COURSE: Small Engine Repair

GRADE LEVEL: 10-12

LENGTH OF COURSE: 90days/1 semester

TEXT: Small Engine Technology

PUBLISHER: Delmar

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COURSE DESCRIPTION:
This course is designed for students who are interested in the operation, construction, overhaul, and diagnosis of small air-cooled gas engines. Emphasis will be placed on: safety, tools, theory of 2 and 4 stroke engines, trouble shooting, overhaul, and related equipment. Students may use their own small engines to perform the class responsibilities.

CURRICULUM WRITING TEAM:
Kevin McCue

DATE OF REVISION:
2007

Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Safety

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Introduction Preventative Safety • Rules • Standards • Colors • Chemicals • Battery Safety	Cognitive and manipulative development Listen to Lecture Discussion Participation Take notes
Activities:	**Performance Assessments:**
Smart Board Presentation Demonstration by the instructor Hands on work by the student in the shop	Shop Observation Oral Questioning Quizzes Written Test

Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Tools

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Identification and Safety • Hand tools • Power tools • Machines • Measuring Tools • Specialized Tools	List the basic units of measure Describe the different types of fasteners List the various mechanical measuring tools Describe the proper procedure for measuring with a micrometer List some of the common hand/power tools Describe the use of common pneumatic, electrical, and hydraulic power tools
Activities:	**Performance Assessments:**
Lecture View Smart board presentation Board demonstrations Open discussion Class debate Guided practice Shop demonstration Supervised shop work Group projects and individual projects Cooperative learning groups Homework	Shop Observation Oral Questioning Quizzes Written Test

Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Engine Classification/Types

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
External Combustion Internal Combustion Four-stroke Two Stroke Engine Power Factors Gasoline	Describe the various ways in which engines can be classified Explain what takes place during each stroke of the four/two-stroke cycle Outline the advantages/disadvantages of different types of small engines Define important engine measurements and performance characteristics, including bore, and stroke, displacement, compression ratio, torque, and horsepower Explain how to evaluate the condition of an engine
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Engine Construction

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Internal Engine Components • Combustion Chamber • Piston, Piston Pin, Rings • Connecting Rod • Crankshaft • Bearings • Crankcase • Valves	List the parts of an engine and briefly describe their operation Explain the common service and assembly techniques used in connecting rod and piston servicing Explain the purpose and design of the different types of rings Describe the purpose of an engine's cylinder head, valves, and related valve parts Recognize the types of combustion chamber shapes
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Engine Construction

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
External Engine Components • Ignition • Carburetors • Starters • Shrouds; sheet metals	Identify the parts and operation of a conventional ignition system Define the basic principles of carburetion and its components List the parts of starters and the starting systems and their purpose Identify the parts and operation of a conventional cooling system of a small engine
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Fuel Systems

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
System Types • Gravity • Suction • Pump • Pressurized	Describe the four performance characteristics of gasoline Define the fuel delivery system components and their functions, including fuel tank, lines, filters, and pumps Explain the operation of a mechanical fuel pump Conduct a visual inspection of a fuel system Test entire fuel system
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Fuel Systems

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**

Carburetors
• Construction/Parts
• Functions
• Maintenance/Troubleshooting
  ○ Briggs and Stratton
  ○ Tecumseh
  ○ Kohler
  ○ Diaphragm/Fuel Pump
  ○ Variable Venturi
  ○ Fuel Injection
Rebuild Steps
	Describe the basic principles of carburetion
	Explain the different carburetor circuits
	Describe the various carburetor controls
	Describe the different types of carburetors
	Understand and identify the steps necessary to rebuild a carburetor
	Recognize carburetor-related performance problems
	Explain how various carburetor adjustments are made
	Diagnose problems
	Adjust idle and mixture

Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Governor Systems

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Purposes Types Operation Construction Adjustment • High Speed • Low Speed • Idle • Problems, Diagnosis and Service	Understand and identify the purpose and different types of governors used • Air-vane • Mechanical Recognize how the governor system protects the engine Define how the system provide operating convenience Describe and properly adjust linkages
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Unit: Lubrication Systems

Grade Level: Grade 10-12

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Components Purposes • Cooling • Corrosion • Cleaning • Noise Problems, Diagnosis and Service	Name and describe the components of a typical lubricating system Inspect and service oil control units Describe the purpose of a crankcase ventilation system Examine and identify the parts of the system Follow the flow of oil through an engine Identify problem, diagnosis and service procedure for the lubricating system
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Lubrication

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Oils • Fossil Based • Synthetics • Additives Oil Grades • Single • Multi-viscosity Lubrication Problems Two-Cycle Oil	Understand oil types Explain oil service and viscosity ratings Identify the contaminants within the engine within the engine that must be removed by the system Analyze the characteristics of lubricating oil Compare the different ways oil can be classified Compare the advantages and disadvantages of synthetic oils
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Ignition Systems

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**

Electrical Concepts/Components
• Alternator
• Charging System
• Battery Ignition System
• Magneto Ignition System
  ○ Coil
  ○ Sparkplug
  ○ Briggs and Stratton Magneto
  ○ Tecumseh Magneto
• Magnetron
• Grounding Switches
	Describe the three major functions of the ignition system
	Describe how each of the major types of electrical test electrical test equipment is connected and operated
	Explain the purpose of a battery
	Demonstrate all safety precautions and rules associated with batteries
	Explain the purpose of the starting system
	List the components of the starting system
	Explain the different types of magnets and magnetos used
	Describe the different types of starter motors
	Explain the purpose of a charging system
	Identify the different components of a charging system
	Perform troubleshooting on all electrical systems

Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Unit: Ignition Systems

Grade Level: Grade 10-12

PA Standards: 13.1
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13.3
13.4

Topics:	**Skills:**

Spark Plug
• Electrodes
  ○ Reach
  ○ Size
  ○ Service
Coils
Cables
	Describe the operation of ignition coils, spark plugs, and ignition cables
	Explain how high voltage is induced in the coil secondary winding
	Describe the various spark timing systems
	Know the purpose of the various designs and how they function
	Describe their operation
	Compare advantages and disadvantages
	Problems, Diagnosis and Service

Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Ignition

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Tune-Up • Points • Timing • Armature Problems/Diagnosis • Spark • Ignition • Armature • Flywheel • Points • Coil	Perform a no-start diagnosis and determine the cause of the condition Determine the cause of an engine misfire Perform a visual inspection of the ignition system components Test the components Service and install spark plugs Check and set timing
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Failure Analysis

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Exterior Examination Disassembly • Lubrication • Abrasive Grit • Overheating • Over speeding • Component failure	Understand and properly identify a problem history Know how to perform a preliminary examination Know how to properly disassemble and perform a complete failure analysis Identify component failures
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Engine Disassembly

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Evaluation Teardown Procedures	Prepare an engine for removal Explain how to label and categorize parts Describe how to disassemble and inspect an engine Name the three basic cleaning processes Identify the types of cleaning equipment
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Engine Assembly

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Preparation • Order Parts • Examine recondition Valves/Components • Cylinder/Piston Preparation • Clean	Explain the various gaskets used to seal an engine Explain gasket installation procedures Reassemble an engine Explain the ways to pre-lubricate a rebuilt engine Reinstall an engine and observe the correct starting and break-in procedures
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Unit: Troubleshooting

Grade Level: Grade 10-12

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Systematic Check Sequence • History • Fuel • Ignition • Compression Performance Problems	Properly perform a sequential system check Analyze cause and effect Complete problem solving procedures Properly identify problems and make repairs Evaluate performance problems
Activities:	**Performance Assessments:**
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Course: Small Engine Repair

Grade Level: Grade 10-12

Unit: Two Stroke

PA Standards: 13.1
13.2
13.3
13.4

Topics:	**Skills:**
Carburetors • Construction/Parts • Functions • Maintenance/Troubleshooting Problems, Diagnosis and Service	Understand and identify simple carburetion problems Evaluate and analyze cause and effect Perform proper repair and replace procedures
Activities:	**Performance Assessments:**
Lecture View Smart board presentation Board demonstrations Open discussion Class debate Guided practice Shop demonstration Supervised shop work Group projects and individual projects Cooperative learning groups Homework	Shop Observation Oral Questioning Quizzes Written Test