



Transportation Technology I - Introduction to Transportation

Course Information

Grade(s):	9-12
Discipline/Course:	Technology Education
Course Title:	Transportation Technology I: Introduction to Transportation
Prerequisite(s):	N/A
Course Description: <i>Program of Studies</i>	This beginning level course offers a general introduction into the processes and repair of the internal combustion engine. Students will be engaged in activities both collaboratively and individually exploring the repair and maintenance of small gas engines. Students will be immersed in lab activities applying engine operational theory, diagnosis and repair while applying standards of shop safety and utilizing tools of the mechanic. Other elements of the course will introduce students to alternate energy resources and vehicles, as well as typical and unique transportation systems. Hands-on practical experiences will be emphasized.
Course Essential Questions:	<ul style="list-style-type: none"> ● How can transportation technology help me develop my problem-solving and critical thinking skills? ● How do mechanical skills and technological problem solving methods interact to diagnose and repair internal combustion engines? ● How do various technologies in mechanical, electrical and fuel play a role in the function, efficiency, and emission control of an internal combustion engine? ● How do alternate sources of energy provide an alternative to present and future transportation systems? ● How do I troubleshoot problems that arise during mechanical repair? ● How do I evaluate success while working on mechanical projects?
Course Enduring Understandings:	<ul style="list-style-type: none"> ● Transportation systems utilize natural resources which benefit society ● Mechanical skills and technological problem solving can be rewarding to diagnose and repair transportation systems and related technologies ● Various technologies in mechanical, electrical and fuel systems play an important role in the function, efficiency, and emission control of an internal combustion engine ● Sources of energy are being utilized in transportation 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 transportation systems

	<ul style="list-style-type: none"> • Math and science concepts are applied in transportation systems to solve practical mechanical problems.
Duration: Credit:	½ Year; .5 credit(s)
Course Materials/Resources:	Equipment and Consumables Textbook - Small Gas Engines - A. C. Roth, B. J. Fisher, W. S. Gauthier
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 Shop, Tools and Measuring Instruments Alternate Energy, the Environment and the Future of Transportation (2 weeks) Unit 2 - Engine Construction and Principles of Operation, Two and Four Cycle Engines (2 weeks) Unit 3 - Fuel Systems, Ignition Systems, Engine Cooling and Lubrication (2 weeks) Unit 4 - Practical Engine Experience (7 weeks) Unit 5 - Torque and Gear Design Experience (3 weeks) Unit 6 - Aerodynamics and Vehicle Design Experience (2 weeks)

Unit No. and Title:	Unit 1– Introduction and Safety in the Shop, Tools and Measuring Instruments, Alternate Energy, the Environment and the Future of Transportation
Duration:	2 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	In this unit students will learn how to actively use safety while working in a mechanics shop/lab and become more aware of general shop safety practices. They will also be involved in gaining understanding of tools of the mechanic and measuring instruments used in engine rebuilding. Different forms of energy sources, their uses and how they affect the environment will be explored and discussed relative to the future of internal engines and transportation.
Learning Goals	
Standard(s):	<p>Automotive 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</p> <p>Transportation Technology TRAN.01 Identify historical, social, economic, environmental, and government regulations impact transportation technology. TRAN.01.01, TRAN.01.02, TRAN.01.03</p>
Essential Question(s):	<ul style="list-style-type: none"> ● 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):	<ul style="list-style-type: none"> ● 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): <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"> ● safety rules and procedures for the transportation/auto shop. ● application of selected tools for working on engines. ● energy sources used in transportation systems and their impact on the work. <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> ● demonstrate proper tool use. ● demonstrate proper safety skills. ● list the dangers associated with working in a small engine shop. ● use common hand tools properly. ● demonstrate several of the common measuring techniques.

Unit Number and Title:	Unit 2– Engine Construction and Principles of Operation, Two and Four Cycle Engines
Duration:	2 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	In this unit students will explain simple engine operation, develop an understanding of four-stroke cycle engines and how they function and develop an understanding of two-stroke cycle engines and how they function.
Learning Goals	
Standard(s):	Automotive Technology AUTO.03 Explain scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems. AUTO.03.01, AUTO.03.02, AUTO.03.03
Essential Question(s):	<ul style="list-style-type: none"> • What are the four strokes of the four-cycle engine and how does each stroke function? • What systems are used in lubricating four-cycle engines? • What are the technical differences between a four-cycle and two-cycle engine?
Enduring Understanding(s):	<ul style="list-style-type: none"> • 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): <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"> • Safety rules and procedures for the transportation/auto shop. • Application of selected tools for working on engines. • Energy sources used in transportation systems and their impact on the work. <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> • identify basic components of a small engine. • describe the function of each part of a small engine.

- describe four-stroke cycle engine operation and explain the function of each stroke.
- describe two-stroke cycle engine operation and explain the function of each stroke.
- list the advantages and disadvantages of two-cycle and four-cycle engines.

Unit No. and Title:	Unit 3– - Fuel Systems, Ignition Systems, Engine Cooling and Lubrication
Duration:	2 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	In this unit students will describe the function of basic ignition systems. Explain the principles of air cooling and water cooling systems. Define friction and explain how it affects internal engine components. Describe the operation of a typical fuel system used on small gas engines.
Learning Goals	
Standard(s):	Automotive Technology AUTO.03 Explain scientific principles in relation to chemical, mechanical, and physical functions for various engine and vehicle systems. AUTO.03.06, AUTO.03.07 AUTO.07 Engine Performance: Describe the components and functions of the various systems that are related to engine performance. AUTO.07.01, AUTO.07.02
Essential Question(s):	<ul style="list-style-type: none"> ● 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):	<ul style="list-style-type: none"> ● 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): <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 function of basic ignition systems. ● the principles of air cooling and water cooling systems. ● how to explain friction and how it affects internal engine components. ● the operation of a typical fuel system used on small gas engines.

- the different types of fuel systems.
- how fuel and air mix together in a carburetor.
- the main electrical components in a small gas engine.
- how a magneto system creates electricity.
- ways of preventing overheating of air-cooled engines.
- the jobs performed by engine lubricant.

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

- demonstrate how cooling and lubrication affect engine operation.
- troubleshoot the function of the ignition system.
- describe the functions of lubricating oil.
- explain the importance of proper fuel-oil mixture and create a proper fuel mixture for a two-cycle engine.
- identify the components of a typical magneto system and describe the function of each part.

Unit No. and Title:	Unit 4–Practical Engine Experience
Duration:	7 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	In this unit students will perform general engine maintenance, diagnosis, service, and repair and develop hands-on experience with the disassembly and reassembly of a small gas engine using proper tools and following proper safety procedures. They will also learn how to actively follow shop safety procedures while working in a mechanics shop/lab and become more aware of general shop safety practices. Students will gain a deeper understanding of a mechanic’s tools and of measuring instruments used in engine rebuilding.
Learning Goals	
Standard(s):	Automotive Technology AUTO.05 Diagnosis and repair engines, including but not limited to two- and four-stroke and supporting subsystems AUTO.05.01 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.01.05
Essential Question(s):	<ul style="list-style-type: none"> • 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):	<ul style="list-style-type: none"> • 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)

- safety rules and procedures for the transportation/auto shop.
- application of selected tools for rebuilding engines.
- engine maintenance, diagnosis, service, and repair.
- the procedures for disassembly and reassembly of a small gas engine using proper tools and following proper safety procedures.

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

- demonstrate proper tool use.
- demonstrate proper safety skills.
- disassemble an engine.
- disassemble engine components and organize parts.
- precisely measure parts for wear and acceptable tolerances.
- describe steps involved with machining and reassembling an engine.
- reassemble an engine and test its functions.

Unit No. and Title:	Unit 5– Torque and Gear Design Experience
Duration:	3 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	In this unit students will learn how to actively use safety while working in a mechanics shop/lab and become more aware of general shop safety practices. They will also be involved in gaining understanding of tools of the mechanic and measuring instruments used in engine rebuilding. Different forms of energy sources, their uses and how they affect the environment will be explored and discussed relative to the future of internal engines and transportation.
Learning Goals	
Standard(s):	Transportation Technology TRAN.02 Define transportation technology systems. TRAN.02.01, TRAN.02.02, TRAN.02.03, TRAN.02.05
Essential Question(s):	<ul style="list-style-type: none"> ● 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):	<ul style="list-style-type: none"> ● 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): <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"> ● methods to solve a simple transportation problem by designing, building, and testing a vehicle that will carry a payload a specified distance. ● how to calculate gear ratios to meet a required torque. ● how gear ratios relate to mechanical advantage and apply different gear ratios for a given task <p>Skills: (Students will be able to...)</p>

- design and test a vehicle using gearing for power transmission
- demonstrate and apply how propulsion, control, guidance, payload, and support systems for land systems are used in transportation technologies
- identify gear ratios for power vs. speed.
- develop basic electricity concepts and soldering techniques.
- assemble a simple electrical circuit.
- list examples of torque.
- design a vehicle based upon either power or speed.
- troubleshoot problems and solutions on the prototype vehicle.

Unit No. and Title:	Unit 6– Aerodynamics and Vehicle Design Experience
Duration:	2 weeks
Resource(s):	Equipment & Consumables
Unit Overview:	In this unit 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):	<p>ITEEA (International Technology and Engineering Educators Association) Standards for Technological and Engineering Literacy (STEL)</p> <p>STEL-2M. Differentiate between inputs, processes, outputs, and feedback in technological systems.</p> <p>STEL-3G. Explain how knowledge gained from other content areas affects the development of technological products and systems</p> <p>STEL-7N. Practice successful design skills.</p> <p>STEL-7O. Apply tools, techniques and materials in a safe manner as part of the design process.</p> <p>STEL-7Q. Apply the technology and engineering design process.</p> <p>STEL-7V. Improve essential skills necessary to successfully design.</p> <p>Transportation Technology</p> <p>TRAN.02 Define transportation technology systems.</p> <p>TRAN.02.04, TRAN.02.09</p>
Essential Question(s):	<ul style="list-style-type: none"> ● 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):	<ul style="list-style-type: none"> ● 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): <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 benefits of aerodynamics related to vehicle design. ● the impact of vehicle weight on efficiency. ● how design factors influence vehicle performance. <p>Skills: (Students will be able to...)</p> <ul style="list-style-type: none"> ● 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.