

Power Technology 1: Small Engines 1

Grades 9-12

Units of Credit: One Semester (Elective)

Prerequisites: None

Course Description:

The small gasoline engine forms the basis of instruction for this course. Books, manuals, and lab work help the student learn engine design, mechanical principles, troubleshooting, tune-up, reconditioning, and maintenance. Basic principles in safety, machining and tool usage are studied. This knowledge is translated into practical skills through lab activities wherein students disassemble, then reassemble small engines. They become familiar with the functions and components of a small engine and diagnose simple failures. This course consists of classroom instruction and assignments and hands-on lab activities. Assessments include written and oral student responses, student-assembled engine and presentation, teacher observation, and performance assessment of learning activities and tasks.

Topics:

- Safety in the Small Gas Engine Shop
- Tools and Measuring Instruments
- Fasteners, Sealants and Gaskets
- Two-Cycle and Four-Cycle Engines
- Engine Construction and Principles of Operation
- Two-Cycle and Four-Cycle Engines
- Measuring Engine Performance
- Fuel Emission Control Systems
- Carburetion
- Ignition Systems
- Lubrication Systems
- Cooling Systems
- Preventive Maintenance and Troubleshooting
- Fuel System Service
- Ignition System Service
- Engine Inspection, Disassembly, and Cylinder Reconditioning
- Piston and Piston Ring Service
- Bearing, Crankshaft, Valve and Camshaft Service
- Career Opportunities and Certification

NOTE: Throughout this document, learning target types are identified as knowledge (“K”), reasoning (“R”), skill (“S”), or product (“P”).

STANDARD 1: Students experience various career opportunities and assess personal career pathways.

Benchmark 1:

Explore and identify personal interests, aptitudes, and abilities and develop strategies to achieve tentative career goals.

Learning Targets (Type):

1. I can use Montana Career Information Systems (MCIS) and/or other systems or web resources to investigate and evaluate my personal interests, aptitudes and abilities. (S)
2. I can formulate tentative career goals. (R)
3. I can evaluate approaches for meeting my goals. (R)
4. I can summarize career opportunities for a person with mechanical skills. (K)

Benchmark 2:

Utilize local resources to research career plans.

Learning Targets (Type):

1. I can identify local resources to develop career plans. (K)
2. I can contact my school career counselor or teacher to pursue career pathways. (S)
3. I can interview a person employed in a mechanical related field or write a report on a mechanical occupation of choice. (S)

Benchmark 3:

Recognize the interrelationships of family, community, career, and leisure roles.

Learning Targets (Type):

1. I can describe the importance of balance between family and community in regards to career and leisure activities. (K)
2. I can compare and contrast the needs of career and leisure activities and how they relate to and/or affect family and community. (R)

STANDARD 2: Students demonstrate an understanding and apply principles of Resource Management (i.e., financial, time, personal management).

Benchmark 1:

Prepare a budget and keep financial records.

Learning Targets (Type):

1. I can research and report cost of materials and time. (R,S)
2. I can document financial inputs and outputs. (S)
3. I can identify the necessity to maintain accurate financial records. (K)
4. I can stay within a fixed budget. (S,P)

Benchmark 2:

Prioritize, allocate time, prepare and follow schedules to complete a project.

Learning Targets (Type):

1. I can estimate the required time to complete a project. (R)
2. I can prioritize resources, equipment and tasks. (R)
3. I can reflect upon completion. (K)
4. I can select goal-relevant activities, rank them, allocate time, and prepare and follow schedules. (R,S)
5. I can use or prepare budgets, make forecasts, keep records, make adjustments to meet objectives, and evaluate financial records. (R,S)

6. I can allocate and evaluate time, materials, facilities and resources to set and achieve goals.

Benchmark 3:

Apply appropriate time to task.

Learning Targets (Type):

1. I can implement a time schedule for task completion. (S)

Benchmark 4:

Use physical resources wisely to accomplish a goal.

Learning Targets (Type):

1. I can identify the resources necessary to accomplish the task. (K)

2. I can maintain the tools of the trade. (S)

3. I can maximize the use of my resources. (S)

STANDARD 3: Students acquire and utilize personal and leadership skills to become successful, productive citizens.

Benchmark 1:

Demonstrate active leadership skills by participation in group activities and projects.

Learning Targets (Type):

1. I can investigate various leadership styles. (R)

2. I can apply leadership styles in group activities and projects. (R)

3. I can discover the principles of group participation and leadership related to citizenship and career preparation. (K,S)

4. I can develop the skills of effective group participation and leadership related to citizenship and career preparation. (S)

5. I can assess work and evaluate work accordingly; evaluate performance and provide feedback toward the accomplishment of personal and team goals. (R,S)

6. I can practice various roles required as a member of an effective team while recognizing individual differences and cultural diversity. (R,S)

7. I can demonstrate and teach a learned skill including performance evaluation of self and others in this process. (S)

Benchmark 2:

Demonstrate positive personal and work ethics.

Learning Targets (Type):

1. I can arrive on time for class and work. (S)

2. I can develop personal and work related goals. (K,P)

3. I can describe ethical behavior in the workplace. (K)

4. I can assess the employability characteristics of a successful worker in the modern workplace. (R,S)

Benchmark 3:

Demonstrate skills to be a productive citizen.

Learning Targets (Type):

1. I can develop professional relationships with community members. (R,S)

2. I can contribute to my community in a positive manner. (S,P)

3. I can practice and evaluate positive service skills (e.g., resolving misunderstanding, consumer complaints). (R,S)

Benchmark 4:

Apply self-esteem building practices.

Learning Targets (Type):

1. I can define and provide evidence of my strengths in my career interest areas. (K,S)
2. I can persevere through set backs and stay focused on my goals. (S)

Benchmark 5:

Demonstrate appreciation for diverse perspective needs and characteristics.

Learning Targets (Type):

1. I can develop a working relationship with diverse populations. (K,S)
2. I can demonstrate communication skills that contribute to positive relationships. (S)
3. I can work to understand diverse points of view. (R)

Benchmark 6:

Practice several methods of effective communication.

Learning Targets (Type):

1. I can demonstrate good listening skills. (S)
2. I can effectively communicate verbally through collaborative projects. (S,P)
3. I can develop quality written professional communications. (P)
4. I can communicate ideas to justify position, persuade and convince others, and responsibly challenge existing procedures and policies. (R,S)
5. I can practice and evaluate the negotiating process including researching, goal setting, presenting, listening, clarifying, adjusting and compromising. (R,S)
6. I can develop effective oral and written communication skills with individuals from varied cultures, including fellow workers, management, and customers. (S)

STANDARD 4: Students acquire and demonstrate current technical skills leading to an occupation.

Benchmark 1:

Practice technical skills and procedures required for an occupation.

Learning Targets (Type):

1. I can use tools, machines, and equipment to manufacture or produce solutions to problems. (S,P)
2. I can practice appropriate welding techniques based on knowledge of modern equipment and newly developed Power Tech processes. (K,S)
3. I can recognize the career opportunities for a person with Power Tech skills. (K)
4. I can assess skills and distribute work accordingly; evaluate performance and provide feedback toward the accomplishment of personal and team goals. (R,S)
5. I can disassemble and assemble an engine from component parts. (K,S)
6. I can apply the concepts and skills of the trade to simulate actual work situations. (K,S)
7. I can apply the essential knowledge and skills in small engines to work-based learning experiences including, but not limited to, cooperative education, job shadowing, mentoring, and apprenticeship training. (K,S)
8. I can discover the principles of group participation and leadership related to citizenship and career preparation. (R,S)
9. I can develop the skills of effective group participation and leadership related to citizenship and career preparation. (S)
10. I can develop effective oral and written communication skills with individuals from varied cultures, including fellow workers, management, and customers. (S)

11. I can evaluate quality and performance of a variety of systems (e.g. impact of change). *(R,S)*
12. I can practice and analyze principles of system management considering external factors and uncontrolled variables. *(R,S)*
13. I can manage and analyze existing systems including optimizing outputs and making in-process adjustments. *(R,S)*
14. I can design and evaluate a system composed of subsystems. *(K,R,S)*
15. I can identify the key components of a small engine. *(K)*
16. I can develop a plan for proper overhaul and maintenance. *(R,S)*
17. I can read and interpret appropriate schematics, charts and service-repair manuals and bulletins. *(K,S)*
18. I can disassemble and assemble an engine from component parts. *(K,S)*
19. I can diagnose and remedy the problems in a non-working engine. *(K,R,S)*

Benchmark 2:

Practice safe and appropriate use of technology.

Learning Targets (Type):

1. I can demonstrate knowledge of new and emerging technologies that may affect the field small engines. *(K)*
2. I can utilize correct techniques for proper handling of hazardous materials. *(S)*
3. I can demonstrate knowledge of concepts and skills related to health and safety in the workplace. *(K,S)*
4. I can safely use hand and power tools and equipment commonly employed in the service and repair of small engines. *(K,S)*
5. I can safely use hand and power tools and equipment commonly employed in the service and repair of small engines. *(K,S)*
6. I can build knowledge of the concepts and skills related to health and safety in the workplace. *(K,S)*
7. I can practice safety in the workplace as specified by appropriate government regulations. *(K)*

Benchmark 3:

Select the appropriate tools, equipment, and procedures for the task.

Learning Targets (Type):

1. I can demonstrate skills and knowledge of current equipment, materials, and processes used in related careers. *(K,S)*
2. I can use and apply basic Power Tech processes in an industrial environment. *(K,S)*
3. I can allocate and evaluate time, materials, facilities and resources to set and achieve goals. *(R,S)*
4. I can assess skills and distribute work accordingly; evaluate performance and provide feedback toward the accomplishment of personal and team goals. *(R,S)*
5. I can develop a plan for proper overhaul and maintenance. *(K,R,S)*
6. I can understand the functions and the applications of the tools, equipment, technologies, and materials used in small engine services. *(K)*
7. I can understand the functions and the applications of the tools, equipment, technologies, and materials used in small engine services. *(K)*
8. I can demonstrate knowledge of new and emerging technologies that may affect the service of small engines. *(K)*

9. I can use measurement tools and units appropriately and recognize limitations in the precision of the measurement tools. *(K,R,S)*

Benchmark 4:

Manage and maintain technological tools and follow troubleshooting protocol.

Learning Targets (Type):

1. I can gather, compile and analyze data from a variety of sources, and evaluate relevance and accuracy in making informed decisions in the workplace. *(R,S)*
2. I can organize, process, analyze, and maintain written and computerized records and other forms of information using systematic methods. *(R,S)*
3. I can diagnose and remedy the problems in a non-working engine. *(R,S)*

Benchmark 5:

Apply technical information to a variety of sources.

Learning Targets (Type):

1. I can use cross-curricular resources and knowledge to develop solutions to problems. *(R,S)*
2. I can develop knowledge to create innovative solutions and ideas. *(R,S)*
3. I can demonstrate and teach a learned skill including performance evaluation of self and others in this process. *(K,S)*
4. I can select, analyze, and present information using a variety of methods (e.g., oral, written, graphic, pictorial, multimedia). *(R,S)*
5. I can identify the key components of a small engine. *(K)*
6. I can read and interpret appropriate schematics, charts and service-repair manuals and bulletins. *(K,S)*
7. I can demonstrate knowledge of new and emerging technologies that may affect the service of small engines. *(K)*

STANDARD 5: Students know and demonstrate the requirements of the workplace through authentic application.

Benchmark 1:

Practice and demonstrate academic and technical skills to a workplace setting.

Learning Targets (Type):

1. I can practice, and demonstrate my technical workplace skills in my school lab. *(S)*
2. I can research, write and present on the technical content utilizing academic skills found in workplace settings. *(R,S,P)*
3. I can apply the concepts and skills of the trade to simulate actual work situations. *(K,S)*
4. I can apply the essential knowledge and skills in small engines to work-based learning experiences including, but not limited to, cooperative education, job shadowing, mentoring, and apprenticeship training. *(R,S)*
5. I can use mathematics to describe the work and power in a system. *(S)*
6. I can use mathematics to describe and predict electrical and magnetic activity (current, resistance, voltage). *(S)*
7. I can derive and use formulas for area, surface area, and volume of many types of figures. *(S)*
8. I can summarize major issues facing engine repair personnel related to customer satisfaction. *(R,S)*
9. I can organize, process, analyze, and maintain written and computerized records and other forms of information using systematic methods. *(R,S)*

10. I can select, analyze, and present information using a variety of methods (e.g., oral, written, graphic, pictorial, multimedia). *(R,S,P)*
11. I can acquire, organize, communicate, process, analyze and evaluate information from print and electronic sources. *(R,S)*
12. I can analyze how matter is affected by changes in temperature, pressure and volume. *(R,S)*
13. I can compare and contrast how conductors, semiconductors, and superconductors work and describe their present and potential uses. *(R,S)*
14. I can demonstrate an understanding that energy can be found in chemical bonds and can be used when it is released from those bonds. *(K,S)*

Benchmark 2:

Apply the concepts of entrepreneurship.

Learning Targets (Type):

1. I can explain the concepts of entrepreneurship. *(K)*
2. I can demonstrate the concepts of entrepreneurship through a unique project. *(R,S)*
3. I can present my unique project to an authentic audience. *(S,P)*

Benchmark 3:

Identify possible outcomes and consequences of decisions.

Learning Targets (Type):

1. I can identify possible consequences of carelessness and horseplay. *(K)*
2. I can explain potential outcomes of not following directions, (i.e. safety, guidelines, rubrics). *(R)*
3. I can use various techniques to approximate solutions, determine the reasonableness of answers, and justify the results. *(K,R,S)*
4. I can gather, compile and analyze data from a variety of sources, and evaluate relevance and accuracy in making informed decisions in the workplace. *(R,S)*

Benchmark 4:

Use acceptable industry standard equipment in a school setting.

Learning Targets (Type):

1. I can successfully use acceptable industry standard equipment to produce an authentic product within budget constraints. *(R,S,P)*