

# TRANSPORTATION TECHNOLOGY 10

## Description

In Transportation Technology 10, students will gain knowledge of safety, use of tools, and the repair and maintenance of small gas engines. Other elements of the course will include the study of alternate energy resources and vehicles, as well as typical and unique transportation systems. Hands-on practical experiences will be emphasized.

## Course Overview

### Course Objectives

Students should be able to:

- use safely and efficiently, the resources, processes, concepts, and tools of transportation technology.
- understand and apply practical technological methods with a hands-on approach to problem-solving on small gas engines.
- develop the ability to analyze, troubleshoot and resolve problems through practical experiences with regard to small engines and vehicle design.
- combine useful math and science concepts to solve practical mechanical problems.
- develop a vocabulary for use in the automotive and transportation field.

### Essential Questions

- What knowledge, skills, tools and safety practices are required to apply practical technological methods to various small gas engines?
- How do mechanical, electrical and fuel technologies play a role in the function, efficiency, and pollution control of an internal combustion engine?
- How do alternate sources of energy provide an alternative to present and future transportation systems?

### Assessments

- Quizzes and Tests on: Safety, Tools, Measuring, Part Identification and Function.
- Engine Lab: Disassembly and Reassembly of a Vertical Shaft and a Horizontal Shaft Small Gas Engine
- Kit Project: Gearbox car (Gear ratios and torque)
- Kit Project: CO2 Car (Friction, Speed, Aerodynamics)

### Content Outline

- I. [Unit 1](#) - Introduction and Safety in the Shop, Tools and Measuring Instruments Alternate Energy, the Environment and the Future of Transportation
- II. [Unit 2](#) - Engine Construction and Principles of Operation, Two and Four Cycle Engines
- III. [Unit 3](#) - Fuel Systems, Ignition Systems, Engine Cooling and Lubrication
- IV. [Unit 4](#) - Practical Engine Experience
- V. [Unit 5](#) - Torque and Gear Design Experience
- VI. [Unit 6](#) - Aerodynamics and Vehicle Design Experience

### Standards

Connecticut State Technology Education standards have been met in the following area:

- *Automotive Technology*
- *Transportation Technology*
- *Pre-Engineering*

## Pacing Guide

1st Marking Period

2nd Marking Period

Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
<a href="#"><u>Introduction and Safety in the Shop,</u></a> <a href="#"><u>Tools and Measuring Instruments,</u></a> <a href="#"><u>Alternate Energy, the Environment and the Future of Transportation</u></a>	<a href="#"><u>Engine Construction and Principles of Operation, Two and Four Cycle Engines</u></a>	<a href="#"><u>Fuel Systems, Ignition Systems, Engine Cooling and Lubrication</u></a>	<a href="#"><u>Practical Engine Experience</u></a>	<a href="#"><u>Torque and Gear Design Experience</u></a>	<a href="#"><u>Aerodynamics and Vehicle Design Experience</u></a>
2 weeks	2 weeks	2 weeks	7 weeks	3 weeks	2 weeks

**Unit 1– Introduction and Safety in the Shop, Tools and Measuring Instruments, Alternate Energy, the Environment and the Future of Transportation, 2 weeks [top](#)**

**Standards**

*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

*Transportation Technology*

**TRAN.01 Identify historical, social, economic, environmental, and government regulations impact transportation technology.**

TRAN.01.01, TRAN.01.02, TRAN.01.03

**Unit Objectives**

Students will be able to:

- describe methods of minimizing the risks involved in working with small engines.
- describe different forms of alternate energy, their uses and how they affect the environment.
- describe the future of internal engines and transportation.

**Essential Questions**

- Why is it important to be an advocate for safe work practices?
- Why be concerned with alternate energy sources and the environment?

**Focus Questions**

- What tools and procedures are potentially dangerous?
- Which types of specialized tools are required to disassemble or reassemble a small gas engine?
- What type of tool would be required for removing hex bolts on small gas engines?
- What types of alternate energy vehicles are presently being driven on the highways?
- How does air pollution from engines exhaust effect the environment?

**Assessments**

- Tests and Quizzes on Unit subject matter

**Skill Objectives**

Students will:

- 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 2 – Engine Construction and Principles of Operation, Two and Four Cycle Engines, 2 weeks [top](#)**

**Standards**

*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

**Unit Objectives**

Students will be able to:

- explain simple engine operation.
- develop an understanding of four-stroke cycle engines and how they function.
- develop an understanding of two-stroke cycle engines and how they function.

**Essential Question**

- What is the impact of the internal combustion engine on our society?

**Focus Questions**

- What are the four strokes of the four-cycle engine in proper order?
- What are the two methods for lubricating four-cycle engine?
- What are the basic differences between a four-cycle and two-cycle engine?

**Assessments**

- Quizzes
- Workbook Assignments

**Skill Objectives**

Students will:

- identify the basic components of a small engine and describe the function of each part.
- 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 3- Fuel Systems, Ignition Systems, Engine Cooling and Lubrication, 2 weeks [top](#)**

**Standards**

*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

**Unit Objectives**

Students will be able to:

- describe the function 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.

**Essential Question**

- Why is it important to understand relationships between systems which function together?

**Focus Questions**

- What are the different types of fuel systems?
- How does fuel and air mix together in a carburetor?
- What are the main electrical components in a small gas engine?
- How does a magneto system create electricity?
- What are ways of preventing overheating of air-cooled engines?
- What are the jobs performed by engine lubricant?

**Assessments**

- Quizzes
- Workbook Assignments

**Skill Objectives**

Students will:

- demonstrate how cooling and lubrication effect engine operation.
- list the primary purposes of the ignition system.
- list the functions of lubricating oil.
- explain the importance of proper fuel-oil mixture in a two-cycle engine.
- identify the components of a typical magneto system and describe the function of each part.

**Unit 4 – Practical Engine Experience, 7 weeks [top](#)**

**Standards**

*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

**Unit Objectives**

Students will be able to:

- perform general engine maintenance, diagnosis, service, and repair.
- develop hands-on experience with the disassembly and reassembly of a small gas engine using proper tools and following proper safety procedures.

**Essential Question**

- What has been the impact of tools and machines on mankind?

**Focus Questions**

- How should you organize parts to help in the reassembly of the engine
- How critical are the torque requirements for reassembly?
- Why can the order of reassembly become critical?
- What happens when parts becomes out of tolerance?

**Assessments**

- Disassembly and Reassembly of Vertical Shaft Engine
- Disassembly and Reassembly of Horizontal Shaft Engine

**Skill Objectives**

Students will:

- list the steps involved for disassembling an engine.
- disassemble and organize parts.
- measure parts for wear and tolerances.
- list steps involved with machining and reassembling an engine.
- reassemble engine and test functions.

**Unit 5 – Torque and Gear Design Experience, 3 weeks [top](#)**

**Standards**

*Transportation Technology*

**TRAN.02 Define transportation technology systems.**

TRAN.02.01, TRAN.02.02, TRAN.02.03, TRAN.02.05

**Unit Objectives**

Students will be able to:

- solve a simple transportation problem by designing, building, and testing a vehicle that will carry a payload a specified distance.
- design and test a vehicle uses gearing for power transmission or speed transmission.
- demonstrate and apply how propulsion, control, guidance, payload, and support systems for land systems are used in transportation technologies.

**Essential Question**

- Why is knowledge of how machines work essential in mechanics?

**Focus Questions**

- What gear ratios will develop the required torque?
- How can the output of the electric motor be changed to alter the torque to the vehicle output axle?
- How do gear ratios relate to mechanical advantage?

**Assessments**

- Building of Gearbox Electric car
- Performance of Gearbox Electric car
- Design drawing of vehicle
- Testing of vehicle

**Skill Objectives**

Students will:

- 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 6 – Aerodynamics and Vehicle Design Experience, 2 weeks [top](#)**

**Standards**

*Transportation Technology*

**TRAN.02 Define transportation technology systems.**

TRAN.02.04, TRAN.02.09

**Unit Objectives**

Students will be able to:

- design, build and evaluate a simple fixed path or variable path transportation system.
- describe how a CO2 powered race vehicle operates considering aerodynamics and weight factors.

**Essential Question**

- How do design factors impact the use and performance of a vehicle?

**Focus Questions**

- What type of front, top and rear end design will benefit the aerodynamics of the vehicle?
- How does vehicle weight factor into the vehicles speed?
- How does friction factor into the vehicles speed and performance?

**Assessments**

- Design drawing of vehicle to be built
- Building of CO2 race car
- Performance of CO2 race car in course

**Skill Objectives**

Students will:

- design, build, and race CO2 vehicle considering safety, proper tool use.
- design a race car considering aerodynamics and weight factors.
- build the vehicle according to all tolerances and acceptable dimensions.