversity, environment, and global awareness impact everyone. ● traits such as innovation, intuition, adaptation, life-long learning and coachability help to develop leadership potential. **Skills:** (Students will be able to…) ● analyze leadership in relation to trust, positive attitude, integrity, and willingness to accept key responsibilities in a work situation. ● describe qualities of leadership in a small team setting such as innovation, intuition, adaptation and coachability. ● consider issues related to self, team, community, diversity, environment, and global awareness when leading others. ● identify personal qualities such as self-discipline, self-worth, positive attitude, and integrity that demonstrate positive work behaviors needed to be employable.

Unit Number and Title:	Unit 3 - Engine Diagnostics, Service and Repair and Removal/Installation
Duration:	2 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	Students will be involved in the removal, rebuilding and installation of an engine. The students will gain an understanding of modern engine parts, assemblies and systems that must work at an individual level as well as in accordance with each other. This unit looks at the engine parts functioning as a system. Diagnostics are applied to analyze what repair and service may be performed.
Learning Goals	
Standard(s):	AUTO.03 Explain scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems. AUTO.05 Diagnosis and repair engines, including but not limited to two- and four-stroke and supporting subsystems
Essential Question(s):	● How does a knowledge of vehicle systems and how they operate enable an accurate diagnosis of a problem?
Enduring Understanding(s):	● The powerplant in a vehicle is made of many parts, assemblies and systems that combine to form the Engine. ● The basics of the gasoline engine are fundamental and apply to all modern gasoline engines. ● Proper tools and a basic knowledge of when and where to use them is an essential skill to properly service and repair an engine.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● symptoms of engine mechanical problems. ● procedures and safety precautions are required prior to removing an engine. ● procedures for installing an engine. **Skills:** (Students will be able to…)

	● diagnose and repair specific engines, as necessary. ● perform engine tests to isolate problems as necessary. ● remove, repair and replace an engine, if necessary. ● perform specific engine disassembly and reassembly procedures.

Unit Number and Title:	Unit 4 - Front Drive Axle and Differential Diagnosis and Repair
Duration:	5-6 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	The front drive axle and differential found in a vehicle must be maintained to proper specifications. This unit covers the basic parts found in the front drive assembly and differential and the proper maintenance of each.
Learning Goals	
Standard(s):	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):	● How do mechanical drive systems transfer power utilizing multiple links to transfer force?
Enduring Understanding(s):	● The proper maintenance of the drive system is imperative for the effective and efficient transfer of power from the engine to the wheel.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know …) ● symptoms of front drive axle problems. ● what is involved with repairing or replacing a front cv axle. ● how to check and replace gear oil in a transaxle or differential. **Skills:** (Students will be able to…) ● diagnose common transaxle and drive axle problems. ● diagnose common differential problems. ● remove and replace Front CV drive axles, as necessary. ● check, change and repair gaskets on transaxles and differentials, as necessary

Unit Number and Title:	Unit 5 - Electrical System and Accessories Diagnosis and Repair
Duration:	5 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	Electrical Systems and Accessories found within modern vehicles vary by make and model. This unit covers the basics found in all Electrical Systems and Accessories, and students learn to diagnose and service the basic parts of these systems.
Learning Goals	
Standard(s):	AUTO.06 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.
Essential Question(s):	● Why is it important to be able to apply Ohm's Law in the diagnosis and repair of electrical systems?
Enduring Understanding(s):	● The basic functions of the electrical systems vary in application between vehicles, but all modern vehicles rely on the proper implementation and maintenance of each system to function properly.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● tools and skills associated with diagnosing a vehicle electrical problem. ● electrical components, wiring, and fuses need to be checked in diagnosing an electrical problem. ● connectors required when splicing wires and how to properly splice or replace wiring. ● how to properly apply Ohm's law to diagnostics and repair. **Skills:** (Students will be able to…) ● diagnose problems with light, instrumentation and accessories. ● read wiring diagrams to install and repair electrical components. ● troubleshoot and perform electrical repairs on vehicles with problems, as necessary.

	● test, remove and replace electrical components, as necessary. ● use solder and solderless connectors to perform wire splicing repairs, as necessary. ● use a voltmeter to diagnose vehicle electrical problems.

Unit Number and Title:	Unit 6 - Major Systems Project-Auto Capstone Experience
Duration:	17-20 weeks
Resource(s):	Equipment & Online Research
Unit Overview:	Students will focus on rebuilding/constructing a fully functioning major system of a real vehicle through system analysis, in-depth research and developing solutions. Teams research and analyze operational principles of major automotive systems. This is a comprehensive, student- directed experience.
Learning Goals	
Standard(s):	AUTO.03 Explain scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems. AUTO.04 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer. AUTO.05 Diagnosis and repair engines, including but not limited to two- and four-stroke and supporting subsystems AUTO.06 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards. AUTO.07 Engine Performance: Describe the components and functions of the various systems that are related to engine performance 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):	● How does an understanding of how major systems function enhance one's ability to analyze a system and come up with solutions? ● Why is it important to gather information to gain background knowledge related to a problem?
Enduring	● Basic system functions of vehicles vary, but all vehicles rely on proper system implementation

Understanding(s):	and maintenance to function properly. ● Problem-solving and diagnosis for automotive repair can be a rewarding profession to explore. ● Mechanical skills and technological repair skills are based on math and science concepts. ● There are essential skills needed to select and use appropriate materials, tools and machines as an automotive technician.
Learning Goal(s): *Students will know and will be able to use their learning to:* (Content/ Skills)	**Content:** (Students will know…) ● logical problem solving methods are utilized to efficiently and correctly use resources, tools and machines to diagnose and repair automotive systems. ● the interrelationship between major systems of an automobile. ● basic functions of the electrical systems. ● various technologies in mechanical, electrical and fuel systems play an important role in the function, efficiency, and emission control of automotive systems. **Skills:** (Students will be able to…) ● perform and document maintenance procedures in accordance with the recommendations of the manufacturer. The components and functions of various systems that are related to engine performance. ● follow the procedures and practices of various manufacturers regarding repair and maintenance schedules. ● demonstrate how to properly document maintenance procedures in accordance with applicable rules, laws, and regulations ● 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. ● evaluate the advantages and disadvantages of existing, new, and emerging systems and the effects of those systems on the environment. ● diagnosis and repair engines, including but not limited to two- and four-stroke and supporting subsystems ● perform general engine maintenance, diagnosis, service, and repair in accordance with portable national industry standards.

	● maintain, diagnose, service, and repair lubrication and cooling systems. ● maintain, diagnose, and repair computerized engine control systems and other engine related systems. ● demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards. ● maintain, diagnose, and repair electrical systems. ● Ohm's Law in the diagnosis and repair of electrical systems.