Metal One

8310

2007-2008

8310 Metals I

Course Description:	Metal/Power One is a course designed to expand the knowledge and experience base for the student interested in the metal material area of industry. The student will spend the entire year in the metal/power lab. The student will select one of two projects, which will expand and test their ability. Project material costs are the responsibility of the student.
Grade Level:	10-12
Length of Course:	Frequency: 6 days per 6 day cycle Duration: 44 minutes Length: full year course Credits: 1
Prerequisites:	Materials technology
Textbook:	N/A
Expected Level of Achievement	Students will be required to maintain a 70% or better. They will be required to come to class prepared to learn. 93-100% = A 85 – 92% = B 77 – 84% = C 70 – 76% = D Below 70% = F

I. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Identifying root causes of problems and solving those issues.
Key Learning(s):	At the end of this course students will be able to solve their own metal working problems. They will learn to identify various root causes and pin point the root cause of problem. They will use this knowledge to correct the issue.
Essential Question(s):	Why are you experiencing poor quality results?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.1.1.10.A 3.1.10.A	Discriminate among the concepts of systems, subsystems, feedback and control in solving technological problems. Apply concepts of systems, subsystems, feedback and control to solve complex technological problems.	Students will learn how to identify a problem with their project. Students will learn how to identify various inputs, which may be causing poor results. Students will then identify the root cause of problem. Students will then change inputs to improve results. Arc welding: Students will identify poor welds. Then they will identify the relationships of amperage, speed, angle and distance on the weld. They will then determine what inputs need to be changed and in what way. MIG welding: Students will identify poor welds. Then they will identify the relationships of voltage, speed, angle, wire speed, gas pressure and distance on the weld. They will then determine what inputs need to be changed and in what way. Lathe work: Students will identify poor cuts such as rough cuts and tapers. Students will identify inputs	The goal of this skill is for the students to be able to assess their own work. At the beginning of the course the teacher will be more willing to help the student identify problems. However, it is the goal of the teacher to have the students learn how to become independent in solving their own problems. The teacher will ask questions to lead the student to his/her own conclusion. At the end of the course the students ability to problem solve will be assessed through the assessment of their	All lab equipment and tools.

		such as cutting speed, cutting feed, tool height, tool sharpness, cooling fluid, and lathe setup. Students will learn to identify what each input affects. Therefore they will be able identify the root cause of the problem and change that input. Milling work: Students will identify poor cuts such as rough cuts, steps, doglegs, non-square cuts, and tapers. Students will identify inputs such as cutting speed, cutting feed, tool sharpness, cooling fluid, vise setup and mill setup. Students will learn to identify what each input affects. Therefore they will be able identify the root cause of the problem and change that input. Casting work: Students will be able to identify poor quality molds. This poor quality may include loose ramming, tight ramming, dry sand, wet sand, dirty mold and breaking of detailed edges. Students will come to understand the relationships between the amount of oil in the sand, the amount of parting compound, the quality of the pattern, and the ramming of the mold. Students will learn to vary these inputs for success. Students will also be able to identify problems in final casting such as grain structure, gas holes, poor detail, sand holes and incomplete pour. They will learn what inputs affect these problems. Then they will change the inputs in order to experience success.	project. Daily assessment will also take place through the daily log in which work is logged and evaluated.	

II. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Identifying material, equipment and tool failure and the root causes of these failures
Key Learning(s):	At the end of this course the students will be able to identify why various parts of their project failed. They will also be able to identify why various tools and equipment failed. The students will be able to correct and prevent these failures.
Essential Question(s):	Why has a part, tool or equipment failed?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.6.10.C	Apply physical technologies of structure design, analysis and engineering, personal relations, financial affairs, structural production, marketing, research and design to real world problems: "Evaluate material failure common to specific applications."	Students will be able to identify a poor weld and the failure or breakage of that weld. They will be able to determine why the failure happened and how to correct the problem. Students will learn how the properties of a piece of metal or tooling can be compromised due to continual bending, overheating and annealing of hardened metals. Students will learn why tooling on equipment has failed. This could be the over heating of a drill bit due to too much speed. It could be the breaking of a lathe tool due to hammering of the bit. It could be the destroying of a file due to plugging of the file. The list continues.	Students, along with the help and advice of the teacher, will learn how to assess the failure of tooling, equipment and projects as issues arise during the course. Students project will be assessed at the end of the course. The assessment will reflect how well the student resolved failure issues.	All equipment, tools, projects and materials available in the lab.

III. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Reading of scale drawing in order to build a final product.
Key Learning(s):	At the end of the course the student will be able to read a simple scale drawings in order to fabrication, machine and/or assemble a product.
Essential Question(s):	How can a scale drawing be used to communicate dimensions, machining processes, and assembly of a product?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.1.10.D	Apply scale as a way of relating concepts and ideas to one another by some measure.	Students will be given scale drawings for the project, which they choose to do. Along with the help of the teacher and written instructions, students will learn to read the scale drawings. Therefore they will use the information on the drawing to produce a final product.	Students' projects will be assessed at the end of the course. The assess will be based partly on how accurate students' projects are to the scale drawings. Measurements will be made to check accuracy of the student's project.	Project packets Equipment in lab Tools in lab Materials in lab

IV. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Choosing correct materials for certain applications and processes
Key Learning(s):	Students will learn why certain materials are used for specific applications. Students will understand the limitations of machining, welding, and forming various materials.
Essential Question(s):	What is the best material to use for this application? It what ways can I work certain materials and in what ways can I not work certain materials?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.4.12.A	Apply concepts about the structure and properties of matter.	Students will understand the limitations of various materials. Through experience, they will know that steel is easy to weld and bend. The will learn that cold rolled steel machines easier than hot rolled steel. They will learn that castings do not bend. They will learn that steel and wrought aluminum and brass bend easy. They will learn that aluminum machines very easily. Students will learn that drill bits and other high speed steel cutting tools can be over-heated and therefore change properties. That will learn that "bluing" the end of a drill bit destroys the hardness of the bit and therefore prevent it from cutting correctly. Students will understand that nonferrous metals cannot be ground because they melt at too low of a temperature.	Students will receive formative assessed throughout the course according to their decisions about how they choose to work a piece of material, how they choose material, or handle tooling.	All equipment in lab All materials in lab

V. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Using the metal lathe to machine various materials
Key Learning(s):	At the end of the course students will be able to solve the problem of machining a part by using the metal lathe. They will be able to perform many of the following lathe procedures: facing, center drilling, straight turning to correct diameter, boring, cutting shoulders, parting, and knurling
Essential Question(s):	How can we use a metal lathe to machine various parts?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.	Students will use the metal lathes in the lab to face and center drill. They will straight turn pieces to within specific tolerances. They will bore and ream pieces. They will cut off pieces and knurl pieces. All of these processes will be preformed as needed according to the student's project. Students will learn how to safety operate lathe. Students will know how to properly vary feeds and speeds on the lathe. Lathe will be used as needed by student.	Final project will be assessed on how well the student used the lathe to produce their project. Students will have to pass a safety test on the lathe.	Metal Lathe Micrometers Lathe tooling Knurling tool Parting tool Drill bits Jacobs chuck Cutting fluid

VI. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Machining materials using the milling machine.
Key Learning(s):	At the end of this course students will be able to use the milling machine to perform some of the following: milling surfaces, milling ends square, milling slots, drilling holes, indexing holes/slots and reaming holes.
Essential Question(s):	What various machining procedures can be performed on the milling machine?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions	Students will properly set up milling operations as needed. They may tram in the mill and the vise. Students will set up parts properly in vise or other clamping devices. Students will learn how to safety use the mill. Students will learn how to square up pieces of metal. Students will index holes or slots. Students will mill various slots. Students will drill and/or ream holes. Students will mill surfaces flat. Students will maintain required tolerances. Students will select proper feeds and speeds. Students will use above procedures as necessary	Final project will be assessed on how well the student used the mill to produce their project. Students will have to pass a safety test on the mill Students will do an indexing assignment, which will be assessed on accuracy.	Milling machine Indexing table End mills Milling vise Cooling fluid Parallels Shell mills Dial indicators Ball end mills Micrometer Dial calipers

VII. **Northern York County School District Curriculum**

Course Name:	8310 Metals I
Content:	Fabrication: The cutting and welding together of a product
Key Learning(s):	Students will be able to properly cut stock to size. Students will be able to properly fit pieces. Students will properly clamp pieces. Students will weld pieces together.
Essential Question(s):	How can we use the various tools and equipment in the lab to fabricate parts or products?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.	Students will learn how to safely use the fabrication equipment in the lab. Students will learn how to safely cut materials to proper lengths. They any use any of the following to do so: chop saw, bandsaw, hacksaw, torch, and grinder. Students will learn to properly fit pieces by safety using the belt sander, bench grinder, die grinder, angle grinder, or files. Student will learn how to properly clamp up pieces using c-clamps, vise grips or bar clamps. Students will learn how to properly and safely weld pieces together using any of the following: arc welder, mig welder, torch, or tig welder. Student may also have to silver solder parts together.	Final project will be assessed on the quality. This is a direct reflection on how well the student used the fabrication equipment in the lab to produce their project. Students will have to pass a safety test on all fabrication equipment Students will do a mig welding assignment, which will be assessed on quality of welds.	Chop saw Bandsaw Hack saw Torch Belt sander Disc sander Bench grinder Die grinder Angle grinder Files C-clamp Vise grips Bar clamps Arc welder Mig welder Torch Tig welder Welding jackets Welding lens Welding gloves

VIII. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Heating and bending metal.
Key Learning(s):	Students will be able to properly heat and shape steel
Essential Question(s):	How can we properly heat and bend metal into a useful shape?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.	Students will learn how to safety use the torch and gas forge. Students will heat and bend/shape metal as needed for their project. Students may use torch or forge to heat metal Students may use any of the following to bend the heated metal: hammer and anvil, jig/fixture, bending machine, or shop vise.	Final project will be assessed on the quality. This is a direct reflection on how well the student used the heating and bending equipment in the lab to produce their project. Students will have to pass a safety test on all dangerous equipment	Gas forge Torch Forging hammer Bench vise Bending jigs Bending machine

IX. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Casting: The pouring of molten metal
Key Learning(s):	Students will be able to ram a mold, pour a mold and cleanup a casting.
Essential Question(s):	How can we form metal into a desired shape using the foundry?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials, and techniques to solve problems and answer questions.	Students will ram a their own mold. Students will clean up their own mold. Students will melt their own metal and pour their mold with the help of the teacher. Students will break down their mold and cleanup their piece.	Final project will be assessed on the quality. This is a direct reflection on how well the student used the foundry equipment in the lab to produce their project. Students will have to pass a safety test on the furnace and bandsaw.	Flasks Foundry sand Riddle Rammer Parting compound Sprue cutter Molders tools Legons Welding jacket Face shield Welding gloves Apron Crucible Gas furnace Pouring cradle Aluminum or bronze Bandsaw Belt sander

X. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Cutting threads using a tap and die set
Key Learning(s):	At the end of this course students will be able to select proper tap or die and use the equipment to cut threads.
Essential Question(s):	How can we select the proper tap or die? How can we properly cut threads using the tap and die set?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials, and techniques to solve problems and answer questions.	Students will learn how to read a set of plans in order to determine the size of tap or die to use. Students will come to understand the various thread sizes and how they are named. Students will properly cut threads.	Final project will be assessed on the thread quality.	Pitch gauge Micrometer Tap drill chart Tap and die set Cutting fluid

XI. Northern York County School District Curriculum

Course Name:	8310 Metals I
Content:	Cleanup, sanding, buffing and finishing of metals
Key Learning(s):	At the end of this course students will be able to smooth rough spots on project, properly clean surfaces and properly finish surfaces.
Essential Question(s):	How can we properly smooth, cleanup and finish a product?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.A	Identify and safely use a variety of tools, basic machines, materials and techniques to solve problems and answer questions.	Students will learn how to safely use finishing equipment. Students will smooth rough edges and surfaces on their project as needed. They will use finishing equipment such as files, wire wheels, belt sanders, disc sanders, and sand blasters to do so. Students will prepare surfaces for finish. Students will paint or buff surfaces.	Final project will be assessed on the quality of the finish. Students will have to pass a safety test on the belt sander, disc sander and buffer.	Files Belt sander Disc sander Bench grinder Die grinder Angle grinder Emery cloth Palm sander Lacquer thinner Paint Spray booth Sand blaster

XII. **Northern York County School District Curriculum**

Course Name:	8310 Metals I
Content:	Using measuring and layout tools
Key Learning(s):	At the end of this course students will be able to use various layout and measuring instruments to accurately layout and measure parts.
Essential Question(s):	How can we properly layout lines and locations on a piece of metal? How can we properly measure parts?
Grade Level:	10-12

Number	***Standard***	***Student Learning Experiences***	**Procedures for Assessment**	**Resources**
3.7.10.B	Apply appropriate instruments and apparatus to examine a variety of objects and processes.	Students will use drawings to determine dimensions and locations for their project. Students may use surface plate, v-block, height gauge, marking gauge and combination square to layout lines and locations on material.	Final project will be assessed on its quality. Measurements will be made and compared to plans to assess quality.	Surface plate V-block Height gauge Combination square Steel rule Marking gauge Micrometer Dial calipers Bluing
3.7.12.B	Evaluate appropriate instruments and apparatus to accurately measure materials and processes.	Students will make measurements using the micrometer, dial calipers or a simple steel rule. They will use these measurements to evaluate their work and to work within tolerances.		