TRANSPORTATION TECHNOLOGY 20

Description

In Transportation Technology 20, students will continue their study of transportation systems, with continued emphasis on safety and use of tools. Student knowledge of small gas engines will expand with the addition of experiences on a variety of engine types. Additional elements of the course will include the study of flight. Hands-on projects facilitating the study of aero science will be explored.

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 a variety small gas engines, one's with including electronic ignition and rocker arms.
- develop the ability to analyze, troubleshoot and resolve problems through practical experiences with regard to larger small engines and aircraft/airframe design.
- combine useful math and science concepts to solve practical mechanical problems.
- develop a vocabulary for use in the automotive and aerospace field.

Essential Questions

- What knowledge, skills, tools and safety practices are required to apply practical technological methods to a modern small gas engine?
- How do modern technological advances relate to various transportation systems, including flight systems?
- What common technological and scientific properties are shared among various transportation and power systems?

Assessments

- Quizzes and Tests on: Safety, Tools, Measuring, Part Identification and Function, Airframe Design
- Engine Lab: Disassembly and Reassembly of an Overhead Valve 5.5 HP Engine and a 3HP Electronic Ignition Engine
- Kit Project: Balsa Wood Plane with Electric Motor
- Kit Project: Estes Rocket Kit

Content Outline

I. Unit 1 - Introduction and Safety in the Shop, Review of Tools and Measuring Instruments
II. Unit 2 - Throttle Body Fuel Systems
III. Unit 3 - Electronic Ignition Systems
IV. Unit 4 - Practical Engine Experience
V. Unit 5 - Aircraft Building Experience
VI. Unit 6 - Space Flight 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	
Month 1	Month 2		Month 3	Month 4	Month 5
Unit 1 Introduction and Safety in the Shop, Review of Tools and Measuring Instruments 1 week	Unit 2 Throttle Body Fuel Systems 2 weeks	Unit 3 Electronic Ignition Systems 2 weeks	Unit 4 Practical Engine Experience 7 weeks	Unit 5 Aircraft Building Experience 4 weeks	Unit 6 Space Flight Experience 2 weeks

Unit 1– Introduction and Safety in the Shop, Review of Tools and Measuring Instruments, 1 week 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.01.04 AUTO.01.05

Pre-Engineering Technology

ENG.03 Ensure quality control using the major components of manufacturing processes including measurement systems, tools and instruments to produce a product.

ENG.03.02 ENG.03.03

Unit Objectives

Students will be able to:

- describe a safe working environment for both employees and the shop environment.
- describe safety methods of minimizing the risks involved in working with engines.
- identify and use tools, fasteners and equipment.
- estimate and precisely measure the size of objects using appropriate tools and units of measurement.

Essential Questions

- Why is safety such an important part of working in an environment utilizing tools and machines?
- What is the value of utilizing precision measurements when working with mechanical systems?

Focus Questions

- What tools and procedures are potentially dangerous?
- What type of specialized tools are required to disassemble or reassemble a small gas engine?
- What test equipment would be used to check spark and compression on a modern small gas engine?

Assessments

- Tests and Quizzes on Unit subject matter

Skill Objectives

Students will:

- describe and demonstrate proper tool use.
- describe the safety associated with working in a small engine shop.
- list common hand tools and describe their proper use.
- utilize rulers, micrometers and gauges to precisely measure components.

Unit 2 – Throttle Body Fuel Systems, 2 weeks top

Standards

Automotive Technology

AUTO.07 Engine Performance: Describe the components and functions of the various systems that are related to engine performance.

AUTO.07.02

Unit Objectives

Students will be able to:

- describe the operation of a typical throttle body fuel system.
- describe the operation of a typical carburetor fuel system.

Essential Questions

- Why is knowledge of fuels important in understanding fuel delivery systems?

Focus Questions

- What are the different types of fuel systems?
- How does a throttle body system differ from a carburetor system?
- How does a small engine throttle body system compare to an automotive throttle body system?

Assessments

- Quizzes
- Workbook Assignments

Skill Objectives

Students will:

- compare carburetor vs. throttle body systems.
- list and explain the components of a carburetor fuel system.
- list and explain the components of a throttle body system.
- perform basic throttle body adjustments.

Unit 3 - Electronic Ignition Systems, 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.03.07

AUTO.06 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.
AUTO.06.01

Pre-Engineering Technology

ENG.08 Demonstrate the application of science and math principles to the electrical engineering process.
ENG.08.02, ENG.08.03, ENG.08.05

Unit Objectives

Students will be able to:

- describe the basic principles of magnetism and electricity.
- describe the operating principles of a mechanical breaker ignition system.
- describe the operating principles of a capacitor discharge ignition system.

Essential Question

- How does an understanding of electricity facilitate problem solving with electrical/electronic systems?

Focus Questions

- How much spark does an electronic ignition system produce?
- What are the main electrical components in a small gas engine with electronic ignition?
- How does a electronic magneto system create electricity?
- How does a small gas engine electronic ignition system compare to an automotive electronic ignition system?

Assessments

- Quizzes
- Workbook Assignments

Skill Objectives

Students will:

- compare contact point and electronic ignition systems.
- list the primary purposes of the ignition system.
- identify the components of a mechanical breaker ignition system and describe their function.
- identify the components of a typical capacitor discharge ignition system and describe their function.

Unit 4 – Practical Engine Experience, 7 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.01.05

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

AUTO.05 Diagnosis and repair engines, including but not limited to two- and four-stroke and supporting subsystems

AUTO.05.01, AUTO.05.02

AUTO.06 Demonstrate the function, principles, and operation of electrical and electronic systems using manufacturer and industry standards.

AUTO.06.01

Unit Objectives

Students will be able to:

- describe the operating principles of internal and external combustion engines.
- develop hands-on experience with small gas engine disassembly and reassembly.
- utilize precision measurement tools to analyze engine components.

Essential Question

- How does an understanding of engine components and engine systems increase the ability to diagnose problems?

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?
- How do the current engines differ from previous engine experiences?

Assessments

- Disassembly and Reassembly of Overhead Valve 5.5 HP Engine
- Disassembly and Reassembly 3HP Electronic Ignition Engine

Skill Objectives

Students will:

- list the steps involved for disassembling an engine.
- disassemble an engine.
- utilize micrometers to analyze components for tolerance and wear to the nearest .001”.
- list steps involved with machining and reassembling an engine.
- reassemble engine and test functions.

Unit 5 – Aircraft Building Experience, 4 weeks top

Standards

Pre-Engineering Technology

ENG.02 Use the design process to solve problems by creating and refining prototypes.

ENG.02.01, ENG.02.03, ENG.02.06, ENG.02.09, ENG.02.10, ENG.02.12

ENG.11 Demonstrate the application of science and math principles to the mechanical engineering process.

ENG.11.02, ENG.11.03

Transportation Technology

TRAN.02 Define transportation technology systems.

TRAN.02.01, TRAN.02.02

Unit Objectives

Students will be able to:

- demonstrate and apply how propulsion, control, payload, and support systems for various air systems are used in transportation technologies.
- solve problems using appropriate units in engineering systems.
- describe the basic principles of flight.
- describe scientific principles of physics applied to powered flight.

Essential Question

- How has flight influenced society?

Focus Questions

- How does wing and airframe design effect lift and aircraft performance?
- Does proper assembly of product directly affect the performance of that product?

Assessments

- Building of aircraft
- Performance of aircraft
- Design drawing of aircraft with templates
- Testing of aircraft including lift, electrical wiring and motor performance

Skill Objectives

Students will:

- design and test a model aircraft.
- assemble a low voltage electrical circuit and motor assembly.
- plan, build, test and modify an electric motor powered plane.
- conduct experiments to enhance their knowledge about the principles of flight.

Unit 6 – Space Flight Experience, 2 weeks top

Standards

Pre-Engineering Technology

ENG.02 Use the design process to solve problems by creating and refining prototypes.

ENG.02.01, ENG.02.03, ENG.02.06, ENG.02.09, ENG.02.10, ENG.02.12

ENG.11 Demonstrate the application of science and math principles to the mechanical engineering process.

ENG.11.02, ENG.11.03

Transportation Technology

TRAN.02 Define transportation technology systems.

TRAN.02.01, TRAN.02.02, TRAN.02.04, TRAN.02.05

Unit Objectives

Students will be able to:

- demonstrate and apply how propulsion, control, guidance, payload, and support systems for space systems are used in transportation technologies.
- design, build and evaluate a simple variable path transportation system.

Essential Question

- How can mathematical and scientific knowledge help solve engineering problems?

Focus Questions

- How do proper construction techniques factor into the vehicles distance and performance?
- What factors (including wind and temperature) affect the rocket's performance?

Assessments

- Building of Estes Solid Fuel Rocket
- Performance of Rocket

Skill Objectives

Students will:

- build and launch rocket considering safety and proper tool use.
- incorporate basic model rocketry construction techniques.
- test the constructed rocket and calculate distance of vertical travel.
- describe how solid fuel rockets are propelled into the atmosphere.