BASIC INDUSTRIAL METALS

Grade Level:	9-10-11
Length:	1 Semester
Period(s) Per Day:	1
Credit:	1/2
Credit Requirement Fulfilled:	Vocational/Elective

Course Description

Basic Metals will expose the student to sheet-metal, foundry and CNC (Computer Numerical Control) machines. Students will spend nine weeks constructing sheet-metal coupons, heat and air ducting and a tool tray. In foundry, students will ram and pour two casting projects. In CNC, students will write a basic program and machine the part accordingly. Students will be introduced to lost wax casting process.

Course Objectives and Expectations

1. To explore basic and advanced skills associated with the Sheet Metal Industry.
2. To create a greater awareness to safety in our everyday routines.
3. To become aware of when to apply academic appropriate and technical skills in the Sheet Metal fields.
4. To work productively in teams, and to use technology to enhance productivity.
5. To utilize critical thinking to make sense of problems and persevere in solving them.

Student Objectives

After completing this course the student will be able:

1. To properly identify sheet metal tools and machines, and use them safely
2. Explain the process of iron production and correctly measure and size types of sheet metal.
3. Fasten sheet metal using rivets, bolts, and screws.
4. Construct coupons with various hems and seams to correct size and qualifications
5. Develop a layout, pattern, and make a one-piece rectangular duct, and develop a layout, pattern, and make a round pipe with a crimped edge..
6. Develop patterns using the parallel line, triangulation or radial line developments.
7. Identify foundry equipment and tools and use them safely,
8. Make a mold using a two-part flask that will be neat and precise, and safely pour a casting.
9. Develop basic concepts that pertain to early jewelry making that includes lost wax casting and soft metal impressions.
10. Develop skills that are required to be a1st level machinist using Machine lathes, CNC plasma cutters, and Milling machines.
11. Develop basic concepts and skills needed to be a successful welder with Hot Air and various Oxyacetylene processes.

COURSE OUTLINE:

Quarter I/First 9 Weeks

Unit 1 Career and Education Exploration **Week 1**

MTCIS-Career and Learning Exploration

Personal Portfolio/Interest Surveys

Multiple Intelligences/Holland Personality Comparison

Unit 2 Technology **Week 1**

What is Technology?

How is Technology used in Metals?

Unit 3 Measuring **Week 1**

What is measuring?

Ruler and Scale reading review

How is measuring used in the Metals industry?

Decimal/Fraction review

Unit 4 Safety **Week 1, 2,**

What is Safety?

Types of Safety

Personal Protective Equipment (PPE)

Unit 5 Sheet Metal Shop **Week 1, 2, 3, 4, 5, 6, 7, 8, 9**

What is a Sheet Metal Shop?

What do they do?

Define and identify different Sheet Metal Shop processes

HVAC/Metal Fabrication/bending/drilling/cutting

Define what safety and Sheet Metal Shop have in common

Shop Safety/Tool and Machine Identification and safety/Sheet Metal Safety

Define what safety and Sheet Metal Shop Technology have in common.

Brainstorming/Concept Ideas/Designing/Prototyping/Manufacturing

Explore Different Engineering design methods in the Sheet Metal Shop

Sketching/Computer Simulation/Modeling

Explore Different Engineering ways to better the Sheet Metal Shop.

Shop Layout/Safety

Explore Iron Production

What is Iron and how it becomes sheet metal

Project construction/Layout/Plan of Procedures/Bill of Materials

Quarter II/ Second 9 Weeks

Unit 1 Foundry/Machine Lathe/CNC/Metal Forming/Welding

What is Foundry? **Week 10, 11**

Define and identify different FoundryProcesses

Sand Casting/Split Mold/

Define what safety and Foundry have in common **Week 10,**

PE/Tools/Surroundings

What is a Machine Lathe? **Week 11,**

What they are used for and How

Explore Basic CNC processing

CNC/Concept Ideas/Designing/Prototyping/Manufacturing **Week 12, 13**

Explore Different Foundry design methods **Week 14, 15,**

Lost Wax
Explore Different Engineering ways to better Metal Shaping Processes.
Thread Cutting/Plastic Welding/Metal Bending/Welding **Week 16, 17**
Explore Hot Air Welding **Week 18, 19**

Montana Content Standards/RST

The grades 6–12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them. The Standards set requirements not only for English language arts (ELA) but also for literacy in
History/social studies, science, and technical subjects.
RST 11.12 .3
RST 11.12 .9

MONTANA STANDARDS FOR CAREER AND VOCATIONAL TECHNICAL EDUCATION

Content Standards indicate what all students should know, understand and be able to do in a specific content area. Benchmarks define our expectations for students' knowledge, skills and abilities along a developmental continuum in each content area. That continuum is focused at three points—at the end of grade 8, the end of one high school course, and the completion of six units of vocational coursework.

CS1 BM 1 2 3
CS2 BM 2 34
CS3 BM 1 2 3
CS4 BM 1 2 345
CS5 BM 1 2 34

MONTANA STANDARDS FOR WORKPLACE COMPETENCIES

Content Standards indicate what all students should know, understand and be able to do in a specific content area. Benchmarks define our expectations for students' knowledge, skills and abilities along a developmental continuum in each content area. That continuum is focused at three points—at the end of grade 4, the end of grade 8, and grade 12.

CS1 BM 2 3
CS2 BM 12 345
CS3 BM 1 2 34
CS4 BM
CS5 BM 1 2 345
CS6 BM 1 2 346

Evaluation

Career and Vocational/Technical Education Performance Standards: A Profile of Four Levels

The Career and Vocational/Technical Education Performance Standards describe students' knowledge, skills, and abilities in the Career and Vocational/Technical content areas on a continuum from Kindergarten through grade 12. These descriptions provide a picture or profile of student achievement at the four performance levels: advanced, proficient, nearing proficiency, and novice.

AdvancedThis level denotes superior performance.

ProficientThis level denotes solid academic performance for each benchmark. Students reaching this level have demonstrated competency over challenging subject matter, including subject-matter knowledge, application of such knowledge to real-world situations, and analytical skills appropriate to the subject matter.

NearingThis level denotes that the student has partial mastery or prerequisite knowledge and **Proficiency** skills fundamental for proficient work at each benchmark.

NoviceThis level denotes that the student is beginning to attain the prerequisite knowledge and skills that are fundamental for work at each benchmark.

Upon Graduation Workplace Competencies

Advanced A graduating student at the advanced level in Workplace Competencies demonstrates superior performance. He/she:(a) independently identifies, organizes, plans and allocates workplace resources of time, money, human resources, material and facilities; (b) consistently practices workplace skills to identify, analyze, and evaluate procedures, policies, and individual team members' strengths;
(c) competently communicates, interprets, and evaluates information; 10/00-10- (d) independently evaluates and redesigns a variety of complex systems to improve system performance; (e) consistently selects, uses, and evaluates appropriate technologies and troubleshooting protocol in all learning situations; and (f) purposefully develops, evaluates and adjusts life and career plans and effectively demonstrates workplace readiness skills.

Proficient A graduating student at the proficient level in Workplace Competencies demonstrates solid academic performance. He/she: (a) identifies, organizes, plans and allocates workplace resources of time, money, human resources, material and facilities; (b) practices workplace skills to identify, analyze, and evaluate procedures, policies, and individual team members' strengths; (c) competently communicates, interprets, and evaluates information;(d) evaluates and redesigns a variety of complex systems to improve system performance; (e) selects, uses, and evaluates appropriate technologies and troubleshooting protocol in all learning situations; and(f) develops, evaluates and adjusts life and career plans and demonstrates workplace readiness skills.

Nearing Proficiency A graduating student at the nearing proficiency level in Workplace Competencies demonstrates partial mastery of the prerequisite knowledge and skills fundamental for proficiency in Workplace Competencies. He/she: (a) sometimes identifies, organizes and plans workplace resources of time, money, human resources, material and facilities, but has difficulty allocating these resources effectively;
(b) sometimes practices workplace skills to identify and analyze procedures, policies, and individual team members' strengths; and, with assistance, evaluates the results;(c) communicates basic workplace information and, with assistance, interprets and evaluates basic workplace information; (d) sometimes evaluates and with assistance redesigns a system to improve system performance;(e) sometimes selects and uses appropriate technologies in learning situations and, with assistance, uses troubleshooting protocol; and (f) develops life and career plans and, with assistance, evaluates and makes adjustments; demonstrates workplace readiness skills.

Novice A graduating student at the proficient level in Workplace Competencies is beginning to attain the prerequisite knowledge and skills that are fundamental in Workplace Competencies. He/she: (a) identifies, but has difficulty organizing, planning, or allocating workplace resources of time, money, human resources, material and facilities; (b) seldom practices workplace skills; (c) seldom communicates, interprets, or evaluates information; (d) seldom evaluates and has difficulty redesigning a basic system to improve system performance; (e) seldom selects or uses technologies or troubleshooting protocol in learning situations; and (f) rarely develops, evaluates, or adjusts life and career plans; but, with assistance, demonstrates workplace readiness skills.

Resources

Montana Content Standards/RST

English Language Arts and Literacy in History/Social Studies, Science, and Technical SubjectsGrade-Level November 2011
Grades 11-12
Reading Standards for Literacy in Science and Technical Subjects

MONTANA STANDARDS FOR CAREER AND VOCATIONAL TECHNICAL EDUCATION
Career and Technical Education (CTE)
http://opi.mt.gov/Programs/CTAE/CTE.html#gpm1_13

MONTANA STANDARDS FOR WORKPLACE COMPETENCIES
Career and Technical Education (CTE)
http://opi.mt.gov/pdf/Standards/ContStds-Workplace.pdf