

**TRUMBULL PUBLIC SCHOOLS
TRUMBULL, CONNECTICUT**

Basic Metal Processing
Technology Education Department
2016

CURRICULUM WRITING TEAM

Debra Owen

Department Chairperson

Matthew Iaccarino

Technology Education Teacher

Jonathan S. Budd, Ph.D.

Director of Curriculum, Instruction & Assessments

Basic Metal Processing

TABLE OF CONTENTS

Core Values and Beliefs.....	2
Introduction	2
Philosophy.....	2
Syllabus.....	3
Course Description.....	3
Goals	4
Standards.....	4
Unit 1: Safety	5
Unit 2: Measurement.....	6
Unit 3: Sheet Metal Design.....	7
Unit 4: Introduction to Welding	8
Course Credit	10
Prerequisites.....	10
Text(s)	10
Supplementary Materials/Resources/Technology	10
Appendix A – NEASC Rubrics	11

The Trumbull Board of Education will continue to take Affirmative Action to ensure that no persons are discriminated against in its employment.

CORE VALUES AND BELIEFS

Trumbull High School community engages in an environment conducive to learning which believes that all students will **read** and **write effectively**, therefore communicating in an articulate and coherent manner. All students will participate in activities **that present problem-solving through critical thinking**. Student will use technology as a tool applying it to decision making. We believe that by fostering self-confidence, self-directed and student-centered activities, we will promote **independent thinkers and learners**. We believe **ethical conduct** to be paramount in sustaining the welcoming school climate that we presently enjoy.

Approved 8/26/2011

INTRODUCTION

This course will emphasize the important role that metal plays in our everyday lives. Through hands-on learning experiences, students will explore metalworking career opportunities, the use of tools, machines, and materials that are essential to industry, and our lives as we know it.

Students will learn all the safety aspects of the Metals lab. The students will learn about hand tools, power tools, and metal working machinery. The students will complete various projects to show their new skills.

PHILOSOPHY

Studies show that students understand and retain knowledge when they experience or apply it to relevant situations. It is important that we provide all students with an education that will help them succeed in the workplace and in life.

Citizens of the 21st Century will need to possess a variety of diverse skills. It is vital that students enter the global economy with the ability to apply what they learned in school to a variety of ever-changing situations that they could not foresee before graduating. This course will help students acclimate to the real world and to prepare them for further education, as well as high-skill and high-demand professions. Metals have been used in one way or another during the manufacturing of almost everything we see, eat, and feel.

COURSE SYLLABUS AND TEXTS

Course Name Basic Metal Processing

Level Grades 9 - 12

Prerequisites N/A

Materials Required Supplied *Modern Metalworking* textbook

General Description of the Course

Are you thinking of getting into the manufacturing field or becoming an engineer? See what some of the metal working machines look like and how to operate them. Precision measurement is of great importance, and you will have the opportunity to learn the proper use of certain measuring devices such as a caliper or micrometer. Sheet metal production will be introduced as well as welding methods. Through the making of metal objects that can be used around the home or for a hobby, you will correctly learn many basic machine and sheet metal practices.

Major Projects

Sheet metal storage box, sheet metal toolbox tray, final project of student's own design

Assessments

Written assessments. Successful completion of a scale-drawn pattern that will be used to create their class project. Course involvement/participation and effort.

Texts

Modern Metalworking, John R. Walker. Tinley Park, IL: Goodheart-Wilcox Company, 2000.

Modern Metalworking, John R. Walker. Tinley Park, IL: Goodheart-Wilcox Company, Workbook, 2000

Recommended Supplemental Texts: N/A

GOALS

Upon completion of this course, students will:

- Identify the different safety equipment in the room and their uses
- Understand how to accurately read a ruler
- Be able to safely use metalworking-specific hand tools
- Use sheet metal tools to design a sheet metal product
- Identify how Arc and MIG welding works, demonstrating proper techniques and where they are used in industry

STANDARDS

The Performance Standards align with the 2014 Connecticut Technology Education Standards:

- BC.02 Describe and demonstrate the procedures related to workplace and job-site safety including personal protective equipment, machine safety, and material handling practices.
- BC.04 Understand and be able to demonstrate the methods involved in turning materials into useable structures and products.
- ENG.03 Ensure quality control using the major components of manufacturing processes including measurement systems, tools and instruments to produce a product.
- MAN.01 Employ engineering design process to achieve desired outcomes.
- MAN.02 Identify and use appropriate engineering materials.
- MAN.03 Demonstrate the methods involved in turning raw materials into usable products.

The Performance Standards also align with the 2010 Connecticut Core Standards for Literacy in Technical Subjects and for Mathematics, including:

- CCSS.MP4 Model with mathematics.
- CCSS.MP5 Use appropriate tools strategically.
- CCSS.MP6 Attend to precision.
- CCSS.HSA-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- CCSS.HSA-CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
- CCSS.HSA-CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
- CCSS.HSA-REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

UNIT ONE

Shop Safety

PERFORMANCE STANDARDS

- BC.02.01 Demonstrate safe material handling practices.
- BC.02.02 Demonstrate and explain knowledge of workplace safety procedures.

ESSENTIAL QUESTION

- Why is it important that everyone understands and follows the safety procedures in and around the shop?

FOCUS QUESTIONS

Following completion of this unit, students will be able to answer the following questions:

- Where is the power emergency stop?
- Where are the fire extinguishers/fire blankets in the room?
- Where is the fire escape route?
- Where is the first aid kit located?
- Where is the nurse's office located?
- What are the different types of Personal Protective Equipment (PPE)?
- Where is the location of the emergency eyewash station?
- Where is the location of the flammable material cabinet?
- What is the MSDS sheet and where is it located?

SCOPE AND SEQUENCE

- Locations of emergency equipment.
- Fire escape route.
- MSDS with specific detail about the chemical properties, health and safety hazards of each chemical product

INSTRUCTIONAL/TEACHING STRATEGIES

- Provide unit material at a level differentiated students can follow
- Provide a note taking-sheet

ASSESSMENTS

- Written assessment covering key points on shop safety

TIME ALLOCATION

- 1 week

UNIT TWO

Measurement

PERFORMANCE STANDARDS

ENG.03.03	Use the following measurement tools and instruments: rulers, micrometers, and Vernier calipers.
BC.04.05	Measure accurately to a sixteenth of an inch.
BC.04.07	Explain and use fractional dimensions.
CCSS.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the test.
CCSS.HSN-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

ESSENTIAL QUESTION

- Why do we need to be able to read a ruler?

FOCUS QUESTIONS

Following completion of this unit, students will be able to answer the following questions:

- What do the lines on a ruler mean?
- How do you convert feet to inches?
- How do you reduce a fraction to its lowest terms?

SCOPE AND SEQUENCE

- 1/16", 1/8", 1/4", 1/2"
- Division of measurements

INSTRUCTIONAL/TEACHING STRATEGIES

- Provide unit material at varied reading levels using multiple resources
- Teach the sixteen parts of an inch using 3-foot-long scale model of an inch as a visual
- Online ruler reading game difficulty can be adjusted from whole to half, and all the way down to sixteenth scale

ASSESSMENTS

- Written quiz that aligns with the teacher-constructed note-taking guide
- Extra points can be earned for the high score on an online ruler reading game

TIME ALLOCATION

- 1 week

UNIT THREE

Sheet Metal Design

PERFORMANCE STANDARDS

- MAN.01.01 Describe the process of interpreting and preparing technical drawings and rough drawings and sketches.
- MAN.03.02 Demonstrate the safe and accurate secondary process to create a finished product; forming; separating; combining; assembly; finishing.
- MAN.03.03 Apply a variety of manufacturing techniques and processes to create a usable product.

ESSENTIAL QUESTION

- How can we take a material and alter it to create something useful that serves a specific purpose?

FOCUS QUESTIONS

Following completion of this unit, students will be able to answer the following questions:

- How is sheet metal classified?
- What is a sheet metal pattern?
- What are the different types of sheet metal machines?
- What are different sheet metal joinery methods?

SCOPE AND SEQUENCE

- | | |
|--|---|
| 1. Thickness of metal (gauge)
12 gauge, 18 gauge, etc.
The higher the number, the thinner the metal | 3. Foot Shear
Box and Pan Brake
Bar Folder
Beverly Shear
Hand Shears |
| 2. Full-size drawing of an object's surface stretched out on a single plane
Stretch-out
Parallel-line developments
Radial-line developments
Transition piece
Geometric shapes | 4. Lap Joint
Countersunk lap joint
Grooved seam joint
Locked corner seam
Flat lock seam
Outside lap seam
Blind rivets |

INSTRUCTIONAL/TEACHING STRATEGIES

- Provide unit material at varied reading levels using multiple resources
- Student will be assigned a work partner if they have difficulty handling the tools/equipment

ASSESSMENTS

- Successful completion of a pattern that will be used to create a class project
- Written quiz that aligns with the teacher-constructed note-taking guide

TIME ALLOCATION

- 8 weeks

UNIT FOUR

Introduction to Welding

PERFORMANCE STANDARDS

MAN.02.03	Select materials based on properties required by the project.
BC.04.12	Prepare stock for use.
CCSS.MP1	Make sense of problems and persevere in solving them.
CCSS.MP2	Reason abstractly and quantitatively.
CCSS.WHST.9-10.2a	Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; including formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.

ESSENTIAL QUESTION

- What is the purpose of welding?
- What is involved with the welding process?

FOCUS QUESTIONS

Following completion of this unit, students will be able to answer the following questions:

- What safety equipment is needed while performing a welding process?
- What accessories or consumables are needed?
- How does the SMAW process work?
- How does the GMAW process work?

SCOPE AND SEQUENCE

1. Welding mask
 - Leather apron
 - Leather gloves
 - Protective sleeves
 - Closed-toe shoes
 - Long pants
 - Tools used to handle hot weld metal
 - Fume extractor
2. Welding machine
 - Electrical supply
 - Electrode holder
 - Electrodes
 - Welding wire spool
 - GMAW gun
 - Ground clamp
 - Chipping hammer/wire brush
 - Base metal

3. Electrical current flows from welding machine, through the leads, through the work piece and back to form a complete circuit.
 - The electrode is the filler metal, and it is covered with a flux covering, which when burned emits a shielding gas to protect the weld.
 - The shielding gas cools, solidifying and producing a hard “slag” that keeps the weld protected from oxidation
4. Electrical current flows from welding machine to the welding gun.
 - Once the trigger is pulled, electrical current continues, and wire is fed through the gun tip to the base metal and back to form a complete circuit.
 - As the wire is fed out of the gun onto the base metal it melts due to the heat of the arc and creates a weld bead.
 - As the trigger is pulled there is a consumable argon gas supply that surrounds the weld metal so it does not oxidize and put the strength or appearance of the weld in jeopardy.

INSTRUCTIONAL/TEACHING STRATEGIES

- Provide unit material through PowerPoint presentation lectures
- Student will be assigned a work partner if they have difficulty handling the tools/equipment

ASSESSMENTS

- Written quiz that aligns with the related PowerPoint presentations
- Successful completion of a project of student’s own design that includes a welding method of student’s choice that student thinks would be best for his/her project application

TIME ALLOCATION

- 10 weeks

COURSE CREDIT

One half credit in Technology Education

One class period daily for half a school year

PREREQUISITES

There are no prerequisites for this course.

RESOURCES

Texts

Modern Metalworking, John R. Walker. Tinley Park, IL: Goodheart-Wilcox Company, 2000.

Modern Metalworking, John R. Walker. Tinley Park, IL: Goodheart-Wilcox Company, Workbook, 2000

SUPPLEMENTARY MATERIALS/RESOURCES/TECHNOLOGY

www.howstuffworks.com

www.youtube.com

www.themathworksheetsite.com

www.rsinnovative.com/rulergame/

APPENDIX A SCHOOL WIDE RUBRICS

NEASC Rubric 6

Demonstrate Responsibility for Self

Exemplary

Student demonstrates an independent, industrious work ethic. He/She sets goals and completes them with detail and on time. The student consistently prepares for classes daily. The student works exceptionally well cooperatively with peers and the staff. He/She participates and contributes in a co-curricular capacity within the total school community.

Proficient

Student demonstrates a positive work ethic. He/She sets goals and completes them within a reasonable amount of time. The student is frequently prepared for daily classes. Student works adequately both cooperatively and independently with peers and staff. He/She participates in co-curricular activities.

Needs Improvement

Student possesses a lackadaisical approach to work. He/She needs constant reminders to follow the goal setting process. When goals are established, they are rarely completed within a reasonable amount of time. Daily class preparation is sporadic. The student can work cooperatively and at times participation in activities with peers and staff. The student explores co-curricular opportunities.

Unacceptable

Student lacks a strong work ethic. No goals are evident. The student is not prepared for classes. He/She prefers to work cooperatively so others can do his/her work. The student selects a co-curricular; however, does not choose to participate actively when presented with the opportunity.

NEASC Rubric 7

Respects themselves and others and practices interpersonal skills

Exemplary

Student demonstrates a high level of cultural understanding and respect for the uniqueness of others, their practices, and perspectives. The student champions discussions to resolve differences through active listening and offers opinions in a positive and rational manner.

Proficient

Student demonstrates an appreciation and respect for cultural understanding of the uniqueness of others, their practices and perspectives. He/She actively discusses avenues to resolve differences when appropriate. The student presents encouraging opinions upon request.

Needs Improvement

Student demonstrates a limited appreciation and respect for the uniqueness of cultural understanding of others, their practices and perspectives. At times, he/she appears indifferent to the ordeals of others. The student supports his/her own opinions, but appears inflexible to resolve differences and remains tied to his/her own beliefs.

Unacceptable

Student demonstrates little or no appreciation and respect for the uniqueness of cultural understanding of others, their practices and perspectives. He/She demonstrates intolerance and lacks social interaction skills.