



Transportation Technology IV: Advanced Automotive Mechanics

Course Information

Grade(s):	11-12
Discipline/Course:	Technology Education
Course Title:	Advanced Automotive Mechanics IV - Advanced Automotive Mechanics
Prerequisite(s):	Transportation Technology III: Intermediate Auto Maintenance and Servicing (Full Year) <i>or</i> Transportation Technology III: Intermediate Auto Maintenance (Semester) with teacher's permission <i>or</i> teacher's permission
Course Description: <i>Program of Studies</i>	Advanced Automotive Mechanics continues and deepens students' understanding of automobile servicing and maintenance/repair. Work is performed on operational vehicles. Complete overhaul, repair, servicing and troubleshooting of all automotive systems are undertaken. Emphasis is placed on practical hands-on learning.
Course Essential Questions:	<ul style="list-style-type: none"> ● What knowledge, skills, and safety practices are required to diagnose and repair various automotive systems? ● Why is it important to follow procedures and practices of various manufacturers regarding repair and maintenance schedules? ● How does innovation in engineering impact the real world application of new and emerging technologies? ● How have emissions control systems impacted the environment?
Course Enduring Understandings:	<ul style="list-style-type: none"> ● There are various components and functions of systems related to engine performance. ● Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. ● Automotive technicians must stay current in the field as technologies continue to change.
Duration; Credit:	1 year; 1 credit
Course	Equipment and Consumables

Materials/Resources:	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 - Automotive Careers, ASE Certification/Safety Review & Service Information and Work Orders (2 weeks) Unit 2 - Computer System Service and Diagnosis (3-4 weeks) Unit 3 - Fuel Injection Diagnosis and Servicing (3-4 weeks) Unit 4 - Starting System, Charging System and Ignition System Testing and Repair (4-5 weeks) Unit 5 - Hybrid System Operation and Service (4-5 weeks) Unit 6 - Cooling System Testing, Maintenance and Repair (4-5 weeks) Unit 7 - Lubrication System Testing, Service and Repair (4-5 week) Unit 8 - Emission Control System Testing, service and Repair (5 weeks) Unit 9 - Brake System Diagnosis and Repair & Anti-Lock Brake and Traction Control Diagnosis (5 weeks)

Unit Number and Title:	Unit 1 - Automotive Careers, ASE Certification/Safety Review & Service Information and Work Orders
Duration:	2 Weeks
Resource(s):	N/A
Unit Overview:	This unit discusses careers found in the automotive industry and the proper way to gain ASE certifications in order to become a qualified automotive technician. The unit also looks at 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):	Automotive Technology 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):	<ul style="list-style-type: none"> • Why is it important to follow procedures and practices of various manufacturers regarding repair and maintenance schedules?
Enduring Understanding(s):	<ul style="list-style-type: none"> • There are various components and functions of systems related to engine performance. • Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. • Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	Content (Students will know ...) <ul style="list-style-type: none"> • the responsibilities and requirements of a qualified automotive technician. • the proper route to become a qualified automotive technician. Skills (Students will be able to ...) <ul style="list-style-type: none"> • use computer based service information to solve part replacements and repairs.

Unit Number and Title:	Unit 2 - Computer System Service and Diagnosis
Duration:	3-4 Weeks
Resource(s):	Diagnostic Tools
Unit Overview:	This unit covers the proper tools and techniques used to diagnose common problems found with the computer systems utilized in the modern vehicle. The unit also discusses the role computer and emission control systems play in vehicle performance and engine tuning.
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. AUTO.05 Diagnosis and repair engines, including but not limited to two- and four-stroke and supporting subsystems AUTO.07 Engine Performance: Describe the components and functions of the various systems that are related to engine performance.
Essential Question(s):	<ul style="list-style-type: none"> • What knowledge, skills, and safety practices are required to diagnose and repair various automotive systems?
Enduring Understanding(s):	<ul style="list-style-type: none"> • There are various components and functions of systems related to engine performance. • Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. • Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning</i>	Content (Students will know ...) <ul style="list-style-type: none"> • what to look for during a preliminary inspection of a computer system. • computers help in the diagnosis of an engine performance problem.

<i>to:</i> (Content/ Skills)	Skills (Students will be able to ...) <ul style="list-style-type: none">● test and diagnose automotive computer problems.● replace sensors and actuators.
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Unit Number and Title:	Unit 3 - Fuel Injection Diagnosis and Servicing
Duration:	3-4 Weeks
Resource(s):	Diagnostic sensors and computer
Unit Overview:	Students will learn how electronic fuel management systems impact vehicle reliability and the proper diagnosis and servicing of the injection system.
Learning Goals	
Standard(s):	AUTO.03.09 Explain scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems. AUTO.07.02 Engine Performance: Describe the components and functions of the various systems that are related to engine performance.
Essential Question(s):	<ul style="list-style-type: none"> • How do fuel injection systems impact vehicle reliability and diagnosis? • What are the different components of a fuel injection management system? • What are the most common causes of fuel injection management system failure?
Enduring Understanding(s):	<ul style="list-style-type: none"> • There are various components and functions of systems related to engine performance. • Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. • Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	<p>Content (Students will know ...)</p> <ul style="list-style-type: none"> • where to find the fuel pressure regulator, multi-port injection system and the throttle body located on the vehicle. • what adjustments can be made to the fuel injection system. <p>Skills (Students will be able to ...)</p> <ul style="list-style-type: none"> • test, remove, and replace fuel system component parts.

- diagnose fuel system problems using diagnostic equipment.
- use service manuals when making basic adjustments on gasoline injection systems.

Unit Number and Title:	Unit 4 - Starting System, Charging System and Ignition System Testing and Repair
Duration:	4-5 Weeks
Resource(s):	Diagnostic tools
Unit Overview:	Students will troubleshoot and diagnose the Starting, Charging and Ignition systems in a vehicle and will gain a general knowledge of each system. How does an increased understanding of electricity and electronics impact the ability of an auto technician to perform diagnosis and repair? Diagnostic tools are updated and utilized on a regular basis to troubleshoot and diagnose each system.
Learning Goals	
Standard(s):	AUTO.06 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards. AUTO.06.01, AUTO.06.02, AUTO.06.03, AUTO.06.04 AUTO.07.01 Engine Performance: Describe the components and functions of the various systems that are related to engine performance.
Essential Question(s):	<ul style="list-style-type: none"> • What knowledge, skills, and safety practices are required to diagnose and repair various automotive systems? • Why is it important to follow procedures and practices of various manufacturers regarding repair and maintenance schedules? • How does innovation in engineering impact the real world application of new and emerging technologies?
Enduring Understanding(s):	<ul style="list-style-type: none"> • There are various components and functions of systems related to engine performance. • Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. • Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning</i>	Content (Students will know ...) <ul style="list-style-type: none"> • common causes of a no-crank problem. • problems associated with a charging system.

<i>to:</i> (Content/ Skills)	<ul style="list-style-type: none"> ● how to correct an ignition system problem. <p>Skills (Students will be able to ...)</p> <ul style="list-style-type: none"> ● maintain, diagnose, and repair electrical systems. ● describe the components and functions of the various electrical and electronic systems that are related to engine performance. ● remove and replace a starter motor if necessary. ● repair common starting problems. remove, test, repair, and replace an alternator, if necessary. ● repair charging system problems. ● test, remove and replace ignition system parts, as required. ● repair typical ignition system problems.
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Unit Number and Title:	Unit 5 - Hybrid System Operation and Service
Duration:	4-5 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	The operation and servicing of hybrid systems in the modern vehicle.
Learning Goals	
Standard(s):	AUTO.04.04 Perform and document maintenance procedures in accordance with the recommendations of the manufacturer. TRAN.02.08 Define transportation technology systems.
Essential Question(s):	<ul style="list-style-type: none"> • How does innovation in engineering impact the real world application of new and emerging technologies?
Enduring Understanding(s):	<ul style="list-style-type: none"> • Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	<p>Content (Students will know ...)</p> <ul style="list-style-type: none"> • the advantages of a hybrid vehicle. • safety precautions that must be followed when working on a hybrid vehicle. • types of problems that can occur with a Hybrid drive system. <p>Skills (Students will be able to ...)</p> <ul style="list-style-type: none"> • explain advantages and disadvantages of existing, new, and emerging systems in automobiles. • explain the operational principles of hybrid drive systems and how they are impacting the environment

Unit Number and Title:	Unit 6 - Cooling System Testing, Maintenance and Repair
Duration:	4-5 Weeks
Resource(s):	Equipment and consumables
Unit Overview:	Coolant testing and coolant systems flushing is an essential part of vehicle maintenance. Chemicals, automotive systems and automotive assemblies interact and rely on each other, so it is important to understand the scientific principles related to diagnosis of cooling systems problems. The chemical, mechanical and physical function of various engines and systems are discussed, diagnosed and fixed.
Learning Goals	
Standard(s):	AUTO.03.06 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):	<ul style="list-style-type: none"> • What knowledge, skills, and safety practices are required to diagnose and repair various automotive systems? • Why is it important to follow procedures and practices of various manufacturers regarding repair and maintenance schedules? • How does innovation in engineering impact the real world application of new and emerging technologies?
Enduring Understanding(s):	<ul style="list-style-type: none"> • There are various components and functions of systems related to engine performance. • Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. • Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning</i>	Content: (Students will know...) <ul style="list-style-type: none"> • basic scientific principles as they apply to the standard vehicle and the systems found within.

<p><i>to:</i> (Content/ Skills)</p>	<p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none">● remove, repair and replace cooling system components, as necessary.● test cooling system for coolant levels and concentrations.● check and replace all parts of the cooling system.● describe the most common causes of system leakage and overheating.
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Unit Number and Title:	Unit 7 - Lubrication System Testing, Service and Repair
Duration:	4-5 Weeks
Resource(s):	Equipment and consumables.
Unit Overview:	Lubrication systems are dynamic. The various lubrication systems found in a vehicle must be maintained on a regular basis, as lubricants break down. Students will learn each lubrication system and how to properly diagnose, service and maintain all lubrication systems.
Learning Goals	
Standard(s):	AUTO.03.06 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):	<ul style="list-style-type: none"> ● What knowledge, skills, and safety practices are required to diagnose and repair various automotive systems? ● Why is it important to follow procedures and practices of various manufacturers regarding repair and maintenance schedules? ● How does innovation in engineering impact the real world application of new and emerging technologies?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● There are various components and functions of systems related to engine performance. ● Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. ● Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning to:</i>	Content: (Students will know...) <ul style="list-style-type: none"> ● the process for diagnosing and repairing cooling systems. ● scientific principles in relation to chemical, mechanical, and physical functions for cooling systems.

(Content/ Skills)	<p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none">● describe lubrication system problems.● diagnose lubrication system problems.● change oil and filter systems.● lubricate and check necessary parts.● service an engine lubrication system.
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Unit Number and Title:	Unit 8 - Emission Control System Testing, Service and Repair
Duration:	5 Weeks
Resource(s):	Equipment and consumables
Unit Overview:	Emission systems must be tested and maintained to function properly. Students will learn the proper methods to diagnose, service and repair the emission control system.
Learning Goals	
Standard(s):	AUTO.05.03 Diagnosis and repair engines, including but not limited to two- and four-stroke and supporting subsystems. AUTO.07.03 Engine Performance: Describe the components and functions of the various systems that are related to engine performance.
Essential Question(s):	<ul style="list-style-type: none"> ● How have emissions control systems impacted the environment?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● There are various components and functions of systems related to engine performance. ● Problems commonly found in non-commercial vehicles can be dealt with through assessing, diagnosing and addressing the issues. ● Automotive technicians must stay current in the field as technologies continue to change.
Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	<p>Content: (Students will know...)</p> <ul style="list-style-type: none"> ● the main causes of emission control problems. ● emission control problems affect an engine's performance. ● a sensor is different from an actuator. <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> ● inspect and troubleshoot emission control systems. ● test, remove or replace emission control components, as necessary. ● scan a vehicle exhaust to diagnose emission control problems.

Unit Number and Title:	Unit 9 - Brake System Diagnosis and Repair & Anti-Lock Brake and Traction Control Diagnosis
Duration:	5 weeks
Resource(s):	Equipment and consumables
Unit Overview:	Brake and Traction Control systems vary across vehicles, yet are essential to the proper handling of a vehicle. This unit covers the basics found in all Brake and Traction Control systems, and students learn to diagnose and service the basic parts of these systems, including the role of fluid dynamics.
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):	<ul style="list-style-type: none"> ● What knowledge, skills, and safety practices are required to diagnose and repair various automotive systems? ● Why is it important to follow procedures and practices of various manufacturers regarding repair and maintenance schedules? ● How does innovation in engineering impact the real world application of new and emerging technologies?
Enduring Understanding(s):	<ul style="list-style-type: none"> ● Brakes must be properly maintained to be effective. ● Traction control and stability are essential to the proper handling of a vehicle.
Learning Goal(s): <i>Students will know and will be able to use their learning to:</i> (Content/ Skills)	Content: (Students will know...) <ul style="list-style-type: none"> ● tools and techniques used to assess various problems found in brake systems. ● tools and techniques to service / replace brake systems. ● tools and techniques to service / replace traction control systems. ● how fluid dynamics apply to the modern brake system.

Skills: (Students will be able to...)

- diagnose common brake problems.
- bleed a hydraulic brake system, as necessary.
- diagnose and repair a vehicle's disc or drum brake system, as necessary.
- inspect and repair anti-lock brakes, traction control, and stability control systems, as necessary.