Metals Technology 1
Grades 9-12

Units of Credit: One Semester (Elective)

Prerequisites: None

Course Description:
Metals Technology 1 provides students with a broad, basic knowledge of various metalworking processes and techniques. Areas of study include sheet metal, foundry, ornamental iron and precision machining. Industrial principles of safety and machine operation and techniques will be stressed. The study of metals technologies allows students to reinforce, apply, and transfer their academic knowledge and skills to a variety of interesting and relevant activities, problems, and settings. In addition to their general academic and technical knowledge and skills, students gain an understanding of career opportunities and employment requirements inherent in metals technologies. Assessments include written and oral student responses, presentations, teacher observation, and performance assessment of learning activities and tasks.

Topics:
- Sheet Metal
- Personal Safety in Metalworking
- Sheet Metal Pattern Development
- Hand Tools and Cutting Tools
- Sheet Metal Manufacturing Methods
- Metal Buffing, Finishing, and Marking systems
- Precision Machining Processes
- Metalworking Lathe
- Lathe Cutting Tools, Tool Holders, Cutting Speeds and Feed Selection
- Sharpening Lathe Cutting Tools
- Drilling, Reaming, Countersinking, and Counterboring in a Lathe
- Straight Turning, Facing, and Boring
- Taper Turning
- Knurling
- Filing and Polishing
- Cutting Threads on the Lathe
- Work Piece-Holding Devices and Accessories
- Milling Cutters
- Cutting Speeds and Feeds for Milling
- Milling Flat Surfaces, Bevels and Chamfers
- Procedures for Square Stock
- Milling Grooves and Keyways
- Drilling and Boring Operations
- Dividing or Indexing Operations
- Foundry
- Metal Casting
- Melting and Pouring Metal
- Powder Metallurgy
- Ornamental Iron/Non-Ferrous Metal
- Metallurgy science
- CNC metal machining

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)*
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)*
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)*
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)*
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)*
Benchmark 3:
Demonstrate skills to be a productive citizen.
Learning Targets (*Type*):
1. I can develop professional relationships with community members. *(S)*
2. I can contribute to my community in a positive manner. *(S,P)*
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)*

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.*(K,S,R)*
2. I can use the computer as a problem-solving and design tool.*(K,S,R,)*
3. I can use math, science, and language arts skills to develop solutions to problems. *(K,S,R)*
4. I can identify current techniques for proper disposal of hazardous materials.*(K,R)*
5. I can use and apply metal design processes.*(K,R)*
6. I can practice various roles required as a member of an effective team while recognizing individual differences and cultural diversity.*(K,R)*
7. I can demonstrate and teach a learned skill including performance evaluation of self and others in this process.*(K,S,R,P)*
8. I can practice and evaluate negotiating process including researching, goal setting, presenting, listening, clarifying, adjusting and compromising.*(K,R,S)*
9. I can gather, compile and analyze data from a variety of sources, and evaluate relevance and accuracy in making informed decisions in the workplace.*(K,R)*
10. I can organize, process, analyze, and maintain written and computerized records and other forms of information using systematic methods.*(K,R,P,S)*
11. I can select, analyze, and present information using a variety of methods (e.g., oral, written, graphic, pictorial, multimedia).*(K,R,S,P)*
12. I can acquire, organize, communicate, process, analyze and evaluate information from print and electronic sources.*(K,R)*
13. I can listen for, receive, interpret and recall specific details and instructions in conversations and group meetings.*(K,R)*
14. I can respond appropriately during conversations, uses proper language etiquette, speaks clearly and directly, and uses correct technical vocabulary.*(K,R,S)*
15. I can describe managerial hierarchy inherent to industry.*(K,R)*
16. I can assess product quality utilizing quality control management processes.*(K,R)*
17. I can practice and analyze principles of system management considering external factors and uncontrolled variables.*(K,R)*
18. I can design and evaluate a system composed of subsystems.*(K,R,S)*

Benchmark 2:
Practice safe and appropriate use of technology.
Learning Targets (*Type*):
1. I can demonstrate skills and knowledge of current equipment, materials, and processes used in related careers. *(K,R,S)*
2. I can use tools, materials, and equipment commonly employed in the industry in a safe manner. *(K,R,S,P)*

Benchmark 3:
Select the appropriate tools, equipment, and procedures for the task.
Learning Targets (*Type*):
1. I can use prior knowledge to create new ideas for problem solving. *(K,R,S)*
2. I can assess skills and distribute work accordingly; evaluate performance and provide feedback toward the accomplishment of personal and team goals. *(K,R,S,P)*
3. I can locate and demonstrate understanding of written technical and non-technical

information necessary for completion of task or project. *(K,R,S,P)*
4. I can use proper business or technical writing styles, take effective notes, and complete written assignments legibly, completely, and accurately. *(K,R,S,P)*
5. I can solve linear equations. *(K,R,S,P)*
6. I can use basic operations with real numbers. *(K,R,S,P)*
7. I can use fractions, decimals, and percents. *(K,R,S,P)*
8. I can use ratios and proportions. *(K,R,S,P)*
9. I can apply coordinate geometry. *(K,R,S,P)*

Benchmark 4:
Manage and maintain technological tools and follow troubleshooting protocol.
Learning Targets (*Type*):
1. I can develop organizational and time management skills as part of the problem solving process.*(K,R,S,P)*
2. I can incorporate critical thinking and assessment skills.*(K,R,S)*
3. I can use or prepare budgets, make forecasts, keep records, make adjustments to meet objectives, and evaluate financial records.*(K,R,S,P)*
4. I can allocate and evaluate time, materials, facilities and resources to set and achieve goals.*(K,R,S)*
5. I can practice and evaluate positive service skills (e.g., resolving misunderstanding, consumer complaints).*(K,R,S,P)*
6. I can evaluate quality and performance of systems (e.g., impact of change).*(K,R,S)*
7. I can manage and analyze existing systems, including optimizing outputs and making in-process adjustments.*(K,R,S)*

Benchmark 5:
Apply technical information to a variety of sources.
Learning Targets (*Type*):
1. I can demonstrate knowledge of new and emerging metal technologies that may affect the field of metals.*(K,R)*
2. I can describe how metals technologies have affected individuals, societies, cultures, economics, and environment.*(K,R,S,P)*
3. I can recognize the career opportunities for a person with metals technologies skills.*(K,R)*
4. I can apply teamwork and cooperative learning abilities.*(K,R,S)*
5. I can demonstrate basic understanding of historical technological advancements by interpreting and applying to problem solving.*(K,R)*
6. I can select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.*(K,R,S,P)*
7. I can research information related to technological continuing education and career decisions.*(K,R)*
8. I can apply vocabulary and formulas of two-dimensional geometric shapes.*(K,R,S)*

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)*

<u>Benchmark 2:</u>
Apply the concepts of entrepreneurship.
<u>Learning Targets (*Type*):</u>
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)*

<u>Benchmark 3:</u>
Identify possible outcomes and consequences of decisions.
<u>Learning Targets (*Type*):</u>
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)*

<u>Benchmark 4:</u>
Use acceptable industry standard equipment in a school setting.
<u>Learning Targets (*Type*):</u>
1. I can successfully use acceptable industry standard equipment to produce an authentic product within budget constraints. *(R,S,P)*